



SWARNIM SCIENCE COLLEGE

MSc Clinical Research Programme

Semester 1

Course Title: MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES-I

Category of Course	Course Code	Credit	Content Hours	Internal			External	
				Theory	Continuous Assessment	Practical	Theory	Practical
Core	256100101	4	40					
				20 %	10 %	-	70 %	-

1. Course Outcomes

Upon completion of this course, the student should be able to:

CO1: Explain and demonstrate the principles of UV-visible spectroscopy along with its instrumentation and application

CO2: Describe the theory, principle, instrumentation, and applications of IR spectroscopy

CO3: Explain the theory, application, and instrumentation including ionization techniques, analysers, and detectors. Also understand the different ions, fragmentation rules, and rearrangements.

CO4: Understand and get knowledge about the basics of NMR and the different terms involved in it with an overview of C13NMR.

CO5: Discuss and classify Chromatography and its techniques and explain the theory, principle, methodology, pros, cons, and applications of Adsorption and partition, column, TLC and paper chromatography, ion exchange, affinity, gel chromatography

CO6: Outline the theory, instrumentation, and parameters of Gas chromatography as well as HPLC along with its advantages, disadvantages, and applications.




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.Syllabus:

Module	Contents	No of Sessions	Weightage
1.	UV-Visible Spectroscopy: Brief review of electromagnetic spectrum and absorption of radiations. The chromophore concept, absorption law, and limitations. Theory of electronic spectroscopy, absorption by organic molecules, choice of solvent, and solvent effects. Applications of UV-visible spectroscopy, multi-component assay, difference spectra and derivative spectra	08	20 %
2.	IR Spectroscopy: Theory of absorption of Infrared radiation by molecules; Molecular vibrations; Factors influencing vibrational frequencies; Calculation of vibrational frequencies (Hooke's law); Sample handling techniques; Instrumentation (Dispersion and FTIR spectrometer) and applications of IR Spectroscopy; Calibration of IR Spectrophotometer as per Pharmacopoeia	08	20 %
3.	Mass Spectrometry: Theory; Ionization techniques, Ion separating techniques; Different types of ions and their significance in mass spectra, Fragmentation rules and rearrangements; Instrumentation and applications of mass Spectrometry	08	15 %
4.	Nuclear Magnetic Resonance spectroscopy: Fundamental Principles - nuclear spin, magnetic moment; Proton NMR spectroscopy - theory, chemical shift and factors affecting chemical shift, spin-spin coupling, coupling constant, relaxation process, Instrumentation and applications of PMR; Brief overview of C13 NMR	08	20 %
5.	Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and applications of the following: a) Paper chromatography b) Thin Layer chromatography c) Ion exchange chromatography d) Column chromatography e) Gas chromatography f) High Performance Liquid chromatography g) Affinity chromatography	06	25%



2. Evaluation		
1	Assignments / Quizzes / Class Participation / Role Play/ Project etc.	10% (Internal Assessment)
2	Internal Examination	20% (Internal Assessment)
3	External Examination (University Exam)	70% (External Assessment)

3. Basic Text Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	Dr. B.K Sharma	Instrumental Methods of Chemical Analysis	Krishna Prakashan	24 th
2.	A.I. Vogel,	Vogel's Textbook of Quantitative Chemical Analysis	Pearson Education	6 th
3	D. C. Garrett	Quantitative Analysis of Drugs	Springer US	3 rd

4. Reference Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	P. D. Sethi	Quantitative Analysis of Drugs in Pharmaceutical Formulations	CBS Publishers & Distributors	3 rd
2.	Robert M Silverstein	Spectrometric Identification of Organic compounds -	John Wiley & Sons	6th
3.	Willards	Instrumental methods of analysis	CBS publishers	7th
4.	Doglas A Skoog, F. James Holler, Timothy A. Nieman	Principles of Instrumental Analysis -	Eastern press	5th




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SWARNIM SCIENCE COLLEGE

MSc Clinical Research Programme

Semester 1

Course Title: PHARMACEUTICAL DOSAGE FORMS

Category of Course	Course Code	Credit	Content Hours	Internal			External	
				Theory	Continuous Assessment	Practical	Theory	Practical
Core	256100102	4	40					
				20 %	10 %	-	70 %	-

1. Course Outcomes

Upon completion of this course the student should be able to:

CO1: Outline basics of different dosage forms like tablet capsules, aerosol and parenteral.

CO2: Design and develop various conventional dosage forms.

CO3: Discuss the basic requirement of cGMP and industrial management.

CO4: Categories the biopharmaceutical consideration for product development

CO5: Prioritise the factor affecting drug product performance.

CO6: Illustrate the requirement of scale up and post approval changes.




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Syllabus:

Module	Contents	No of Sessions	Weightage
1.	Tablets: a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipment and tablet tooling. Capsules: a. Hard gelatin capsules: Introduction, Production of hard gelatin capsule shells. Size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. b. Soft gelatin capsules: Nature of shell and capsule content, size of capsules, importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules	08	20 %
2.	Parenteral Products: a. Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, b. Production procedure, production facilities and controls, aseptic processing c. Formulation of injection. d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Pharmaceutical Aerosols: Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies	08	20 %
3.	Biopharmaceutic considerations in drug product design and In Vitro Drug Product Performance: Introduction, biopharmaceutic factors affecting drug bioavailability, rate-limiting steps in drug absorption, physicochemical nature of the drug formulation factors affecting drug product performance, in vitro: dissolution and drug release testing, compendial methods of dissolution, alternative methods of dissolution testing, meeting dissolution requirements, problems of variable control in dissolution testing performance of drug products. In vitro–in vivo correlation, dissolution profile comparisons, drug product stability, considerations in the design of a drug product.	08	20 %
4.	Drug Product Performance, In Vivo: Bioavailability and Bioequivalence: drug product performance, purpose of bioavailability studies, relative and absolute availability. methods for assessing bioavailability, bioequivalence studies, design and evaluation of bioequivalence studies,	08	20 %



	study designs, crossover study designs, evaluation of the data, bioequivalence example, study submission and drug review process. biopharmaceutics classification system, methods. Permeability: In-vitro, in-situ and In-vivo methods. generic biologics (biosimilar drug products), clinical significance of bioequivalence studies, special concerns in bioavailability and bioequivalence studies, generic substitution		
5.	cGMP & Industrial Management: Objectives and policies of current good manufacturing practices, layout of buildings, services, equipment and their maintenance Production management: Production organization, materials management, handling and transportation, inventory management and control, production and planning control, Sales forecasting, budget and cost control, industrial and personal relationship.	06	15%
6.	Pilot plant scale up techniques: General considerations – including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology	04	5%

2. Evaluation

1	Assignments / Quizzes / Class Participation / Role Play/ Project etc.	10% (Internal Assessment)
2	Internal Examination	20% (Internal Assessment)
3	External Examination (University Exam)	70% (External Assessment)

3. Basic Text Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	Lachmann and Libermann	Theory and Practice of Industrial Pharmacy	Publisher Lea & Febiger, U.S.	3rd
2.	Sidney H. Willig.	Good manufacturing practices for Pharmaceuticals: A plan for total quality control	Marcel Dekker Inc	2 nd




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3	Gillbert and S. Banker.	Modern Pharmaceutics	CRC press	4 th

4. Reference Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	P.P. Sharma.	How to practice GMPs	Vandhana Publications, Agra	5 th
2.	Rawlins.	Bentley's Textbook of Pharmaceutics	Elsevier	Old




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SWARNIM SCIENCE COLLEGE

MSc Clinical Research Programme

Semester 1

Course Title: FUNDAMENTALS OF PHARMACOLOGY AND CLINICAL RESEARCH

Category of Course	Course Code	Credit	Content Hours	Internal			External	
				Theory	Continuous Assessment	Practical	Theory	Practical
Core	256100103	4	40	20 %	10 %	-	70 %	-

5. Course Outcomes

Upon completion of syllabus, students can able to

CO1. Identify various routes of administration of drugs and their pharmacokinetic processes.

CO2. Understand the concepts of drug action and mechanisms involved along with basics of cell biology and secondary messengers.

CO3. Summarize the basic principles of transmission including transmission of neurotransmitters of autonomic and central nervous system.

CO4. Describe the principles and applications of various techniques used in basic research.

CO5. Demonstrate about the laboratory animals, their maintenance as per the guidelines, basic knowledge of preclinical and toxicological evaluation processes.

CO6. Illustrate the basic fundamentals of clinical research.




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6. Syllabus:

Module	Contents	No of Sessions	Weightage
1	General Pharmacology Routes of Drug Administration Pharmacokinetics: The dynamics of drug absorption, distribution, biotransformation and elimination. Significance of protein binding.	05	12.5 %
2	Cell biology and cell signalling: Structure and functions of cell and its organelles, Transport across the cell membrane. Classification of receptor family and molecular structure ligand gated ion channels; G-protein coupled receptors, tyrosine kinase receptors and nuclear receptors. Secondary messengers: cyclic AMP, cyclic GMP, calcium ion, inositol 1, 4, 5-trisphosphate, (IP3), NO, and diacylglycerol.	06	15 %
3	Neurotransmission a. General aspects and steps involved in neurotransmission. b. Neurohumoral transmission in autonomic nervous system c. Neurohumoral transmission in central nervous system	05	12.5 %
4	Principles and applications of following tools DNA electrophoresis, Polymerase chain reaction, SDS page, ELISA, Western blotting technique, Recombinant DNA technology and gene therapy.	08	20 %
5	Preclinical and toxicological screening Common laboratory animals, Transgenic animals, CPCSEA guidelines to conduct experiments on animals. Anaesthesia and euthanasia of experimental animals. General principles of preclinical screening. Basic definition and types of toxicology. ICH guidelines for conducting toxicity studies. Oral and dermal toxicity studies as per OECD guidelines. General principles of treatment of poisoning.	10	25%
6	Basics of clinical research	06	15%



	a. Introduction to Clinical research. b. Adverse drug reactions: Definition, Terminologies and types of ADR. Causality assessment, Severity and seriousness assessment. c. Drug interactions (Pharmacokinetic and Pharmacodynamic interactions) d. Phases of clinical trials e. Origin and Principles of ICH-GCP (Good Clinical Practice) guidelines f. Institutional Review Board		

7. Evaluation

1	Assignments / Quizzes / Class Participation / Role Play/ Project etc.	10% (Internal Assessment)
2	Internal Examination	20% (Internal Assessment)
3	External Examination (University Exam)	70% (External Assessment)

8. Basic Text Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	K. D. Tripathi	Essentials of Medical Pharmacology	Jaypee Brothers Medical Publishers Ltd	7 th
2.	Julia Lloyd and Ann Raven	Handbook of clinical Research	Churchill Livingstone	2 nd
3.	Karen E. Stine, Thomas M. Brown	Principles of toxicology	CRC Press	3 rd

9. Reference Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	Bjorn Knollmann, Laurence Brunton	Goodman and Gillman's, The Pharmacological Basis of Therapeutics	McGraw-Hill Education	14 th
2.	David Machin, Simon Day, Sylvan Green	Textbook of Clinical Trials	John Wiley and Sons	2 nd





SWARNIM SCIENCE COLLEGE

MSc Clinical Research Programme

Semester 1

Course Title: CONCEPTS OF NATURAL PRODUCTS

Category of Course	Course Code	Credit	Content Hours	Internal			External	
				Theory	Continuous Assessment	Practical	Theory	Practical
Core	256100104	4	40					
				20 %	10 %	-	70 %	-

10. Course Outcomes

Upon completion of this course the student should be able to:

CO1: Explain medicinal importance of natural drugs

CO2: Illustrate the importance of quality control of drugs of natural origin.

CO3: Describe importance of primary and secondary metabolites of medicinal plants.

CO4: Discuss the principles of alternative system of medicines.

CO5: Demonstrate various extraction and estimation techniques of Phytoconstituents.

CO6: Brief outline the uses of herbs in nutraceuticals and cosmeceuticals.




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Syllabus

Module	Contents	No of Sessions	Weightage																		
1.	Definition, history, present status, and scope of Pharmacognosy Classification of Natural drugs: ● Alphabetical ● Taxonomical ● Morphological ● Pharmacological ● Chemical ● Chemo-taxonomical Adulteration of drugs of natural origin. WHO guidelines in quality assessment of herbal drugs.	07	15 %																		
2.	Introduction to primary and secondary metabolites: Definition, classification, properties and test for identification of Carbohydrates, Proteins, Lipids, Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins Basic principles involved in the traditional systems of medicine like: Ayurveda, Siddha, Unani and Homeopathy	10	20 %																		
3.	Biological source, chemical constituents, and therapeutic efficacy of the following categories of crude drugs. <table><tr><td>Cardiotonic</td><td>Digitalis</td></tr><tr><td>Drugs acting on GI tract</td><td>Fennel, Ginger, Black Pepper,</td></tr><tr><td>Asafoetida, Senna</td><td></td></tr><tr><td>Drugs acting on nervous system</td><td>Datura, Opium, Tea leaves, Coffee seeds</td></tr><tr><td>Anti-hypertensive</td><td>Rauwolfia</td></tr><tr><td>Anti-Cancer</td><td>Vinca, Podophyllum, Taxus</td></tr><tr><td>Antidiabetics</td><td>Pterocarpus, Gymnema</td></tr><tr><td>Antiseptics and disinfectants</td><td>Neem, Turmeric, Tulsi</td></tr><tr><td>Antimalarials</td><td>Cinchona, Artemisia</td></tr></table>	Cardiotonic	Digitalis	Drugs acting on GI tract	Fennel, Ginger, Black Pepper,	Asafoetida, Senna		Drugs acting on nervous system	Datura, Opium, Tea leaves, Coffee seeds	Anti-hypertensive	Rauwolfia	Anti-Cancer	Vinca, Podophyllum, Taxus	Antidiabetics	Pterocarpus, Gymnema	Antiseptics and disinfectants	Neem, Turmeric, Tulsi	Antimalarials	Cinchona, Artemisia	08	20 %
Cardiotonic	Digitalis																				
Drugs acting on GI tract	Fennel, Ginger, Black Pepper,																				
Asafoetida, Senna																					
Drugs acting on nervous system	Datura, Opium, Tea leaves, Coffee seeds																				
Anti-hypertensive	Rauwolfia																				
Anti-Cancer	Vinca, Podophyllum, Taxus																				
Antidiabetics	Pterocarpus, Gymnema																				
Antiseptics and disinfectants	Neem, Turmeric, Tulsi																				
Antimalarials	Cinchona, Artemisia																				



4.	Basics of Phytochemistry Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of natural drugs.	08	20 %
5.	Nutraceuticals: Brief introduction, Regulatory aspects, FSSAI guidelines and therapeutic applications of Nutraceuticals. Different herbs used as a health food. Herbal cosmetics: Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.	07	25%

11. Evaluation

1	Assignments / Quizzes / Class Participation / Role Play/ Project etc.	10% (Internal Assessment)
2	Internal Examination	20% (Internal Assessment)
3	External Examination (University Exam)	70% (External Assessment)

12. Basic Text Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	C.K. Kokate, Purohit, Gokhlae.	Text book of Pharmacognosy, Gokhlae (2007),	Nirali Prakashan, Pune, 2007	37 th
2.	V.D. Rangari	Textbook of Pharmacognosy & Phytochemistry; Vol 1	Career publication	-
3	H.Pande	Herbal Cosmetics	Asia Pacific Business press, Inc, New Delhi.	-



4.	Mohammad Ali	Pharmacognosy	CBS Publishers & Distributors, New Delhi 2008	2008

13. Reference Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	W. C. Evans, Trease and Evans	Pharmacognosy	W.B. Sounders & Co., London, 2009	16 th
2.	WHO	WHO: Quality Control Methods for Medicinal Plant Materials	WHO, Geneva	1988
3.	Mukherjee P.W.	Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals	Business Horizons Publishers, New Delhi, India	2002
4.	Agrawal S.S.	Herbal Drug Technology	Orient Blackswan, New Delhi, 2012	2 nd




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SWARNNIM SCIENCE COLLEGE

MSc Clinical Research Programme

Semester 1

Course Title: MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES-I PRACTICAL

Category of Course	Course Code	Credit	Content Hours	Internal			External	
				Theory	Continuous Assessment	Practical	Theory	Practical
Core	256100105	4	120					
				-	-	50%	-	50%

Course Outcomes

Upon completion of this course, the student should be able to:

CO1: Develop skills in the Analysis of Pharmacopoeial Compounds and Formulations by different spectroscopy.

CO2: Describe and perform different practical methods for performing and separating of mixtures by paper and thin layer chromatography.

CO3: Develop the ability to document experimental procedures, record observations, and effectively communicate results. Emphasize the importance of maintaining accurate and organized experimental records.

CO4: Understand and apply the fundamental principles of HPLC, including the role of the stationary phase, mobile phase, and detector in achieving high-resolution separations.

CO5: Apply knowledge and hands-on skills on Gas Chromatography Instrumentation Proficiency




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No.	Title	Hours/ week
1	Analysis of pharmacopoeial compounds and their formulations by UV Vis spectrophotometer (Any TWO)	8
2	Simultaneous estimation of multi component containing formulations by UV spectrophotometry (Any TWO)	
3	Assay of raw materials as per official monographs (Any TWO)	
4	Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds	
5	To determine isobestic point of indicator by UV Spectrophotometry	
6	To determine dissociation constant of indicators by UV spectrophotometry	
7	Estimation of Sulfanilamide by colorimetry	
8	Estimation of non coloured drugs by derivatization	
9	Determination of vitamin C	
10	Estimation of quinine sulfate by fluorimetry	
11	Study of quenching of fluorescence	
12	Separation of amino acids by paper chromatography	
13	Separation of sugars by thin layer chromatography	
14	Separation of plant pigments by column chromatography	
15	Demonstration experiment on HPLC and Gas Chromatography	

1. Basic Text Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	Beckett and Stenlake	Practical Pharmaceutical Chemistry – Vol II	CBS Publishers	4 th
2.	P. D. Sethi, Dilip Charegaonkar	Identification of Drugs and Pharmaceutical Formulations by Thin Layer Chromatography	CBS Publishers	2 nd

2. Reference Books:




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Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	P. D. Sethi	Quantitative Analysis of Drugs in Pharmaceutical Formulations	CBS Publishers & Distributors	3 rd
2.	Doglas A Skoog, F. James Holler, Timothy A. Nieman	Principles of Instrumental Analysis	Eastern press	5th
3.	F. D. Snell and C. T. Snell	Colorimetric Methods of analysis (Van Nostrand Reinhold Company, N.Y.).	John Wiley and Sons	3 rd
4.	A.C.Moffat, M. David Osselton, Brain Widdop, L. Y. Galichet	Clarke's Analysis of Drugs and Poisons	Pharmaceutical Press	3 rd
5.	K. A. Connors	Text book of Pharmaceutical Analysis	John Wiley & Sons	3 rd





SWARNNIM SCIENCE COLLEGE

MSc Pharmaceutics Programme

Semester 2

Course Title: MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES-II

Category of Course	Course Code	Credit	Content Hours	Internal			External	
				Theory	Continuous Assessment	Practical	Theory	Practical
Core	256070201	4	40					
				20 %	10 %	-	70%	-

1. Course Outcomes

Upon completion of this course, the student should be able to:

CO1: Explain and demonstrate the principles of Fluorescence spectroscopy and Atomic absorption and emission spectroscopy along with its instrumentation and application

CO2: Describe the theory, principle, instrumentation, and applications of Gas chromatography

CO3: Explain the theory, principle, methodology, pros, cons, and applications of High-performance liquid chromatography

CO4: Understand and get knowledge about the basics of High-performance Thin layer chromatography with its instrumentation and applications.

CO5: Develop theoretical and practical skills for validation and calibration of various analytical instruments

CO6: Outline the HPLC and Bio-analytical method development




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Syllabus:

Module	Contents	No of Sessions	Weightage
1.	Atomic Absorption And Plasma Emission Spectroscopy: Principle, instrumentation, interferences and applications in Pharmacy Spectrofluorimetry: Theory of Fluorescence, Factors affecting fluorescence, Quenchers, Instrumentation and Applications of fluorescence spectrophotometer	08	20 %
2.	Gas Chromatography: Introduction; Theory and Principle of Gas-Chromatography; Mobile phase, Stationary phases for GSC and GLC; Instrumentation (including temperature programming and derivatization) and applications of GC; Overview of GC-MS. High-Performance Liquid Chromatography: Introduction; Theory, Classification and Principle of HPLC; Mobile phase, Stationary phases for normal and reversed-phase HPLC; Instrumentation (including the significance of guard column) and applications of HPLC; Comparison of HPLC with GC; Overview of LC-MS, LC-MS/MS.	12	25 %
3.	HPTLC Principle; Comparison with HPLC; Instrumentation, applications, advantages, and limitations of HPTLC	8	15 %
4.	Validation and calibration of various instruments used for drug analysis: pH Meter, Conductometer, UV Visible Spectrophotometer, IR Spectrophotometer, HPLC, HPTLC	4	15 %
5.	HPLC Method Development: Basics of separation including Column resolution, Plate number, Plate height, Selectivity factor, Capacity factor, and their optimization. Selection of detector and column Mobile phase optimization including the selection of the correct pH value Bio-analytical HPLC method development and validation: Biological sample preparation: Protein precipitation, liquid-liquid extractions, solid phase extractions, and membrane separations	8	25%



2. Evaluation		
1	Assignments / Quizzes / Class Participation / Role Play/ Project etc.	10% (Internal Assessment)
2	Internal Examination	20% (Internal Assessment)
3	External Examination (University Exam)	70% (External Assessment)

3. Basic Text Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	Dr. B.K Sharma	Instrumental Methods of Chemical Analysis	Krishna Prakashan	24 th
2.	A.I. Vogel,	Vogel's Textbook of Quantitative Chemical Analysis	Pearson Education	6 th
3	D. C. Garrett	Quantitative Analysis of Drugs	Springer US	3 rd

4. Reference Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	P. D. Sethi	Quantitative Analysis of Drugs in Pharmaceutical Formulations	CBS Publishers & Distributors	3 rd
2.	Robert M Silverstein	Spectrometric Identification of Organic compounds -	John Wiley & Sons	6th
3.	Willards	Instrumental methods of analysis	CBS publishers	7th
4.	Doglas A Skoog, F. James Holler, Timothy A. Nieman	Principles of Instrumental Analysis -	Eastern press	5th





SWARNNIM SCIENCE COLLEGE

MSc Pharmaceutics Programme

Semester 2

Course Title: REGULATORY AFFAIRS

Category of Course	Course Code	Credit	Content Hours	Internal			External	
				Theory	Continuous Assessment	Practical	Theory	Practical
Core	256070202	4	40					
				20 %	10 %	-	70 %	-

1. Course Outcomes

Upon completion of this course, the student should be able to:

CO1. The Concepts of innovator and generic drugs, drug development process.

CO2. The Regulatory guidance's and guidelines for filing and approval Process

CO3. Preparation of Dossiers and their submission to regulatory agencies in different countries

CO4. Post approval regulatory requirements for actives and drug products

CO5. Submission of global documents in CTD/ eCTD formats

CO6. Clinical trials requirements for approvals for conducting clinical trials, Pharmacovigilance and process of monitoring in clinical trials.




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Sr. No	Course Content	Total Hrs
1.	a. Documentation in Pharmaceutical industry: Master formula record, DMF (Drug Master File), distribution records. Generic drugs product development Introduction, Hatch- Waxman act and amendments, CFR (CODE OF FEDERAL REGULATION), drug product performance, invitro, ANDA regulatory approval process, NDA approval process, BE and drug product assessment, in –vivo, scale up process approval changes, post marketing surveillance, outsourcing BA and BE to CRO. b. Regulatory requirement for product approval: API, biologics, novel, therapies obtaining NDA, ANDA for generic drugs ways and means of US registration for foreign drugs	15
2	CMC, post approval regulatory affairs. Regulation for combination Products and medical devices. CTD and ECTD format, industry and FDA liaison. ICH - Guidelines of ICH-Q, S E, M. Regulatory requirements of EU, MHRA, TGA and ROW countries.	10
3	Non clinical drug development: Global submission of IND, NDA, ANDA. Investigation of medicinal products dossier, dossier (IMPD) and investigator brochure (IB)	7
4	Clinical trials: Developing clinical trial protocols. Institutional review board/ independent ethics committee Formulation and working procedures informed Consent process and procedures. HIPAA- new, requirement to clinical study process, pharmacovigilance safety monitoring in clinical trials.	8



2. Evaluation		
1	Assignments / Quizzes / Class Participation / Role Play/ Project etc.	10% (Internal Assessment)
2	Internal Examination	20% (Internal Assessment)
3	External Examination (University Exam)	70% (External Assessment)

3. Basic Text Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	by Ira R. Berry and Robert P.Martin,	The Pharmaceutical Regulatory Process, Second Edition Edited Drugs and the Pharmaceutical Sciences,	Informa Health care Publishers	Vol.185
2.	Fay A.Rozovsky and Rodney K. Adams	Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance	-	-

4. Reference Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	Richard A Guarino,	New Drug Approval Process: Accelerating Global Registrations	Drugs and the Pharmaceutical Sciences, Vol.190	5th edition,
2.	Leon Shargel and IsaderKaufer	Generic Drug Product Development, Solid Oral Dosage forms	Marcel Dekker series,	Vol.143




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SWARNIM SCIENCE COLLEGE

MSc Pharmaceutics Programme

Semester 2

Course Title: DRUG DELIVERY SYSTEM

Category of Course	Course Code	Credit	Content Hours	Internal			External	
				Theory	Continuous Assessment	Practical	Theory	Practical
Core	256070203	4	40					
				20 %	10 %	-	70 %	-

1. Course Outcomes

Upon completion of this course, the student should be able to:

- CO1. To understand various approaches for development of various controlled drug delivery system.
- CO2. To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation.
- CO3. Differentiate the transdermal delivery approaches and its evaluation.
- CO4. Explore various approaches for gastroretentive drug delivery system.
- CO5. Demonstrate various approaches of microencapsulation and mucosal drug delivery.
- CO6. Design and develop nasopulmonary and ocular drug delivery system.




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Sr. No	Course Content	Total Hrs
1.	Controlled drug delivery systems: Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates. Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations Polymers: Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems	8
2	Microencapsulation: Definition, advantages and disadvantages, microspheres /microcapsules, microparticles, methods of microencapsulation, applications Mucosal Drug Delivery system: Introduction, Principles of bioadhesion / mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems	10
3	Transdermal Drug Delivery Systems: Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches Gastroretentive drug delivery systems: Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems and their applications	12
4	Nasopulmonary drug delivery system: Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers Ocular Drug Delivery Systems: Introduction, intra ocular barriers and methods to overcome –Preliminary study, ocular formulations and ocuserts Intrauterine Drug Delivery Systems: Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications	10



2. Evaluation		
1	Assignments / Quizzes / Class Participation / Role Play/ Project etc.	10% (Internal Assessment)
2	Internal Examination	20% (Internal Assessment)
3	External Examination (University Exam)	70% (External Assessment)

3. Basic Text Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	N.K. Jain,	Controlled and Novel Drug Delivery,	CBS Publishers & Distributors, New Delhi, First	Edition 1997 (reprint in 2001).
2.	S.P. Vyas and R.K. Khar,	Controlled Drug Delivery - concepts and advances, First	Vallabh Prakashan, New Delhi,	edition 2002.

4. Reference Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	Edith Mathiowitz, Published by Wiley Interscience Publication,	Encyclopedia of Controlled Delivery.	John Wiley and Sons, Inc, New York	-
2.	Robinson, J. R., Lee V. H. L.,	Controlled Drug Delivery Systems,	Marcel Dekker, Inc., New York, 1992.	-




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SWARNIM SCIENCE COLLEGE

MSc Pharmaceutics Programme

Semester 2

Course Title: Drug Delivery System

Category of Course	Course Code	Credit	Content Hours	Internal			External	
Core	256070204	4	120	Theory	Continuous Assessment	Practical	Theory	Practical
				-	-	100%	-	-

Course Outcomes

Upon completion of this course, the student should be able to:

CO1: Design various novel dosage forms.

CO2: Evaluate various parameters of dosage forms

CO3: Perform dissolution profile of various drug delivery systems.

CO4: Study stability parameters of various dosage forms.

CO5: Check the effect of various process parameters for optimization of dosage forms.




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No.	Title	Hours/ week
1	To study Micrometric properties of powders and granulation.	8
2	To carry out preformulation studies of tablets.	
3	Formulation and evaluation of sustained release matrix tablets.	
4	Preparation and evaluation of Floating DDS- hydro dynamically balanced DDS	
5	Preparation and evaluation of bilayer tablet.	
6	Formulation and evaluation of Mucoadhesive tablets.	
7	Formulation and evaluation of trans dermal patches.	
8	Formulation and evaluation of osmotic tablet	
9	Preparation and evaluation of microspheres.	
10	Design and development of ocular inserts	
11	Formulation development of buccal drug delivery.	
12	To plot Heckal plot, Higuchi and peppas plot and determine similarity factors.	
13	To perform stability testing of drug in liquid formulation.	
14	To study the effect of polymer on drug release.	
15	To perform In-vitro dissolution profile of CR/ SR marketed formulation	

1. Evaluation		
1	Assignments / Quizzes / Class Participation / Role Play/ Project etc.	10% (Internal Assessment)
2	Internal Examination	20% (Internal Assessment)
3	External Examination (University Exam)	70% (External Assessment)

2. Basic Text Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	N.K. Jain,	Controlled and Novel Drug Delivery,	CBS Publishers & Distributors, New Delhi, First	Edition 1997 (reprint in 2001).




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2.	S.P. Vyas and R.K. Khar,	Controlled Drug Delivery - concepts and advances, First	Vallabh Prakashan, New Delhi,	edition 2002.

3. Reference Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	Edith Mathiowitz, Published by Wiley Interscience Publication,	Encyclopedia of Controlled Delivery.	John Wiley and Sons, Inc, New York	-
2.	Robinson, J. R., Lee V. H. L,	Controlled Drug Delivery Systems,	Marcel Dekker, Inc., New York, 1992.	-




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SWARNIM SCIENCE COLLEGE

MSc Pharmacognosy Programme

Semester 2

Course Title: Advanced Pharmacognosy-I

Category of Course	Course Code	Credit	Content Hours	Internal			External	
				Theory	Continuous Assessment	Practical	Theory	Practical
Core	256110203	4	40					
				20 %	10 %	-	70 %	-

1. Course Outcomes: Upon completion of this course the student should be able to:

CO1: Understand biosynthetic pathways for secondary metabolite production in plants

CO2: Explain the importance of primary metabolites of medicinal plants.

CO3: Describe different category of Plant products with their pharmaceutical applications

CO4: to understand the in vitro techniques in the cultivation and production of crude drugs

CO5: to know the extraction techniques, isolation, characterization, and identification of the phytoconstituents

CO6: to know the content of monograph for herbal drugs and their biological evaluation by in vivo & in vitro models




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Syllabus:

Module	Contents	No of Sessions	Weightage
1	Metabolic pathways in higher plants and their determination a) Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways b) Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.	05	10 %
2	Primary metabolites: General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids for the following Primary metabolites: Carbohydrates: Acacia, Tragacanth, Honey, Starch Enzymes: proteolytic enzymes (Papain, bromelain, urokinase, pepsin). Lipids (Waxes, fats, fixed oils): Castor oil, Wool Fat, Bees Wax	06	20 %
3	Plant Products: Fibers - Cotton, Jute, Hemp Hallucinogens, Teratogens, Natural allergens Marine Drugs: Novel medicinal agents from marine sources	05	10 %
4	Plant Tissue Culture: Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth, and their maintenance. Applications of plant tissue culture in pharmacognosy. Edible vaccines	07	20 %
5	Isolation, Identification and Analysis of Phytoconstituents a) Terpenoids: Menthol, Citral b) Glycosides: Glycyrrhetic acid, Sennosides c) Alkaloids: Atropine, Quinine, Caffeine d) Resins: Podophyllotoxin, Curcumin	08	20%
6	Monographs of herbal drugs: General parameters of monographs of herbal drugs and comparative study in different Pharmacopoeia,	03	5%
7	Biological screening of herbal drugs: In vivo & In vitro evaluation techniques for different category of herbal drugs and Toxicity studies as per OECD guidelines	06	15 %




2. Evaluation		
1	Assignments / Quizzes / Class Participation / Role Play/ Project etc.	10% (Internal Assessment)
2	Internal Examination	20% (Internal Assessment)
3	External Examination (University Exam)	70% (External Assessment)

3. Basic Text Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	C.K. Kokate, Purohit, Gokhlae.	Text book of Pharmacognosy, Gokhlae (2007),	Nirali Prakashan, Pune, 2007	37 th
2.	V.D. Rangari	Textbook of Pharmacognosy & Phytochemistry; Vol 1	Career publication	-
3	S. V. Bhat, B. A. Naga Sampagi, M. Shivakumar	Chemistry of Natural Products	Narosa Publishing House, New Delhi, 2015	
4	R Endress	Plant cell Biotechnology	Springer-Verlag, Berlin, 1994	1994
5	Gurdeep R Chatwal	Organic Chemistry of Natural Products, Vol. 1 & 2.	Himalaya Publishing House, 2016	4th Edition
6	Vyas and Dixit	Text Book of Biotechnology	-	-

4. Reference Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	W. C. Evans, Trease and Evans	Pharmacognosy	W.B. Saunders & Co., London, 2009	16 th
2.	WHO	WHO: Quality Control Methods for Medicinal Plant Materials	WHO, Geneva	1988
3.	Mukherjee P.W.	Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals	Business Horizons Publishers, New Delhi, India	2002
4.	Agrawal S.S.	Herbal Drug Technology	Orient Blackswan, New Delhi, 2012	2 nd



5.	Indian Pharmacopoeian Commisiion	Indian Pharmacopoeia	Ministry of health & family welfare, Gov. of India	2008
6.	Hildebert Wagner and Sabine Bladt	Plant Drug Analysis	Springer, NY, 1996	2nd Edition




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SWARNIM SCIENCE COLLEGE

MSc Pharmacognosy Programme

Semester 2

Course Title: Pharmacognosy Practical-I

Category of Course	Course Code	Credit	Content Hours	Internal			External	
Core	256110204	4	120	Theory	Continuous Assessment	Practical	Theory	Practical
				-	-	30%	-	70%

Course Outcomes

Upon completion of this course, the student should be able to:

CO1: Identify crude drugs with Morphological parameters.

CO2: Identify crude drugs with Microscopical parameters.

CO3: Extraction of phytoconstituents from plant powders.

CO4: Isolation of phytoconstituents from plant powders.

CO5: Perform Qualitative Chemical evaluation of crude drugs




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No.	Title	Hours/ week
1	Morphology, histology, and powder characteristics of: Cinnamon bark	8
2	Morphology, histology, and powder characteristics of: Senna leaflet	
3	Morphology, histology, and powder characteristics of: Vasaka leaf	
4	Morphology, histology, and powder characteristics of: Clove flower buds	
5	Morphology, histology, and powder characteristics of: Ephedra stem	
6	Morphology, histology, and powder characteristics of: Fennel and Coriander Fruits	
7	Exercise involving isolation & detection of active principles Caffeine - from tea dust	
8	Exercise involving isolation & detection of active principles Glycyrrhithinic acid from Liquorice	
9	Exercise involving isolation & detection of active principles Atropine from Belladonna	
10	Exercise involving isolation & detection of active principles Sennosides from Senna	
11	Separation of amino acids by Paper chromatography	
12	TLC of herbal extract	
13	Distillation of volatile oils and detection of Phyto constituents by TLC	
14	Monograph analysis of herbal drugs from recent Pharmacopoeias	
15	Analysis & Identification of crude drugs by chemical tests	



1. Evaluation		
1	Assignments / Quizzes / Class Participation / Role Play/ Project etc.	10% (Internal Assessment)
2	Internal Examination	20% (Internal Assessment)
3	External Examination (University Exam)	70% (External Assessment)

2. Basic Text Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	C.K. Kokate, Purohit, Gokhlae.	Text book of Pharmacognosy, Gokhlae (2007),	Nirali Prakashan, Pune, 2007	37 th
2.	V.D. Rangari	Textbook of Pharmacognosy & Phytochemistry; Vol 1	Career publication	-
3.	Khandelwal K. R.	Practical of Pharmacognosy	Nirali Prakashan	19 th edition

3. Reference Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	WHO	WHO: Quality Control Methods for Medicinal Plant Materials	WHO, Geneva	1988
2.	Indian Council of Medical Research,	Quality Standards of Indian Medicinal Plants	New Delhi, 200	
3.	Hildebert Wagner and Sabine Bladt	Plant Drug Analysis	Springer, NY, 1996	2nd Edition





SWARNNIM SCIENCE COLLEGE

MSc Programme

MSc Pharmacology Semester 2

Course Title: Advanced Pharmacology

Category of Course	Course Code	Credit	Content Hours	Internal			External	
				Theory	Continuous Assessment	Practical	Theory	Practical
Core	256090203	4	40	20 %	10 %	-	70 %	-

1. Course Outcomes

Upon completion of syllabus, students can able to

CO1. Describe the pharmacology of drugs acting on parasympathetic and sympathetic nervous system.

CO2. Illustrate the pharmacological aspects of drugs acting on central nervous system, local anaesthetics, opioid and non-opioid analgesics.

CO3. Classify drugs acting on cardiovascular-haemopoietic system and discuss their pharmacology.

CO4. Understand the basic concepts and pharmacology of diuretics, anti-histamines and drugs used in the treatment of asthma, ulcer, diabetes and hyperthyroidism.

CO5. Explain the basics of chemotherapy along with the detailed study of Antibiotics.

CO6. Summarize the drug classes and their pharmacological role in cancer, tuberculosis, malaria, fungal and viral infections.




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2. Syllabus:

Module	Contents	No of Sessions	Weightage
1	Pharmacology of drugs acting on Autonomic nervous system a) Parasympathomimetics and lytics b) Sympathomimetics and lytics c) Agents affecting neuromuscular junction	05	12.5 %
2	Pharmacology of drugs acting on Central nervous system a) General and local anesthetics b) Sedatives and hypnotics c) Anti-depressants d) Anti-psychotic agents e) Antiepileptic agents f) Drugs used for the treatment of neurodegenerative diseases g) Narcotic and non-narcotic analgesics	09	22.5 %
3	Pharmacology of drugs acting on Cardiovascular system a) Antihypertensives b) Anti-ischemics c) Anti- arrhythmics d) Drugs for heart failure e) Anti-hyperlipidemic f) Anticoagulants g) Fibrinolytics and antiplatelet drugs	08	20 %
4	Pharmacology of following drugs a) Diuretics b) Anti-asthmatic agents c) Anti-ulcer drugs d) Anti-diabetic drugs e) Anti-thyroid drugs f) Anti-histamines	07	17.5 %




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5	Chemotherapeutic agents a) Anti-bacterial agents: Sulphonamides, Fluoroquinilones, Penicillins, Cephalosporins, Tetracyclines, Chloramphenicol, Aminoglycosides b) Anti-fungal agents c) Anti-viral agents d) Anti-malarial agents e) Anti-tubercle agents f) Anti-cancer agents	11	27.5%

3. Evaluation		
1	Assignments / Quizzes / Class Participation / Role Play/ Project etc.	10% (Internal Assessment)
2	Internal Examination	20% (Internal Assessment)
3	External Examination (University Exam)	70% (External Assessment)

4. Basic Text Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	Bikash Medhi, Ajay Prakash	Advanced Pharmacology	PharmaMed Press / BSP Books	2 nd
2.	Padmaja Udaykumar	Pharmacology for Pharmacy students	CBC publishers and Distributors Pvt. Ltd.	1 st
3.	HL Sharma, KK Sharma	Principles of Pharmacology	Paras Medical Publisher	3 rd

5. Reference Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	K. D. Tripathi	Essentials of Medical Pharmacology	Jaypee Brothers Medical Publishers Ltd	7 th
2.	Bjorn Knollmann, Laurence Brunton	Goodman and Gillman's, The Pharmacological Basis of Therapeutics	McGraw-Hill Education	14 th
3	Rang HP, Dale MM, Ritter JM, Flower RJ	Rang and Dale's Pharmacology,	Churchil Livingstone Elsevier	10 th





SWARNNIM SCIENCE COLLEGE

MSc Pharmacology Programme

Semester 2

Course Title: PHARMACOLOGY AND CLINICAL RESEARCH PRACTICAL-I

Category of Course	Course Code	Credit	Content Hours	Internal			External	
				Theory	Continuous Assessment	Practical	Theory	Practical
Core	256090204	4	120					
				-	-	100%	-	-

1. Course Outcomes

Upon completion of this course, the student should be able to:

CO1: summarize the importance and maintenance of lab animals along with various techniques of drug administration, blood collection, anesthesia- euthanasia and handling of lab animals.

CO2: identify analgesic, skeletal muscle relaxant, anticonvulsant, CNS depressant and CNS stimulant effect of drugs using different instruments and Ex-Pharm software.

CO3: evaluate and compare miotic, mydriatic and local anaesthetic effects of drugs using Ex-Pharm software.

CO4: analyze prescriptions for their format, essentiality and rationality.

CO5: write SOAP (Subjective, Objective, Assessment and Plan) notes for the given clinical cases of selected common diseases.

CO6: counsel the patients about the disease conditions, uses of drugs, methods of handling and administration of drugs, life-style modifications, and monitoring parameters.




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2. Syllabus

No.	Title	Hours /week
PART-A		8
1	Introduction to experimental pharmacology and common laboratory animals.	
2	Maintenance of laboratory animals as per CPCSEA guidelines.	
3	Techniques of drug administration, blood collection, anesthesia- euthanasia and handling of laboratory animals.	
4	Evaluation of analgesic drugs using Eddy's Hot plate method.	
5	Evaluation of skeletal muscle relaxant activity using rota rod apparatus.	
6	Evaluation of CNS stimulant and depressant drugs on locomotor activity of rat using photoactometer.	
7	Evaluation of anticonvulsant effect of drug by MES and PTZ method.	
8	Effect of drugs on rabbit eye.	
PART-B		
9	Introduction to format of prescription, essentiality and rationality.	
10	To audit given prescription for format of prescription, essentiality and rationality.	
11	To audit given prescription for format of prescription, essentiality and rationality.	
12	Preparation and discussion of SOAP (Subjective, Objective, Assessment and Plan) notes for clinical cases of CNS disorders.	
13	Preparation and discussion of SOAP (Subjective, Objective, Assessment and Plan) notes for clinical cases of cardiovascular disorders.	
14	Preparation and discussion of SOAP (Subjective, Objective, Assessment and Plan) notes for clinical cases of respiratory disorders.	
15	Case studies related to patient counselling.	

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos.




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3. Basic Text Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	Dr. R.K. Goyal	Practicals in Pharmacology	B.S. Shah Prakashan	11 th
2.	Roger Walker and Cate Whittlesea	Clinical pharmacy and therapeutics	Churchill Livingstone	5 th
3.	Kulkarni S.K.	Handbook of experimental pharmacology.	Vallabh Prakashan	3 rd

4. Reference Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	Bikash Medhi, Ajay Prakash	Practical Manual of Experimental and Clinical Pharmacology	Jaypee Brothers Medical Publishers	2 nd
2.	Eric T Herfindal, Dick R Gourley, Joseph L Hirschman	Textbook of therapeutics, Drug and disease management.	Lippincott Williams and Wilkins	6 th
3.	M. N. Ghosh	Fundamentals of Experimental Pharmacology.	Hilton & Company Kolkata.	6 th



**Course Title: PHARMACEUTICAL VALIDATION AND QUALITY MANAGEMENT
SYSTEM**

Category of Course	Course Code	Credit	Content Hours	Internal			External	
				Theory	Continuous Assessment	Practical	Theory	Practical
Core	256080203	4	40					
				20 %	10 %	-	70 %	-

1. Course Outcomes

Upon completion of this course, the student should be able to:

CO1: Explain and demonstrate the principles of Fluorescence spectroscopy and Atomic absorption and emission spectroscopy along with its instrumentation and application

CO2: Describe the theory, principle, instrumentation, and applications of Gas chromatography

CO3: Explain the theory, principle, methodology, pros, cons, and applications of High-performance liquid chromatography

CO4: Understand and get knowledge about the basics of High-performance Thin layer chromatography with its instrumentation and applications.

CO5: Develop theoretical and practical skills for validation and calibration of various analytical instruments

CO6: Outline the HPLC and Bio-analytical method development




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Syllabus:

Module	Contents	No of Sessions	Weightage
1.	Introduction to validation: Definition of Calibration, Qualification and Validation, Scope, frequency, and importance. Difference between calibration and validation. Calibration of weights and measures. Advantages of Validation, scope of Validation, Organization for Validation, Validation Master plan, Types of Validation, Streamlining of qualification and validation process and Validation Master Plan. Qualification: User requirement specification, Design qualification, Factory Acceptance Test (FAT)/Site Acceptance Test (SAT), Installation qualification, Operational qualification, Performance qualification, Re-Qualification (Maintaining status Calibration Preventive Maintenance, Change management).	8	25 %
2.	Process Validation: Concept, Process, and documentation of Process Validation. Prospective, Concurrent & Retrospective Validation, Re validation criteria, Process Validation of various formulations (Coated tablets, Capsules, Ointment/Creams, Liquid Orals, and aerosols.), Aseptic filling: Media fill validation, USFDA guidelines on Process Validation-A life cycle approach. Analytical method validation: General principles, Validation of analytical method as per ICH guidelines and USP	8	20 %
3.	Cleaning Validation: Cleaning Method development, Validation of analytical method used in cleaning, Cleaning of Equipment, Cleaning of Facilities. Cleaning in place(CIP). Validation of facilities in sterile and non-sterile plants. Computerized system validation: Electronic records and digital signature-21CFR Part 11 and GAMP	8	20 %
4.	Process analytical technology (PAT): FDA initiative on process analytical technology. PAT as a driver for improving quality and reducing costs: quality by design (QbD), QA, QC, and GAMP. PAT guidance, standards, and regulatory requirements	8	15 %
5.	Quality as a Strategic Decision: Meaning of strategy and strategic quality management, mission and vision statements, quality policy, Quality objectives, strategic planning and implementation, McKinsey 7s model, Competitive analysis, Management commitment to quality Six System Inspection model: Quality Management system, Production system, Facility and Equipment system, Laboratory control system, Materials system, Packaging and Labeling system. Concept of self-inspection. Quality	8	20 %



	systems: Change Management/ Change control. Deviations, Out of Specifications (OOS), Out of Trend (OOT), Complaints - evaluation and handling , Investigation and determination of root cause, Corrective and preventive Actions (CAPA), Returns and Recalls, Vendor Qualification, Annual Product Reviews, Batch Review and Batch Release. Concept area clearance/ Line clearance.		

2. Evaluation

1	Assignments / Quizzes / Class Participation / Role Play/ Project etc.	10% (Internal Assessment)
2	Internal Examination	20% (Internal Assessment)
3	External Examination (University Exam)	70% (External Assessment)

3. Basic Text Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	Nancy R. Tague	The Quality Toolbox		2 nd
2.	Duke Okes	Root Cause Analysis, The Core of Problem Solving and Corrective Action	ASQ Publications	-
3.	Phillip A.Cloud	Pharmaceutical Equipment Validation: The Ultimate Qualification Handbook	Interpharm Press	-
4.	Huber L.	Validation and Qualification in Analytical Laboratories.	Informa Healthcare	-
5.	Snyder, Kirkland, Glaich	Practical HPLC Method Development	John Wiley & Sons, New Jersey. USA	2 nd

4. Reference Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	B. T. Loftus & R. A. Nash	Pharmaceutical Process Validation, Drugs and Pharm Sci. Series, Vol. 129	Marcel Dekker Inc., N.Y	3 rd



2.	Frederick J. Carlton and James Agalloco	Validation of Pharmaceutical Processes: Sterile Products	Marcel Dekker Inc., N.Y	-
3	Frederick J. Carlton and James Agalloco	Validation of Aseptic Pharmaceutical Processes	Marcel Dekker Inc., N.Y	2 nd
4	Joseph M. Juran and Joseph A. De Feo	Juran's Quality Handbook	ASQ Publications	6 th
5	Christine Avery; Diane Zabel, Routledge	The Quality Management Sourcebook: An International Guide to Materials and Resources	----	-
6	James W. Fairfield-Sonn	Corporate Culture and the Quality Organization	Quorum Books	-
7	Roger L Bertholf, Ruth E Winecker	Chromatographic methods in clinical chemistry & Toxicology	John Wiley & Sons, New Jersey, USA. 2007	-
8	John A Adamovics	Chromatographic Analysis of Pharmaceuticals	Marcel Dekker, New York, USA. 1997	2 nd




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Course Title: PHARMACEUTICAL QUALITY ASSURANCE PRACTICAL - II

Category of Course	Course Code	Credit	Content Hours	Internal			External	
				Theory	Continuous Assessment	Practical	Theory	Practical
Core	256080204	4	120	-	-	100%	-	-

Course Outcomes

Upon completion of this course, the student should be able to:

CO1: Develop skills and understanding for qualification of pharmaceutical equipment, pharmaceutical testing equipment and analytical instrument.

CO2: Execute validation studies and document results to ensure compliance with ICH guidelines.

CO3: Analyze case studies to understand the application of PAT and QbD tools and techniques.

CO4: Develop the ability to document experimental procedures, record observations, and effectively communicate results. Emphasize the importance of maintaining accurate and organized experimental records.

No.	Title	Hours/ week
1	Qualification of the equipment: Autoclave and Hot air oven	8
2	Qualification of the equipment: Powder Mixer (Dry) and Tablet Compression Machine	
3	To perform linearity, range, LOD, and LOQ studies for a given drug	
4	To perform an Accuracy study for a given drug	
5	To perform a Precision study of a given drug	
6	Validation of a processing area	
7	Qualification of analytical instrument: UV Visible Spectroscopy	
8	Qualification of analytical instrument: pH Meter	
9	Qualification of analytical instrument: HPLC	
10	Cleaning validation of one equipment	
11	Qualification of Pharmaceutical Testing Equipment: Friability Apparatus	




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12	Qualification of Pharmaceutical Testing Equipment: Disintegration Tester	
13	Qualification of Pharmaceutical Testing Equipment: Dissolution testing apparatus	
14	Case study on application of QbD	
15	Case study on the application of PAT	

1. Basic Text Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	Chung Chow Chan, Herman Lam, Xue-Ming Zhang	Practical Approaches to Method Validation and Essential Instrument Qualification	John Wiley & Sons	-
2.	Joachim Ermer, Phil W. Nethercote	Method Validation In Pharmaceutical Analysis: A Guide To Best Practice	John Wiley & Sons	2 nd
3.	Bakeev	Process Analytical Technology	Cambridge University Press	-

2. Reference Books:

Sr. No.	Author/s	Name of the Book	Publisher	Edition
1.	Phil Cloud	Pharmaceutical Equipment Validation: The Ultimate Qualification Guidebook	CRC Press	1 st
2.	Shiv Shankar Shukla, Ravindra Kumar Pandey, Beena Gidwani, Gunjan Kalyani	Pharmaceutical Calibration, Validation and Qualification: A Comprehensive Approach	Springer	-
3.	K. A. Connors	Text book of Pharmaceutical Analysis	John Wiley & Sons	3 rd
4.	Walkiria S. Schlindwein, Mark Gibson	Pharmaceutical Quality by Design: A Practical Approach	John Wiley & Sons	-
5.	Katherine A. Bakeev	Process Analytical Technology: Spectroscopic Tools and Implementation Strategies for the Chemical and Pharmaceutical Industries	John Wiley & Sons	-



SWARNIM STARTUP & INNOVATION UNIVERSITY (SSIU)

SCHOOL OF SCIENCE

DEPARTMENT OF ENVIRONMENTAL SCIENCE

M.Sc. SEMESTER – III

ENVIRONMENTAL BIOTECHNOLOGY

CODE : 256060301

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	0	4	4	30	50	70	-	150

UNIT-1 General Aspects and Case Studies

Cleaner Bioprocesses and Sustainable Development, Environmental **Impact of Nitrogen Fertilizers**, Impermeable Barrier Liners in Containment Type Landfills, **Control of Submicron Air Toxin Particles after Coal Combustion Utilizing Calcium Magnesium Acetate.**

UNIT-2 Recycling and Treatment of Organic Wastes

Duckweed-Based Wastewater Treatment for Rational Resource Recovery and Reuse, Anaerobic Treatment of Tequila Vinasse, Immobilization of Living Microalgae and their Use for Inorganic Nitrogen and Phosphorus Removal from Water, Engineered Reed Bed Systems for the Treatment of Dirty Waters.

UNIT-3 Removal of Recalcitrant Compounds

Immobilization of Non-viable Cyanobacteria and their use for Heavy Metal Adsorption from Water, **Bioremediation: Clean-up Biotechnologies for Soils and Aquifers**, Increasing Bioavailability of Recalcitrant Molecules in Contaminated Soils, **Bioremediation of Contaminated Soils, Environmental Oil Biocatalysis.**




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UNIT-4 Cleaner Bioprocesses

Clean Biological Bleaching Processes in the Pulp and Paper Industry, Clean Technologies through Microbial Processes for Economic Benefits and Sustainability, Cleaner Biotechnologies and the Oil Agroindustry, Cleaner Production Activities.

Course outcome: This paper teaches about replacing chemical materials and processes with biological technologies can reduce environmental damage.

REFERENCES

- 1) Eugenia J. Olguin, Gloria Sanchez, and Elizabeth Hernandez, “*Environmental Biotechnology and Cleaner Bioprocesses*”, Taylor & Francis Publishing House, London, 2000.
- 2) Anderson, J.M., and Ingram, J.S.I., “*Tropical Soil Biology and Fertility, A Handbook of Methods*”, 2nd Edn., Oxford CAB International, 1993.
- 3) Arceivala, S.J., “*Wastewater Treatment for Pollution Control*”, Tata McGraw-Hill, New Delhi, India, 1986.
- 4) Ehrlich, H.L., and Brierley, C.L., “*Microbial Mineral Recovery*”, McGraw-Hill, New York, 1990.
- 5) Alezander, M., “*Biodegradation and Bioremediation*”, Academic Press Inc., San Diego, California, 1994.
- 6) Wise, L.D., “*Global Environmental Biotechnology*”, Elsevier, Amsterdam, 1997. 7) R.M. Atlas, “*Microbiology: Fundamental and Applications*”, 2nd Edition, Macmilan, New York, 1988.




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M.Sc. SEMESTER – III

ENVIRONMENTAL TOXICOLOGY AND ITS IMPACT CODE : 256060302

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	50	70	-	150

UNIT-1 Toxicology Chemistry

Introduction to Toxicology and Toxicological Chemistry, Dose – Response Relationships, Relative Toxicities, Reversibility and Sensitivity, Xenobiotic and Endogenous Substances, Kinetic Phase and Dynamic Phase, Teratogenesis, Mutagenesis, Carcinogenesis, and Effects on the Immune and Reproductive Systems, Health Hazards.

UNIT-2 Toxicology of Chemical Substances

Introduction, Toxic elements and elemental forms, Ozone, White Phosphorus, Elemental Halogens, Heavy metals, Cadmium, Lead, Arsenic, Toxic Inorganic Compounds, Cyanide, Carbon Monoxide, Nitrogen Oxides, Hydrogen Halides, Hydrogen Fluorides, Hydrogen Chlorides, Interhalogen Compounds and Halogen Oxides, Inorganic Compounds of Silicon, Asbestos, Inorganic Phosphorus Compounds, Phosphine, Tetraphosphorus decoxide, Inorganic Compounds of Sulphur, Organometallic Compounds, Organolead Compounds, Organotin Compounds, Carbonyls, Toxicology of Organic Compounds.

UNIT-3 Heavy Metals in Environment




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Arsenic: **Biochemical Effects of Arsenic**, Transformation.

Cadmium: Emissions to the Environment, Toxicity, Emission Control and

Other Measures, **Biochemical Effects of Cadmium**.

Lead: Emissions, Toxicity, Transformation, Biochemical Effects of Lead. Mercury:

Biochemical Effects of Mercury, Toxic Effect, Biological Methylation, Remedial Measures.

Chromium: Sources, Toxicity.

UNIT-4 Environmental Impact of Pesticides

Introduction, Historical Aspects, Classification, **Application Potential**, Limitation of Pesticides Uses, **Toxicology of Major Pesticides**, Pesticide Persistence, Bioaccumulation and Biomagnification.

Course outcome: Students get enlighten about environmental toxicology, its mechanism in body as well as its impacts in environment.

REFERENCES

- 1) Stanley, E. Manahan, “*Environmental Chemistry*”, 7th Edn, Lewis Publishers, New York, 2000.
- 2) S.C. Santra, “*Environmental Science*”, New Central Book Agency (P) Ltd., 2006.
- 3) Cockerham, Lerris, G., and Barbara, S. Shane, “*Basic Environmental Toxicology*”, CRC Press/Lewis Publishers, Boca Raton, FL, 1994.
- 4) Bridggs, Shirley, and The Rachel Carson Council, “*Basic Guide to Pesticides : Their Characteristics & Hazards*”, Taylor & Francis, Washington, 1992.
- 5) S.A. Abbasi, N. Abbasi, R. Soni, “*Heavy Metals in The Environment*”, Mittal Publications, New Delhi, India, 1997.
- 6) A Wallace Hayes, “*Principles and Method of Toxicology*”, Published by Raven Press, New York.
- 7) Perry G., “*Introduction of Environmental Toxicology*”, Elsevier, Netherland, 1980.




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M.Sc. SEMESTER – III

ENVIRONMENTAL RULES AND REGULATIONS

CODE : 256060303

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	50	70	-	150

UNIT-1 Environmental Laws and Acts

Introduction, Environmental Legislation : Status in India, Some Indian Environmental Laws (i) The Water (Prevention and Control of Pollution) Act, 1974, (ii) The Air (Prevention and Control of Pollution) Act, 1981, (iii) The Environment (Protection) Act, 1986, (iv) The Biological Diversity Act, 2002, Environmental Legislation in USA, Introduction and Schedule of the factories Act, 1948, Protection of Specified Plants in the Wildlife Act, Sanctuaries, National Parks and Closed Areas, Sanctuaries or National Parks Declared by Central Government.

UNIT-2 National Conservation Strategy and Policy Statement on Environment and Development

Environmental Problems: Nature and Dimensions, Actions Taken, Legal, Institutions, Prevention and Control of Pollution, Conservation of Forests and Wildlife, Land and Soil, Environmental Impact Assessment, Other Activities, Constraints and Agenda for Action, Priorities and Strategies for Action, Development Policies from Environmental Perspectives, Energy Generation and Use, Industrial Development, Mining and Quarrying, Tourism, Transportation, Human Settlements, International Cooperation, Support Policies and Systems.




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UNIT-3 Policy Statement for Abatement of Pollution

Future Directions and Objectives, Critically Polluted Areas, Assistance for Adoption of Clean Technologies by Small-Scale Industries, Standards, Fiscal Measures, Integration, Environmental Audit, Environmental Statistics, Public Partnership.

UNIT-4 The National Environment Tribunal Bill, 1992

Introduction, Preliminary, Compensation for Death of, or Injury to a Person and Damage to Property and Environment, Establishment of National Environment Tribunal and Benches thereof, Jurisdiction and Proceedings of the Tribunal, Miscellaneous.

Course outcome: The purpose of this paper is to teach students environmental laws and its regulations which protects the environment and create rules for people about the appropriate utility of natural resources due to degradation of environment.

REFERENCES

- 1) S.C. Santra, “*Environmental Science*”, New Central Book Agency (P) Ltd, India, 2006.
- 2) Hunter, Malcolm L. Jr., “*Wildlife, Forests and Forestry: Principles of Managing Forests for Biodiversity*”, Englewood Cliffs N.J., Prentice Hall, 1990.
- 3) S.K. Mohanty, “*Environment and Pollution Laws*”, Universal Law Publishing Co.Pvt. Ltd., New Delhi, 2008.
- 4) P.W. Birnie and A.E. Boyle, “*International Law and The Environment*”, 2nd Edition, Oxford University Press, 2004.
- 5) Cassese, “*International Law in a Divided World*”, Oxford, 1986.
- 6) Caldwell, “*International Environmental Policy and Law*”, 1st Edition, Durham, NC, 1980.
- 7) H.M. Tiwari, “*Environmental Law*”, 2008.




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M.Sc. SEMESTER – III
ENVIRONMENTAL IMPACT ASSESSMENT
CODE : 256060304

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	50	70	-	150

UNIT-1 Fundamental Approach and Methodology of EIA

Basic Concept, EIA as Planning Tool for Major Project Activities, Comparative Evaluation from EIA Studies, Criteria for Selection of EIA Methodology, EIA Method, Predictive Models for Impact Assessment.

UNIT-2 Prediction and Assessment of Impacts

Prediction and Assessment of Impacts: Noise, Transport, Landscape, Archaeological and other materials as well as Cultural Assets, Air Quality and Climate, Soil, geology and geomorphology, Water, Ecology, Freshwater Ecology, Coastal Ecology, Noise Environment, Socio-Economic and Human Health.

UNIT-3 Environmental Risk Assessment (ERA) and Risk Management in EIA

Introduction, Definition and Concept, Legislative and policy background, Key-steps in Performing an ERA, Different levels of risk analysis, Parallels between ERA and EIA, Opportunities and Challenges in ERA.




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UNIT-4 Environmental Remote Sensing (RS), Geographical Information System (GIS) and EIA

Introduction, Definition and concepts, Sources of remote sensing information, software, data, Application of Remote Sensing with particular reference to EIA, GIS and Environment impact assessment, GIS in screening, scoping, baseline studies, impact prediction, mitigation, and monitoring, EIA Case Studies.

Course Outline: By studying this paper, students learn how to identify, predict and evaluate the economic, environmental and social impact of development activities.

REFERENCES

- 1) P. Morris, and R. Therivel, ***“Methods of Environmental Impact Assessment”***, 2nd Edition, Spon Press, Newyork, 2001.
- 2) Y. Anjaneyulu and V. Manickam, ***“Environmental Impact Assessment”***, 2nd Edition, B.S. Publication, Hyderabad, 2007.
- 3) S.C. Santra, ***“Environmental Science”***, 2nd Edition, New Central Book Agency (P) Ltd, Kolkata, India, 2005.
- 4) P. Calow, ***“Handbook of Environmental Risk Management”***, Blackwell Publishing Ltd., Australia, 1998.
- 5) J. Glasson, R. Therivel and A. Chadwick, ***“Introduction to Environmental Impact Assessment”***, 3rd Edition , Routledge, Newyork, 2009.
- 6) H. Abaza, R. Bisset, B. Sadler, ***“Environmental Impact Assessment and Strategic Environmental Assessment: Towards an Integrated Approach”***, 1st Edition, 2004. 7) P. Wathern, ***“Environmental Impact Assessment: Theory and Practice”***, Routledge, London and Newyork, 1998.



M.Sc. SEMESTER – III

ENV PRACTICAL

CODE : 256060305

INSTRUMENTATION

1. **Spectroscopy**: Atomic absorption, Infrared, ICPMS.
2. Microscopy: Scanning and Transmission Electron Microscopy.
3. Basics of NMR instrumentations.
4. Screening: GC, HPLC.
5. **Thermal analysis**: Thermo gravimetric Analysis, Differential Scanning Calorimetry, Differential Thermal Analysis.




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**SWARNIM STARTUP & INNOVATION
UNIVERSITY (SSIU) SCHOOL OF SCIENCE
DEPARTMENT OF ENVIRONMENTAL SCIENCE**

M.Sc. SEMESTER – IV

**REMOTE SENSING AND GEOGRAPHICAL INFORMATION
CODE : 256060401**

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	50	70	-	150

Unit - I

Definition, Introduction and **scope of remote sensing**. Electromagnetic radiation, atmosphere window, Platforms, Sensors and type of scanning systems. Basic characteristics of sensors; **salient features of sensors used in LANDSAT, SPOT and Indian remote sensing satellites.**

Unit - 2

Aerial photography- vantage point, cameras, Filters and types of films. Elements of visual image interpretation. Multispectral Remote sensing, Microwave Remote sensing, Photogrammetry - Introduction, Stereo- scopic vision, Projection types.

Unit - 3

Digital image and image structure, Image restoration and image and image enhancement. Image classification. **Remote sensing application in Forestry, Ecology and environment, Landuse, Agriculture, soils and geology, Disaster management.**




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Unit- 4

GIS technology and its uses in environmental science, Hardware and software requirement for GIS. Conceptual model of spatial information, Conceptual model of non-spatial information. GPS.

Course outcome: This paper teaches about replacing chemical materials and processes with biological technologies can reduce environmental damage.

References :

1. Introduction to Environmental remote sensing - Curtis
2. Principles of Remote sensing - Lily and kliffer.
3. Remote sensing of the Environment – Jenson




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ENVIRONMENTAL MODELLING AND BIOSTATISTICS

CODE : 256060402

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	50	70	-	150

UNIT - I

Measurement of central tendency - mean (Geometric and Harmonic), median, mode, Measurement of dispersion moments, standard deviation, skewness and kurtosis, Correlation and linear regression of one independent variable, **Basic laws and concepts of probability**

UNIT - II

Definition of random variable, density function, Basic concepts of binomial and normal distributions. Sampling measurement and distribution of attributes, moments, matrices and simultaneous linear equations, **tests of hypothesis and significance.**

UNIT - III

Role of modelling in environmental sciences, Model classification deterministic models, stochastic models, steady state models, dynamic models, different stages involved in model building. Simple microbial growth kinetics monod equation, **methods for formulation of dynamic balance equations mass balance procedures.**



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UNIT - IV

Models of population growth and interactions Lotka Volterra model, Leslies matrix model, Point source stream pollution, Box model, Gaussian plume model, Linear, simple and multiple regression models, **validation and forecasting.**

Course outcome: Students get enlighten about environmental Statistical and modelling, its mechanism in body as well as its impacts in environment.

REFERENCES

1. Dynamics of Environmental Bioprocesses-Modelling and simulation-Snape and Dunn.
2. Environmental Modeling - Jorgensen

M.Sc. SEMESTER – IV

Practicals

CODE : 256060403

- 1) **Energy and Environment/ Energy and Electricity**
- 2) **Wildlife Conservation and Species Extinction**
- 3) Water Pollution
- 4) Air Pollution
- 5) Nuclear power, waste and pollution
- 6) Waste Disposal
- 7) Loss of Biodiversity




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- 8) Urban Sprawl
- 9) Sustainable Development
- 10) Climate Change

M.Sc. SEMESTER – IV

Dissertation

CODE : 256060404

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
-	-	-	12	12	70	-	70	-	150




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Environmental Science and Ecology-ENV-101**Code:256060101****M.Sc. : 1st SEM****Teaching & Evaluation Scheme:-**

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	50	70	-	150

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Basic of Ecology and Ecosystem Introduction, Interactions between species, Natural selection, Species richness, Ecological succession, Food chains and food webs, Primary production, Energy flow in ecosystems, Secondary productivity, Decomposition, Ecosystem stability.	6
2	Terrestrial Biomes and Forest Resources Introduction, Tundra and Taiga, Temperate deciduous forest, Mediterranean vegetation, Temperate and tropical grasslands, Desert and tropical rainforest, Forest Resources-Uses, Forest Type and Management, World Forest Cover, Forest Resources of India, Deforestation, Effect of Deforestation on Tribal People, Effect of Dams on Forest, Forest Degradation in India, Sustainable Forest Management.	8
3	Mineral and Food Resources Introduction, Exhaustibility, Localized Occurrence, Uses and Exploration of Mineral Resources, Environmental Effects of Mineral Exploration and Usage, World Food Problems and Production, Pesticides in Modern Agriculture and Environmental Problems, Environmental Limits for Increasing Food Production, Solutions: Sustainable Agriculture, Impact of Irrigation on Environmental Quality.	6
4	Conservation of Natural Resources and Environmental Management Conservation of Natural Resources, Role of Individuals in Sustainable Environmental Management, Value System and Equitable Resources Use for Sustainable Life System, Role of Individuals in Conservation and Prevention of Pollution.	4



1. Determination of minimum size quadrat by the Species Curve method.
2. Determination of minimum no. of quadrat to be laid down in the field under the study.
3. Study of vegetation using line transect method.
4. Study of vegetation using belt transect method.
5. Study of vegetation using chart quadrat method.
6. Determination of important value index (IVI).

Reference Books

- 1) Y. Anjaneyulu, "*Introduction to Environmental Science*", BS Publications, Hyderabad, India, 2004.
- 2) H. Kaur, "*Environmental Studies*", Pragati Prakashan, 2006.
- 3) Andrew R.W., Jackson & Julie M. Jackson, "*Environmental Science – The Natural Environment and Human Impact*", Addison Wesley Longman Limited, 1996.
- 4) S.C. Santra, "*Environmental Science*", 2nd Edition, New Central Book Agency (P) Ltd, Kolkata, India, 2005.
- 5) Richard T. Wright, "*Environmental Chemistry*", Pearson Education Inc., South Asia, 2007.
- 6) Sharma B.K., "*Environmental Chemistry*", Goel Publ. House, Meerut, 2001.
- 7) Wanger K.D., "*Environmental Management*", W.B. Saunders Co. Philadelphia, USA, 1998.
- 8) Krebs J.R., Davies N.B., "*Behavioral Ecology: An Evolutionary Approach*", 3rd Edition, Oxford: Blackwell Scientific, 1991.
- 9) Ricklifs R.E., "*Ecology*", 3rd Edition, W.H. Eereman, New York, 1990.
- 10) O' Neill P., "*Environmental Chemistry*", 2nd Edition, Chapman & Hall, London, 1993.
- 11) Bunce N. J., "*Environmental Chemistry*", Wuerz, Winnipeg, 1990.
- 12) Y. Anjaneyulu, "*Introduction to Environmental Science*", BS Publications, Hyderabad, India, 2004.
- 13) H. Kaur, "*Environmental Studies*", Pragati Prakashan, 2006.
- 14) Andrew R.W., Jackson & Julie M. Jackson, "*Environmental Science – The Natural*



Environment and Human Impact", Addison Wesley Longman Limited, 1996.

- 15) Richard T. Wright, "*Environmental Chemistry*", Pearson Education Inc., South Asia, 2007.
- 16) Sharma B.K., "*Environmental Chemistry*", Goel Publ. House, Meerut, 2001.
- 17) Wanger K.D., "*Environmental Management*", W.B. Saunders Co. Philadelphia, USA, 1998.
- 18) Krebs J.R., Davies N.B., "*Behavioral Ecology: An Evolutionary Approach*", 3rd Edition, Oxford: Blackwell Scientific, 1991.
- 19) Ricklifs R.E., "*Ecology*", 3rd Edition, W.H. Ereeman, New York, 1990.
- 20) O' Neill P., "*Environmental Chemistry*", 2nd Edition, Chapman & Hall, London, 1993.
- 21) Bunce N. J., "*Environmental Chemistry*", Wuerz, Winnipeg, 1990.



ENVIRONMENTAL ISSUES AND IMPACTS-102

Code:

M.Sc. : 1st SEM

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	50	70	-	150

Sr. No.	Course Contents	Number of Hours
1	The Atmosphere and Acid Rain Composition of the atmosphere, Residence times, sources and sinks, Evolution of the primitive atmosphere, Temperature profile of the atmosphere, Atmospheres around the other planets, Nature and Development of Acid Rain, Acid Rain and its impacts on geological Environment, Terrestrial Environment, and Build Environment, Impact of Acid Rain on Human Health and Mitigation of its problems.	5
2	Stratospheric Ozone and Tropospheric Chemistry The ozone layer, Formation and destruction of ozone, Chlorofluorocarbons, The Montreal Protocol, CFC replacement compounds, Nitrogen oxides as ozone depleters, The hydroxyl radical as an oxidant, Oxidation of carbon monoxide by OH, Oxidation of methane, Photochemical smog, Tropospheric concentration of OH, Particles in the atmosphere, London smog, Particles and climate, Control of particles.	5
3	Global Warming and Climate Change Introduction, Greenhouse Gases and Global Climate Changes, Global Warming Potential, Possible Impact of Global Warming, Greenhouse Effect – Policy Response, Kyoto Protocol, El Niño- Climate Cycle,	5



	Ozone in the Atmosphere, Ozone Hole, Worldwide Ozone Trends, Consequence of Ozone Depletion, Consequences of global CO ₂ changes, Strategies for Conservation of Environmental Changes Induced by CO ₂ Rise.	
4	Radiation Hazardous and Environmental Degradation Introduction, Radiation: Atomic and Natural Background, Measurement of Radio Activity, Nuclear Winter, Radioactive Waste, Ionizing Radiation, Anthropogenic Sources and Effects of Radioactive Pollution, Preventive Measurements.	5

Course Outcome: A wide range of aspect is covered about the atmosphere and its correlation with environment. However, addition to this, knowledge on atmospheric radiation dwindling around and its degradation is also notified to give better understanding of global warming and climate change.

Reference Books

- 1) Nigel J. Bunce, “*Environmental Chemistry*”, Wuerz Publishing Ltd, Winnipeg, Canada, 1991.
- 2) S.C. Santra, “*Environmental Science*”, 2nd Edition, New Central Book Agency (P) Ltd, Kolkata, India, 2005.
- 3) H. Kaur, “*Environmental Studies*”, Pragati Prakashan, 2006.
- 4) Joner J.AA., “*Global Hydrology: Processes, Resources and Environment*”, Longman, Essenx, England, 1997.
- 5) Wilson E.O., “*Biodiversity*”, National Academy Press, Washinton, DC, 1988.
- 6) Tudge, Colin, “*Global Ecology*”, Oup, New York, 1991.
- 7) Moeller, Dave W., “*Environmental Health*”, Mass: Harvard University Press, Cambridge, 1992.
- 8) Eds. J.D. Coyle, R.R. Hill and D.R. Roberts, “*Light, Chemical Change and Life*”, Open University press, Milton Keynes, England, 1982.
- 9) B.J. Finlayson-Pitts and J.N. Pitts, “*Atmospheric Chemistry*”, Wiley-Interscience, New York, 1986.



ENERGY AND ENVIRONMENT -103**Code:****M.Sc. : 1st SEM****Teaching & Evaluation Scheme:-**

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	50	70	-	150

Sr. No.	Course Contents	Number of Hours
1	Energy Flow and Equilibrium Introduction, The laws of energy flow, Dynamic equilibrium and spontaneous change, Chemical kinetics, Atoms and elements, Molecules and covalent compounds, Valency and periodic table of the elements, Oxidation states, Compound mixtures, Chemical species and chemical reactions, The atomic nucleus and nuclear reactions.	4
2	Energy Production and Management Introduction, Energy Production and Consumption, Sources of Energy, Renewable Energy, Energy Conservation, Solar Energy Input, Conventional Fuels, Natural Gas, Uranium, Nuclear Energy and Nuclear Reactions, The Risk of Nuclear Accidents	4
3	Non-Conventional and Biological Energy Introduction, Photovoltaics, Solar Heating, Wind Energy, Tidal Power, Biomass and Biofuels, Natural Vegetation, Energy Tree Plantations, Specific Energy Crops, Power from Biomass, Biomass Programs, Biomass and the Environment.	5



4	Energy from Wastes Introduction, Water-Based Biomass, Energy from Wastes, Solid Wastes, Research and Development , Biogas Plants in India and its use, Utilization of Effluent, Cost of Installation and Annual Savings, Financial Assistance from Government, Organization of the BiogasSector, Potential for Biogas Generation and Digester Construction, Future Energy Scenario of the World.	5

Reference Books

- 1) Andrew R.W., Jackson & Julie, M. Jackson, “*Environmental Science – The Natural Environment and Human Impact*”, Addison Wesley Longman Limited, 1996.
- 2) S.C. Santra, “*Environmental Science*”, 2nd Edition, New Central Book Agency (P) Ltd, Kolkata, India, 2005.
- 3) Fowler, John M., “*Energy and the Environment*”, 2nd Edition, McGraw Hill, New York, 1984.
- 4) Atkins P.W. and J.A. Beran, “*General Chemistry*”, 2nd Edition, W.H. Ereeman, NewYork, 1992.
- 5) Weast R.C., “*Handbook of Chemistry and Physics*”, CRC Press, 1994.
- 6) Ebbing, D.D., “*General Chemistry*”, (International 4th Edition) MA: Houghton Mifflin,Boston, 1993.
- 7) Carless, Jennifer, “*Renewable Energy: A Concise Guide to Green Alternative*”, Walker, New York, 1993.
- 8) Gray, N.E., “*Biology of Wastewater Treatment*”, Oxford University Press, New York, 1992.



ENVIRONMENT AND SOIL -104

Code:

M.Sc. : 1st SEM

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	50	70	-	150

Sr. No.	Course Contents	Number of Hours
1	Soil Composition, Formation and Morphology Preview and Historical Perspectives, Weathering of Soil Minerals, Soil Formation and the factors, Land, Development and Horizons, Degradation and Destruction, Quality Assessment, Soil Individual and Mapping Units, GIS and GPS for Soil.	6
2	Physical Properties of Soil Soil Texture, Rock Fragments, Soil Structure, Particle Density and Bulk Density, Soil Porosity and Permeability, Soil Air, Rhizotrons, Soil Consistence, Soil Color, Soil Temperature, Other Soil Physical Properties.	6
3	Soil Water Properties Water and its Relation to Soil, Terminology and Classifications for Soil Water, Soil as Water Reservoirs, Soil Water Content, Instruments for determining Water Content or Potential, Water Flow into and through Soils, Water Uptake by Plants, Consumptive Use and Water Efficiency, Reducing Water Loss	6
4	Chemical and Acidic Properties of Soil Soil Clays, Organic Colloids, Cation/Anion Exchange and Adsorption, Reactions and Buffering in Soils, Ecological Relation of Soil Acidity, Composition and Reactions of Lime, Crops, Lime and Soil, Lime Balance Sheet, Acidifying Soils.	6



1. Soil moisture measurement.
2. Determination of soil pH.
3. Determination of salt in soil.
4. Determination of calcium and magnesium in soil.
5. Determination of chloride in soil.
6. Determination of carbonate and bicarbonate in soil.
7. Determination of total phosphorus.

Books Recommended:

- 1) Raymond W. Miller, Duane T. Gardiner, “*Soil in our Environment*”, 8th Edition, Upper Saddle River, New Jersey, 1998.
- 2) Dr. H. Kaur, “*Environmental Chemistry*”, 2nd Edition, Pragati Prakashan, Meerut, 2007.
- 3) E.A. FitzPatrick, “*Soils: Their Formation, Classification and Distribution*”, Longman Publishers, 1980.
- 4) Karl Terzaghi, Ralph B. Peck and Gholamreza Mesri, “*Soil Mechanics in Engineering Practice*”, 3rd Edition, John Wiley & Sons, New York, 1996.
- 5) R.G. Burns, “*Soil Enzymes*”, Academic Press, New York, 1978.
- 6) S.L. Tisdale, W.L. Nelson, J.P. Beaton and John L. Havlin, “*Soil Fertility and Fertilizers*”, 5th Edition, Macmillan, New York, 1993.
- 7) F.R. Troch, J.A. Hobbs, and R.L. Donahue, “*Soil and Water Conservation*”, 2nd Edition, Prentice-Hall Englewood Cliffs, NJ, 1991.



WATER QUALITY AND WASTEWATER TREATMENT TECHNIQUES -ENV-

201 Code:

M.Sc. : 2nd SEM

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	0	4	4	30	00	70	-	100

Sr. No.	Course Contents	Number of Hours
1	Water Resources and Classification of Water Pollutants Introduction, Hydrological Cycle, Surface Water, Ground Water, Natural Conditions That Influence Water Quality, Methods for Managing Water Resources, Utilization of water, Origin of Wastewater, Types of Water Pollutants and their Effects.	5
2	Wastewater Sampling and Analysis Methods Sampling, Methods of Analysis, Determination of Organic Matter, Determination of Inorganic Substances, Physical Characteristics, Bacteriological Measurement.	4
3	Wastewater Treatment Techniques Basic Process of Water Treatment, Primary Treatment, Secondary (Biological) Treatment, Advanced Wastewater Treatment, Recovery of Materials from Process Effluents.	6
4	Industrial Chemical Processes and Water Quality Regulations Sugar Industry and Distillery, Pesticides, Drugs and Pharmaceuticals, Pulp and Paper Industry, Tanneries, Dye and Dye Intermediates, Paints and Synthetic Resins, Fertilizer Industry, Dairy Industry, Water Quality Regulations.	6




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Course Outcome: Water is very important aspect of life and this paper enlightens students about its availability, use, presence of pollutants, conservation and rules and regulations.

2

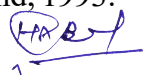
ENV PR WATER ANALYSIS

1. Determination of pH, Conductivity.
2. Determination of Total Hardness.
3. Determination of Chloride, Acidity and Alkalinity.
4. Determination of DO, BOD and COD.
5. Determination of Phosphate, Iron, Sulphate, Fluoride.
6. Determination of Oil and Grease.

Reference Books

- 1) Y. Anjaneyulu, ***“Introduction to Environmental Science”***, BS Publications, Hyderabad, India, 2004.
- 2) K. Vigil, ***“Clean Water- An Introduction to Water Quality and WaterPollution Control”***, 2nd Edition, Oregon State University Press, USA, 2003.
- 3) C.S. Rao, ***“Environmental Pollution Control Engineering”***, Wiley Eastern Limited, New Delhi, India, 1995.
- 4) S.C. Bhatia., ***“Solid and Hazardous Waste Management”***, Atlantic Publishers and Distributors (P) Ltd., 2007.
- 5) Brown, R.L., ***“Treatment of Water and Solid Wastes”***, Springer Field, New York.
- 6) S.C. Santra, ***“Environmental Science”***, 2nd Edition, New Central Book Agency (P) Ltd, Kolkata, India, 2005.
- 7) S.N. Kaul., Arvind Kumar., ***“Waste Water Engineering”***, APH Publishing Corporation, New Delhi, India, 2006.
- 8) G.S.Sodhi., ***“Fundamental Concepts of Environment Chemistry”***, (3rd Edition), Narosa Publishing House Pvt. Ltd., New Delhi, India, 2009.
- 9) Mark M. Benjamin., ***“Water Chemiatry”***, McGraw-Hill, New York, 2002. 10) J.C. Currie, and A.T. Pepper, ***“Water and The Environment”***, Ellis Horwood Limited, England, 1993.




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INTEGRATED SOLID WASTE MANAGEMENT - ENV 202

Code:
M.Sc. : 2nd SEM

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Sr. No.	Course Contents	Number of Hours
1	Basic Concepts of Solid Waste Management and Volume Reduction Technologies Introduction, Types of Solid Waste, Solid Waste Collection, Factors in Planning, Reducing the Amount of Garbage, Hierarchy of Waste Management, Source Reduction Policy: Goals and measurement methodology, initiatives, government programmes, Cost of Environmental Management, Concentrating Methods: vacuum filtration, rotary drum precoat filter, pressure filtration, centrifuge dewatering, Incineration of Municipal Sludge.	8
2	Recycling of Solid Waste Introduction, Ways to Recycle, Collection of Recyclables, Processing Equipment for Recycling Facilities: Baling, magnetic separation, screening, Size Reduction, Air classification, Processing Recyclables: source separated recyclables, glass, plastics, can and metal processing, Recycling of PVC and related products, Automotive and Household Batteries.	6
3	Composting and Landfilling of Municipal Solid Waste Introduction, Definition, Classification of Compost Process, Compost Phases, Environmental Factors and Operational parameters affecting Composting, Classification of Compost system, Classification of Landfills, Landfilling Methods, Generation and Composition of Landfill Gases, Formation and Composition of Leachate.	5



4	Hazardous Waste Introduction, Definition of various Hazardous Waste, Transportation of Hazardous Waste, Treatment, Storage and Disposal, Site Remediation, Hazardous Waste Minimization, Medical and Hospital Wastes, Nuclear Pollution and Radio-active Wastes.	4

4

Course Outcome: To improve environment it is necessary to eradicate solid waste. Thus, student understand types, source, recycling and management of solid waste by studying this paper.

Reference Books

- 1) S.C. Bhatia., ***“Solid and Hazardous Waste Management”***, Atlantic Publishers and Distributors (P) Ltd., 2007.
- 2) Curds, C.R. and Hawkes, H.A., ***“Basic Hazardous Waste Management”***, Academic Pres, London.
- 3) Goldberg, E.D., ***“Hazardous Waste Management”***, Gordon and Breach, Science Publishers, New York.
- 4) Odum, E.P., ***“Integrated Solid Waste Management”***, John Wiley & Sons, New York.
- 5) Lehr, J.H., Tyler, E.G., Wayne, A.P. and Jack, D., ***“Handbook of Solid Waste Management”***, McGraw-Hill, New York.
- 6) Nemerow, N.L., ***“Industrial Waste Management”***, Addison-Wesley Publishing Company, Philippines.
- 7) James, A. and Evison, L., ***“Treatment of Industrial Wastes”***, John Wiley & Sons, New York.




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Aquatic and marine Environmental Chemistry - ENV 203

Code:
M.Sc. : 2nd SEM

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Sr. No.	Course Contents	Number of Hours
1	Fundamentals of Aquatic and Marine Chemistry The Aquatic Environment, The Acidity of Water, Metal Complexes in Solution, Oxidation and Reduction, Deposition Dissolution and Processes, Pharmaceuticals from the Sea.	8
2	Contamination and Pollutants in the Marine Environment Introduction, Pollution of Marine Environment, Sources and Nature of pollutants, Oil Pollution and Marine Biota, Microbial Degradation of Oil and Petrochemical in the Sea, Metallic Pollutant and Aquatic Biota of the Sea, Status of Coastal and Estuarine Pollution in India, Mitigation of Marine Pollution	6
3	The Oceans and Climate Introduction, The Complex Medium Called Seawater, Spatial Scales and the Potential for Change, Oceanic Gases and the Carbon Cycle, Oceanic Gases and Cloud Physics, Feedback Processes Involving Marine Chemistry and Climate, Future Prospects	5
4	Remote Sensing and Geographical Information and Positioning System Principles of Remote Sensing, Types of Remote Sensing, System Overview in Remote Sensing, Application of Remote Sensing, GIS and GPS.	4




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Course Outcome: Earth consist of water and thus it is extremely necessary to understand water bodies present as it serves main source of living that is water. So, this paper gives students are wider vision towards the chemistry prevailing in aquatic and marine zone and apart from that their conservation. However, inclusion of remotesensing is also done just to give knowledge about correlation between remote sensing and its usefulness to environment..

6

Reference Books

- 1) Alan, G. Howard, “*Aquatic Environmental Chemistry*”, Oxford University Press, Oxford, New York, 1997.
- 2) R.E. Hester and R.M. Harrison, “*Chemistry in the Marine Environment*”, Published by The Royal Society of the Chemistry, Cambridge, UK, 2000.
- 3) S.C. Santra, “*Environmental Science*”, 2nd Edition, New Central Book Agency (P) Ltd, Kolkata, India, 2005.
- 4) Manahan, S.E., “*Environmental Chemistry*”, Lewis Publishers, Chelsea Michigan, 1995.
- 5) Ward, R.C., and Robinson, M., “*Principles of Hydrology*”, 3rd Edition, McGraw-Hill, Maidenhead, 1989.
- 6) J.A. Knauss, “*An Introduction to Physical Oceanography*”, Prentice Hall, Englewood, NJ, 1978.
- 7) G.R. Bigg., “*The Oceans and Climate*”, Cambridge University Press, Cambridge, 1996.
- 8) J.T. Houghton, L.G. Meira Filho, B.A. Callander, N. Harris, “*Climate Change*”, Cambridge University, Cambridge, 1996.
- 9) S. Grabley and R. Thiericke, “*Drug Discovery from Nature*”, Springer, Berlin, 1999.

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AIR POLLUTION: QUALITY AND CONTROL METHODS - ENV 204

Code:

M.Sc. : 2nd SEM**Teaching & Evaluation Scheme:-**

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Sr. No.	Course Contents	Number of Hours
1	Sources and Effects of Air Pollution Definition, Classification and Properties of Air Pollutants, Emission Sources, Behavior and Fate of Air Pollutants, Photochemical Smog, Effects of Air Pollution: human health, vegetation and materials, Air (Prevention and Control of Pollution) Act 1981	6
2	Sampling and Measurement of Air Pollutants Types of Pollutant Sampling and Measurement, Ambient Air Sampling, Collection of Gaseous Air Pollutants: grab sampling, absorption in liquids, adsorption on solids, freeze out sampling, Collection of Particulate Pollutants, Stack Sampling: sampling system, particulate and gaseous sampling , Analysis of Air Pollutants.	6
3	Air Pollution Control Methods and Equipment Introduction, Source Correction Methods, Particulate Emission Control Equipments: gravitational settling chambers, cyclone separators, fabric filters, electrostatic precipitators, wet collectors , Control of Gaseous Pollutants: Control of Sulphur, Dioxide Emission, Nitrogen Oxides, Carbon Monoxide, Hydrocarbons, Mobile Sources.	6



4	Indoor Air Quality Nature, Sources and Toxicity of Indoor Air Pollutants, Syndromes related to indoor air quality: Sick building syndrome, building related illness, multiple chemical sensitivity or chemical hypersensitivity syndrome, Sources and Sinks in the Indoor Environment.	6

Course Outcome: This paper illuminates' students about air quality prevailing in environment. Apart from this it also educates them about the toxicity lead due to air pollution and measures to treat them.

8

Books Recommended:

- 1 C.S. Rao, "*Environmental Pollution Control Engineering*", Wiley Eastern Limited, New Delhi, India, 1995.
- 2 M. Marconi, B. Seifert and T. Limdwall, "*Indoor Air Quality*", Elsevier Science B.V., Netherland, 1995.
- 3 S.H. Stoker, and S.L. Seager, "*Environmental Chemistry: Air and Water Pollution*", Scott Foresman & Co., New York, 1976.
- 4 P.O. Warner, "*Analysis of Air Pollutants*", John Wiley & Sons, New York, 1976.
- 5 J.D. Butler, "*Air Pollution Chemistry*", Academic Press, London, 1979.
- 6 S.C. Santra, "*Environmental Science*", 2nd Edition, New Central Book Agency (P) Ltd, Kolkata, India, 2005.
- 7 Y. Anjaneyulu, "*Introduction to Environmental Science*", BS Publications, Hyderabad, India, 2004.
- 8 Trivedi, R.K. and P.K. Goal, "*Introduction to Air Pollution*", Techno-Science Publications.




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Sr. No.	Course Contents	Number of Hours
1.	Introduction to fermentation technology - Fundamental concepts of fermentation - Chronological development in industrial microbiology - Introduction to the component parts of fermentation process - Range of fermentation processes	10
2.	Industrially important microorganisms - SCREENING: (A) Characteristics of industrially important microorganisms (B) Primary screening of organic acid producers, Primary screening of antibiotics, growth factors, and enzyme producers. (C) Significance of secondary screening - STRAIN IMPROVEMENT (A) STRAGIES i. Selection of induced mutants ii. Selection of recombinants (B) Strain improvement for modification of properties other than yield (C) Preservation: Principle, methods and quality control	10
3.	Fermenter Design & Fermentation Process - Stirred tank bioreactor (A) Basic functions of fermenter and design (B) Structural components of fermentor (C) Devices of aeration and agitation (D) Devices for monitoring pH, temerpature, foam and dissolved oxygen - Types of fermentation - Submerge (Batch, Fed batch and Continuous). - Solid state fermentation.	10
4.	Fermentation media and inoculum development - Fermentation media (A) Principles of media formulation (B) Media ingredients: water, carbon sources, nitrogen sources, minerals, growth factors, buffers, chelators, precursors, inducers, inhibitors, antifoam agents - Methods of sterilization (A) Use of high pressure steam: principle, batch and Continuous sterilization process (B) Use of filtration: principle, types of filter.	10



	• Inoculum development: general principles for development of seed culture for bacterial, yeast and fungal processes	
		40

Learning Outcomes:

- Student will learn about the bioprocess technology in the industry, how to isolate the micro-organisms, its preservation. How the strain can be improved for industrially important organisms. Types of substrate used for fermentation and about medium optimization.
- Provide an idea about the bioreactor design. Types of bioreactor used in the industry. how the sterilization of media and air can be done. Importance of mass transfer and determination of $K_L a$, inoculum development.
- Get knowledge about kinetic of substrate and utilization of batch, types of fermentation i.e fed batch and batch fermentation. What can be control system for monitoring the fermentation process.
- To provide the idea about down streaming process how to get end product in the fermentation. What different methods can be used for down streaming process.

Teaching & learning Methodology:

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.



Basic Text & Reference Books:

- Principles of Fermentation Technology : Whitaker & Stanbury Comprehensive
- Biotechnology : Murray Moo Young
- Methods in Industrial Microbiology : Sikyta
- Fermentation Microbiology and Biotechnology, El Mansi and Bryc




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SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

MOLECULAR TECHNIQUES

Subject Code :253010502

B.Sc. Semester- 5

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	-	70	-	100

Objectives:-

- To provide basic knowledge Molecular Techniques
- **Molecular biology** is the branch of biology that concerns the molecular basis of biological activity in and between cells, including molecular synthesis, modification, mechanisms and interactions. The central dogma of molecular biology describes the process in which DNA is transcribed into RNA then translated into protein.
- Particular areas of interest include the following: stability and expression of cloned gene products, cell transformation, gene cloning systems and the production of recombinant proteins, protein purification and analysis, transgenic species, developmental **biology**, mutation analysis, the applications of DNA fingerprinting, RNA interference, and PCR technology, microarray technology..
- Molecular Biotechnology publishes original research papers on the application of molecular biology to both basic and applied research in the field of biotechnology.
- Increasing knowledge of the molecular basis of disease and advances in technology for analyzing nucleic acids and gene products are changing pathology practice.
- The explosion of information regarding inherited susceptibility to disease is an important aspect of this transformation.




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Prerequisites:-

- Student Must have studied 2years B.Sc. with microbiology/Biotechnology as a major subject and knowledge of basic microbiology.
- Students must have basic knowledge of Molecular Techniques

Course outline:-

Unit No.	Course Contents	Teaching Hours
1.	Gene libraries: • Genomic libraries, cDNA libraries, • PCR: types and applications-Basic PCR and RT-PCR	10
2.	Techniques: • Nucleic acid hybridization, • Colony and plaque hybridization, • Southern, Northern and Western blotting, • Dot-Blot, • Differential screening. • In situ hybridization, • FISH (radioactive and non-radioactive detection of hybridization), • Autoradiography.	10
3.	Molecular markers: • RFLP, • RAPD, • AFLP, • SNP, • Satellite DNA. • DNA Fingerprinting- process and its application.	10
4.	DNA sequencing: • Chain termination, chemical cleavage and automated. • DNA Foot printing- types and application. • <i>In vitro</i> transcription and <i>in vitro</i> translation, various systems and application.	10
		40



Learning Outcomes:

- At the end of the course the student would have basic knowledge of molecular techniques.
- Increasing knowledge of the molecular basis of disease and advances in technology for analyzing nucleic acids and gene products are changing pathology practice
- The practice of anatomic and clinical pathology is being transformed by new knowledge in molecular pathology and human genetics and by advances in the application of molecular biology technology.
- Many residents enter pathology training with sophisticated backgrounds in molecular biology and human genetics obtained from research experiences, graduate programs, and medical school courses

Teaching & Learning Methodology

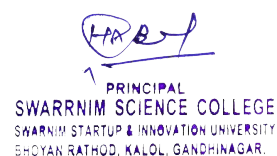
We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Winnacker, Ernst L. (1987), *From genes to clones : introduction to gene technology*
- R. W. Old and S. B. Primrose, *Principles of Gene Manipulation. An Introduction to Genetic Engineering. 1981*
- PK Gupta. *Biotechnology and Genomics*
- RC Dubey. *A text of biotechnology –*



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

ENVIRONMENTAL BIOTECHNOLOGY

Subject Code: 253010503

B.SC. Semester -5

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	-	70	-	100

Objectives

- To provide students the basic knowledge of Environmental of biotechnology.
- The purpose of the course is to give student to introduce about biotechnology field like environmental biotechnology.
- To provide an understanding of various types of pollutions, bioleaching process, biomagnifications, biodegradation and bioremediation process and knowledge of biosensor mechanism.

Prerequisites

Student must have studied B.Sc. with biotechnology as a major subject and knowledge of basic Environmental biotechnology.




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Course outline

Unit No.	Course Contents	Teaching hours
1.	Bioremediation : • Bioremediation principles • Strategies and techniques of bioremediation: in situ and ex situ • Bioremediation of metals • Phytoremediation • GMOs and their impact on bioremediations	10
2.	Biodegradation : • Principles of biodegradation and mechanism of detoxification • Biodegradation of detergent, pesticide, lignin, hydrocarbon and dyes	10
3.	Biodeterioration: • Principles and mechanisms of biodeterioration • Methodology to assess biodeterioration • Prevention and control of biodeterioration • Biodeterioration of selected materials	10
4.	Environmental Problems & monitoring: • Biosensor: types, principle, applications and limitations. • Bioplastic- Introduction, technology and applications, • Biotransducer	10
		40

Learning Outcomes

- The students will be able to understand the Knowledge of the environmental biotechnology to understand concepts of various types of pollution, waste water treatment process, Bioleaching process, biomagnification, Biosensor process.
- Student should be able to understand basic concepts of Environmental biotechnology such as water treatment process, bioleaching of metal, application of bioremediation process.



Access information on a topic from a variety of sources, and be able to learn on one's own.

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Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- U. Satyanarayana- Biotechnology
- B.C. Bhattacharyya and R. Banerjee- Environmental Biotechnology
- G. M. Evans and J. C. Furlong- Environmental Biotechnology
- S. C. Santra, Central, India- Environmental Science




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

Genetic Engineering and Tissue culture

Subject Code: 253010504

B.Sc. Semester-5

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Th	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	-	70	-	100

Objectives

- To provide basic knowledge of Applications of Biotechnology
- The purpose of the course is to introduce students to methods of 'Biotechnology' combines utilizing the living systems - microorganisms, plants, animals with basic scientific and engineering, for providing various solutions for improving our lives.
- The present course opens the door to all of the abundant careers in and out of the area of biological sciences including health/ Industrial field/ medical / Environmental Sciences.

Prerequisites

Student Must have studied BS.c with Biotechnology as a major subject and knowledge of genetic engineering




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Course outline

Unit No.	Course Contents	Teaching hours
1	Recombinant vectors • Characteristics of an Ideal Vector • Plasmid(pBR322) • pUC vectors • Bacteriophage Lambda • Cosmid • Construction of recombinant DNA and transformation • Visual selection by antibiotic • Blue-white selection.	10
2	Genetic engineering • Introduction of Genetic Engineering • Molecular tools of Genetic Engineering • Restriction endonucleases • DNA Cutting enzyme • DNA Ligation Techniques • DNA Modifying Enzymes • Gene transfer methods	10
3	Tissue culture-I • Introduction of tissue culture • Types of tissue culture • Plant tissue culture • Method and significance of PTC • Application of PTC	10
4	Tissue culture-II • Animal tissue culture introduction • Primary culture and established cell line cultures • Equipment and material for animal cell technology • Basic media and techniques of mammalian cell culture • Manipulation and application of animal cell culture	10
		40



Learning Outcomes

- The students will be able to understand and the basic principles and, the tools and techniques of Genetic engineering
- The course is designed to give students an understanding of the applications of genetic engineering in various fields.
- This is a course where the topics to be studied include different types of plant cultures, to understand principles of animal culture, media preparation , To describe meristem culture and clonal propagation of plants on a commercial scale.
- To get insight in applications or recombinant DNA technology in agriculture, production of therapeutic proteins.

Teaching & Learning Methodology

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.



Books Recommended

- PRINZIPIEN DER BIOCHEMIE Textbook by Albert L. Lehninger, David L. Nelson, and Michael M. Cox
- Elements of Biotechnology P. K. Gupta Rastogi Publications, 1994 - Biotechnology
- A TEXTBOOK OF BIOTECHNOLOGY BY R C DUBEY
- Biotechnology and genomics P. K. Gupta, Rastogi Publication
- Molecular biology and genetic engineering P. K. Gupta




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SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Organic Chemistry C -I

CODE : 253020501

B.Sc. 5th Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	50	70	-	150

Objectives:- To provide basic knowledge Chemistry

Sr. No.	Prerequisites:- Course outline:-	Course Contents	Number of Hours
1	(A) Carbohydrates Disaccharides, structure of (+) maltose, (+) cellobiose, (+) lactose and (+) sucrose. (B) Purine and Pyrimidines (i) Purines – Synthesis of Purines, Adenine and Guanine. (ii) Pyrimidines – Synthesis of Pyrimidine, Uracil, Thymine and Cytosine.		14
2	(A) Nucleophilic Substitution at a Saturated Carbon Atom Mechanism and scope of reaction-available mechanism, Kinetic Characteristics, Scope of reaction, Stereochemistry of SN1 and SN2 reactions, Relative reactivity in substitution, Solvent effect, variation at carbon site, Relative leaving group activity, SNi (substitution nucleophilic internal) Mechanism and Neighboring group participation. Elimination Reactions, E1, E2 and E1cB mechanism, Orientation E1 and E2 reactions, Elimination Vs		14




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	Substitution. (B) Nucleophilic Aromatic Substitution Nucleophilic aromatic substitution, Bimolecular displacement and its mechanism, Reactivity, Orientation, Electron withdrawal by resonance, Evidence for the two steps-mechanism, Elimination-addition mechanism-Benzyne.	
3	(A) Inorganic reagents for Organic synthesis Use of specific reagents and their synthetic applications with mechanism. (i) Aluminium Isopropoxide (ii) Lithium Aluminium Hydride (iii) Adams's catalyst (PtO₂) (iv) Selenium Dioxide (v) Osmium Tetroxide (vi) Lead Tetraacetate (B) Molecular rearrangements and Name Reactions Rearrangements occurring through Carbocations, carbenes and nitrenes Principle, Mechanism and Synthetic applications of the reactions: (i) Wolf rearrangement (ii) Fries migration (iii) Hoffmann reaction (iv) Oppenauer oxidation reaction (v) Diels-Alder reaction (vi) Birch Reduction	14
4	(A) Stereo Chemistry (I) Optical activity in the absence of chiral carbon (Biphenyls, Allenes and Spirans) (B) Stereoselectivity and Stereospecificity Stereoselective and stereospecific reactions. Mechanism "Addition of halogens to alkenes". Stereochemistry of E2 reaction (syn and anti elimination).	14



Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

1. Organic Chemistry: I. L. Finar, Vol-II, 5th Edition, Pearson Education Ltd.
2. (2) Organic Chemistry: Morrison & Boyd, 6th Edition, Prentice Hall of India Pvt. Ltd.
3. (3) Stereochemistry of carbon compounds: E. L. Eliel, Wiley Eastern Ltd.
4. (4) Stereochemistry and mechanism through solved problems: P. S. Kalsi, New Age International.
5. (5) Stereochemistry of Organic Compounds: Principles and Applications: D. Nasipuri; New Academic Science; 4th Revised Edition.
6. (6) Organic Chemistry: Hendrickson, Cram, Hammond, Mc Graw-Hill.
7. (7) Organic Chemistry: 6th Edition, John McMurry, Brooks Cole, International Edition.
8. (8) Organic Chemistry: T.W. Graham Solomons and Craig B. Fryhle Wiley, 8th Edition




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(9) Organic Chemistry: Francis A. Carey, Mc Graw-Hill, 7th Edition (10) Organic Chemistry: Leroy G. Wade, Prentice Hall, 6th Edition.

(11) Organic Chemistry: Jonathan Clayden, Nick Greeves, Stuart Warren and Peter Wothers. Oxford University Press, USA




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Inorganic Chemistry C-I

CODE : 253020502

B.Sc. 5th Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	50	70	-	150

Objectives:- To provide basic knowledge Chemistry

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Molecular symmetry Introduction, symmetry operations and symmetry elements: C_n , σ , S_n , i and E . Point groups for the molecules (excluding S_{2n} and I_h). Multiplication tables of C_{2v} , C_{2h} and C_{3v} point groups.	14
2	(A) Chemical bonding (I) VB and MO treatment of H_2 and H_2^+ , comparison of VB and MO MO treatment of $[FeF_6]^{4-}$, $[Fe(CN)_6]^{4-}$, $[V(CN)_6]^{3-}$, $[IrF_6]^{4-}$, $[NiF_4]^{2-}$, $[PtCl_4]^{2-}$ and $[Ni(CN)_4]^{2-}$. (B) Boron hydrides Preparation, properties and structure of diborane. Types of bonds found in higher boranes. Structure of B_4H_{10} , B_5H_9 , B_5H_{11} , B_6H_{10} and $B_{10}H_{14}$.	14
3	(A) Co-ordination chemistry Reaction, kinetics and mechanism. Trans effect and trans influence, Applications of trans effect in synthesis and analysis. Theories of trans effect: Polarisation theory, π - bonding theory, MO theory. Lability, inertness, stability and instability.	14



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	(B) Kinetics and reaction rates of substitution Ligand field effect and reaction rates, mechanism of substitution reaction. Nucleophilic substitution reaction (S_N1 and S_N2) in octahedral complexes. Substitution in square planar Pt (II) complexes. Substitution in octahedral Co (III) complexes. Acid hydrolysis, base hydrolysis. Cis effect. Electron transfer reaction. Mechanism of redox reaction (inner-sphere and outer-sphere).	
4	(A) Inorganic polymers Classification of inorganic polymers. Polymers containing boron and silicon: methods of preparation, physical and chemical properties, structures and their uses. (B) Mossbauer Spectroscopy Principle and Instrumentation. Experimental technique Application for iron complexes	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

1. Concise Inorganic Chemistry: J.D. Lee; Wiley India, 5th Edition (1996).
2. 'Shriver and Atkins' Inorganic Chemistry: Atkins, Overton, Rourke, Weller, Armstrong;
3. Oxford University Press, 5th Edition (2011).
4. Advanced Inorganic Chemistry: F.A. Cotton and Wilkinson G.; John Wiley, 5th Edition (1988).
5. Introductory Quantum Chemistry: A.K. Chandra; Tata- McGraw Hill, 4th Edition (1994).
6. Quantum chemistry: R.K. Prasad; New Age International, 4th Edition (2010).
7. Electron and chemical bonding: H. B. Grey, W.A. Benjamin. INC, New York.
8. Inorganic chemistry: James E. Huheey, 4th Edition, Wesley Publishing Company.
9. Mechanism of Inorganic reaction: Basalo and Pearson, 2nd Edition, Wiley Eastern Pvt Ltd.
10. Introduction to Advanced Inorganic chemistry, Durrant and Durrant, John Wiley.
11. Advanced Inorganic chemistry: (Vol. 1) Satya Prakash, Tuli, Basu and Madan; S. Chand
12. Advanced Inorganic chemistry: Gurdeep Raj; Goel Publishing House, 23rd Edition (1998).



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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Physical Chemistry C-I

CODE : 253020503

B.Sc. 5th Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	50	70	-	150

Objectives:- To provide basic knowledge Chemistry

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Thermodynamics Zeroth law of Thermodynamics, Clausius - Clapeyron equation, Trouton's Rule, Craft's equation, van't Hoff's isotherm and isochore equations.	14
2	Electrochemistry Electrochemical cell and Electrolytic cell, Reversible and irreversible electrodes and cell, Poggendorff's compensation method and Weston cell, Reference electrodes (i) Saturated Calomel Electrode (ii) Standard Hydrogen Electrode (iii) Quinhydrone Electrode, Nernst's single electrode potential equation, Applications of emf measurements to calculate ΔG , ΔG° , ΔH , ΔS , K_{eq} , K_{sp} , K_w and K_h .	14
3	(A) Chemical Kinetics Prediction of reaction rate, Primary and secondary salt effect, Heterogeneous reactions, Retarded reaction. (B) Polymer Chemistry Polymerization and types of Polymerization, Co-polymers, Bio-	14




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	polymers, Polymer additives, Thermodynamics of polymer solution, Molecular weight determination of polymers: Number average molecular weight, Weight average molecular weight, Viscosity and Osmotic pressure method.	
4	(A) Nuclear Chemistry Detection of isotopes, Velocity focusing mass spectrograph, Bainbridge and Neiers mass spectroscopy, Double focusing mass spectroscopy, Applications of isotopes and trace technique examples (B) Molecular spectra Pure rotational spectra, Equation for frequency of pure rotational spectral line, Vibrational-Rotational spectra, Equation for frequency of vibrational-rotational spectral line, Ortho and Para hydrogen.	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

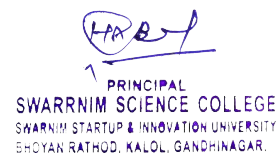
Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

1. Physical Chemistry: G. M. Barrow, 5th Edition, McGraw-Hill education, India.
2. Advanced Physical Chemistry: Gurdeep Raj, 35th Edition (2009), Goel / Krshina Publishing House.
3. Principles of Physical Chemistry: Puri, Sharma and Pathania, 42nd Edition, Vishal Publishing Company.
4. Polymer Science: Gowariker, Viswanathan and Sreedhar, 1st Edition (2012 reprint) New Age International.
5. Essentials of Nuclear Chemistry: Arnikaar, 4th Edition (2012 reprint), New Age International.
6. Physical Chemistry: Atkins, 9th Edition. Oxford University Press.
7. Advanced Physical chemistry: Gurtu and Gurtu, 11th Edition , Pragati Prakashan.

Physical chemistry: Levine, 6th Edition, McGraw-Hill edu



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Analytical Chemistry- C-I

CODE : 253020504

B.Sc. 5th Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	50	70	-	150

Objectives:- To provide basic knowledge Chemistry

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	(A) Ultraviolet Spectroscopy Origin of UV Spectra, Principle, Electronic transition ($\sigma\text{-}\sigma^*$, $n\text{-}\sigma^*$, $\pi\text{-}\pi^*$ and $n\text{-}\pi^*$), relative positions of λ_{max} considering conjugative effect, steric effect, solvent effect, red shift (bathochromic shift), blue shift (hypsochromic shift), hyperchromic effect, hypochromic effect (typical examples). Aromatic and Polynuclear aromatic hydrocarbons. (B) Ultraviolet Spectroscopy (Problems) Problems of Dienes and enones using Woodward-Fieser rules. Problems of aromatic ketones, aldehydes and esters using empirical rules.	14
2	(A) Infrared Spectroscopy Introduction, principle of IR spectroscopy, instrumentation, sampling technique, selection rules, types of bonds, absorption of common functional groups. Factors affecting frequencies, applications. Application of Hooke's law, characteristic stretching frequencies of O-H, N-H, C-H, C-D, C=C, C=N, C=O functions; factors affecting stretching frequencies (H-bonding, mass effect, electronic factors, bond	14



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	multiplicity, ring size). (B) Raman Spectra Basic principal, Instrumentation, Application of Raman spectra, Comparison of IR and Raman spectra.	
3	(A) Nuclear Magnetic Resonance Principal, Magnetic and non magnetic nuclei, absorption of radio frequency. Equivalent and non equivalent protons, chemical shifts, anisotropic effect, relative strength of signals, spin-spin coupling, long range coupling, coupling constant, Deuterium labelling, applications to simple structural problems. (B) Problems based on Spectral data Structural problems based on UV, IR and NMR	14
4	(A) Visible Spectroscopy Introduction, Beer Lambert's law, instrumentation (light source, optical system, wavelength selector, light sensitive device), Accuracy and error of Spectrophotometry. (B) Atomic Spectroscopy Introduction, Principle, Flame Emission Spectroscopy (FES) and Atomic adsorption Spectroscopy (AAS), Principal, comparison and applications, Burners (Total consumption burner and Premix burners), Inductively coupled plasma Emission Spectroscopy (ICPES)	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

1. Introduction to Spectroscopy: Donald L. Pavia, Gary M. Lampman, George S. Kriz
2. Cengage Learning; 4th Edition.
3. Spectrometric Identification of Organic Compounds: Robert M. Silverstein, Francis X. Webster, David Kiemle Wiley; 7th Edition.
4. Infrared spectra of Complex molecules: J. Bellamy, John Wiley & Sons, Inc., 3rd Edition.
5. Spectroscopic Method in Organic Chemistry: Dudley Williams, Ian Fleming McGraw-Hill Education; 6th Edition.
6. Applications of spectroscopic techniques in Organic Chemistry: P.S. Kalsi, New Age International; 6th Edition.
7. Elementary Organic Spectroscopy; Principles And Chemical Applications: Y. R. Sharma, S. Chand & Co Pvt Ltd.
8. Fundamentals of Molecular Spectroscopy: C. M. Banwell and E. McCash, Tata McGraw Hill, 4th Edition.
9. Modern Raman Spectroscopy: A Practical Approach; Ewen Smith, Geoffrey Dent., Wiley; 1st Edition.



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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

CHEMISTRY PRACTICAL

CODE : 253020505

B.Sc. 5th Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	50	70	-	150

Objectives:- To provide basic knowledge Chemistry

Practical [I] (Inorganic and Physical Practicals)

[A] Inorganic Qualitative Analysis:

Inorganic **Qualitative Analysis** of mixture containing six radicals only.

(Minimum 08 mixtures to be done)

[B] Physical Chemistry (Kinetics, Solubility & Instruments)

(1) **Kinetics and solubility:**

Investigate the order of reaction in experiments no. 1, 2 and 3 by graphical method.

Exp 1: Reaction between $K_2S_2O_8$ and KI (a $\square$ b)

Exp 2: Reaction between $KBrO_3$ and KI (a = b)

Exp 3: Reaction between H_2O_2 and HI (a $\square$ b)

Exp 4: Determine the heat of solution of a given substance (Oxalic acid and Benzoic acid) by solubility method.

(2) **Instruments:**

Exp 1: Determine dissociation constant of monobasic acid (CH_3COOH) using pH meter.

Exp 2: Determine the amount of bases in given mix ($NaOH+NH_4OH$) Conductometrically using

standard solution of HCl

Exp 3: Determine the amount of ferrous in the given solution of Ferrous Ammonium Sulphate

potentiometrically using standard $KMnO_4$ solution.

Exp 4: Determine the concentration of Cu^{2+} and Fe^{3+} in the given solution by Colourimetry.



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Reference Books

- (1) Vogel's "Textbook of Quantitative Chemical Analysis": Pearson Education Ltd. 6th Edition, 2008.
- (2) Vogel's "Qualitative Inorganic Analysis": Pearson Education Ltd. 7th Edition, 2009.
- (3) Gurdeep Raj, "Advanced Practical Inorganic Chemistry": Krishna Prakashan, Meerut, 21st Edition, 2009.
- (4) J. B. Yadav, "Advanced Practical Physical Chemistry": Krishna Prakashan, Meerut, 29th Edition, 2010.
- (5) P. H. Parsania, "Experiments in Physical Chemistry": Neminath Printers Rajkot 1st Edition 2004.
- (6) A. M. James and F. E. Prichard, "Practical Physical Chemistry": Longman Group Limited London 3rd Edition Reprinted 1979. Guj. Uni. Chemistry Syllabus – B.Sc. Sem-V Page 12




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Practical [II] (Organic and Analytical Practicals)

[A] Organic Preparation:

- (i) Nitration of Acetanilide
- (ii) Acetanilide from Aniline (Green Preparation)
- (iii) Benzilic Acid from Benzil (Green Preparation)
- (iv) 1,5-Diphenyl-penta-1,4-diene-3-one from Benzaldehyde and Acetone (Green Preparation)
- (v) Diels-Alder reaction between furan and maleic acid (Green Preparation)

[B] Analytical:

(B-1) Organic Estimation:

- (i) Unknown Acid (e.g., Oxalic, Succinic, Citric, Tartaric, Benzoic, Phthalic and Cinnamic acid)
- (ii) Ketone (Acetone)
- (iii) Ester

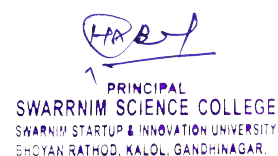
(B-2) Chromatography [TLC]

Analysis of the following drugs by Thin Layer Chromatography.

- (i) Aspirin (ii) Paracetamol (iii) Ibuprofen

Reference Books

- (1) A. I. Vogel, "Elementary Practical Organic Chemistry Part-II, Qualitative Organic Analysis": CBS Publishers & Distributors, New Delhi, 2nd Edition, 2004.
- (2) A. I. Vogel, "Elementary Practical Organic Chemistry Part III Quantitative Organic Analysis": CBS Publishers & Distributors, New Delhi, 2nd Edition, 2004.
- (3) Hand book of Organic qualitative analysis by H. T. Clarke.
- (4) Practical Organic Chemistry: F. G. Mann and B. C. Saunders. Low – priced Text Book. ELBS, Longman.
- (5) V.K. Ahluwalia, Sunita Dhingra, "Comprehensive Practical Organic Chemistry –Qualitative Analysis": University Press (India) Private Limited, Hyderabad, 1st Indian Edition, 2010.
- (6) "Advanced Practical Organic Chemistry": Stanley Thornes Publishers Ltd., J Leonard, B Lygo, G Procter, 1st Indian Edition, 2004.
- (7) "Quantitative Analysis": R. A. Day, A. L. Underwood, Prentice-Hall of India Pvt. Ltd., New Delhi, 6th Edition, 2004.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Complex Analysis

Subject Code: 253030501

B.Sc. Semester -5

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Students are evaluated on the basis of Mid term examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The aim of this subject is to present the important ideas in Linear equation using multiple method to student whose principal interest lie outside the field of mathematics.
- It is a subject which provide a vital arena where students can see the interaction of mathematics and machine computation.

Prerequisites

A Candidate for admission to the bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline:

This Course designed for undergraduate and graduate students working on scientific , engineering, statistics , and mathematics majors This course serves as an introduction to numerical methods used to applied mathematics problems, with applications across the




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spectrum of discription.

Sr. No.	Course Contents	Teaching hours
1	Unit: I Sum and product of complex numbers with properties, moduli and conjugate, triangle inequality, polar coordinates, product and quotients in exponential form, roots of complex numbers, De Moivre's theorem and application, the exponential function, trigonometric functions, hyperbolic functions, convergence of sequence and series.	8
2	Unit: II Functions of complex variables, theorems on limits, continuity, derivatives, differentiation formulas, Cauchy-Riemann equations, sufficient condition for differentiability, polar coordinates, analytic functions and harmonic functions. Mapping and Conformal mapping: Elementary functions, mapping by elementary functions , mobius mapping, linear function. Bilinear mapping $w = (az+b)/(cz+d)$, $w=z$, $w = z^2$, $w = \frac{1}{z}$, $w = \exp(z)$	12
3	Unit: III Line integral(complex), Cauchy' integral formula, maximum modulus, (only statement), liouville's theorem. Definition of complex sequence, complex series and power series. Expansion of complex function in Taylor's series and Laurent's series.	14



4	Unit: IV Residues and poles: Definition of a singular point, Isolated singular points, Zeros of complex functions, Poles and residues of complex function, Cauchy's residue theorem, Evaluation of improper real integrals by residue theorem and evaluation of definite integral of trigonometric functions by residue theorem.	10

Learning Outcomes

After Successfully Completion of the Course the student will be

- Derive Numerical methods for various mathematical operation and tasks , such as interpolations,differentiations ,integration,the solution of linear and nonlinear equations, and the solution of linear and nonlinear equation, and the solution of differential equations.
- Analyse and evaluate the accuracy of common numerical methods.
- Derive numerical methods for various mathematical operations and tasks , such as interpolation,differentiations, integrations , the solution of Linear and nonlinear equations..

Teaching & Learning Methodology

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.




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Books Recommended

1. S.S.Sastry, Introductory methods of Numerical analysis, Prentice hall of India, 1990.
2. Numerical Analysis by G. Shankar Rao.
3. Numerical Analysis, B.S.Grawal.
4. Numerical methods by Dr. P. kandasamy.
5. Introduction of Numerical analysis by Josef Stoer and Roland Bulirsch.
6. Analysis of Numerical Methods by Isaacson and Herbert Keller.

E-Resources

- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics.
<https://swayam.gov.in/> and <https://nptel.ac.in/>
- cims.nyu.edu/~cfgranda/pages/OBDA_fall17/notes...
- www.sxccal.edu/mathematics-lecture-notes




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SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Operation research

Subject Code: 253030502

B.Sc. Semester -5

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	-	70	-	100

Objectives:-

- The aim of this subject is to present the important ideas in operation research using multiple method to student whose principal interest lie outside the field of mathematics.
- It is a subject which provides a vital arena where students can see the interaction of industrial mathematics and practical problems.

Prerequisites

- A Candidate for admission to the Bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline:

- This Course designed for undergraduate and graduate students working on scientific, engineering, statistics, and mathematics majors this course serves as an introduction to operation research used to applied mathematics problems, with applications across the spectrum of description.




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Sr. No.	Course Contents	Teaching hours
1	<u>Unit: I</u> Convex Set and Linear Programming Problem Convex set, Extreme points of a convex set, Convex combination, Examples of convex sets and Theorems on Convexity. Formulation Techniques of LP problems (Only Examples). Problem solving techniques for LP problems :Simplex method for solving LPP, Big-M (Penalty) method, Two- Phase method, Integer programming problem (Only Gomory's cutting plane method).	10
2	<u>Unit: II</u> Duality and Dual simplex method Introduction, Definition of the dual problem, General rules for converting any primal problem into its dual, How to interpret the solution of the dual from its primal and vice versa, Comparison of the solution of the primal and its dual. Find initial solution for dual simplex table, Mathematical procedure to find solution by dual simplex method	8
3	<u>Unit: III</u> Introduction of Transportation problems and Assignment problems Mathematical formulation, Tabular representation, Definitions, Methods for finding initial basic feasible solution (North West Corner Rule, Least Cost Method, Vogel's Approximation Method), Optimality test (MODI method), Degeneracy in Transportation Problem, Unbalanced Transportation Problem. Introduction of Assignment problem, Mathematical formulation of Assignment problem, Method for solving Assignment problem (Hungarian Method), Unbalanced Assignment problem, Examples.	14
4	<u>Unit: IV</u> Introduction to game	10



Learning Outcomes:-

- In this Mathematics student will learn how to convert real life problems into linear equations.
- They will learn to solve set of linear equations.
- Students will learn the concept transportation and assignment problems NWC rules and MODI method.

Teaching & Learning Methodology: –

- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video Podcast etc) to support key concepts/knowledge.
- Particularly at the start of a program /module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include inquiry based learning exercises in international or intercultural contexts.
- Include group work, with groups representing diverse cultures and nationalities.

Reference Books:-

- Mathematical models in O.R. - J. K. Sharma, Tata-McGraw Hills book-company.
- Operations Research – Nita H Shah, Ravi Gor and Hardik Soni. PHI –Learning.
- Optimization method in O.R. & System Analysis - K. V. Mittal, New Age inter. Publishers.
- Operation Research - S. D. Sharma, Kedarnath Ramnath & Co.
- Operation Research - Kanti Swaroop & Man Mohan, Sultan Chand & Co.
- Linear Programming - L. I. Gass, Tata McGraw Hills book-company.
- Linear Programming - G. Hadley, Narosa Publishing house.
- Operation Research- A. M. Natarajan, P. Balasubramani, A. Tamilarasi, Pearson Education.

E-learning websites for operation research:-

https://www.mathcity.org/msc/notes/operation_research

<https://web.itu.edu.tr/topcuil/ya/OR.pdf>

<http://www.svecw.edu.in/Docs%5CCSEOSLNotes2013.pdf>

<https://www.mathcity.org/msc/notes/operation-research-haidar-ali>

<https://www.math.cuhk.edu.hk/course/1920/math3215>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Discrete Mathematics

Subject Code: 253030503

B.Sc. Semester -5

Teaching & Evaluation Scheme:-

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Student are evaluated on the basis of Midterm examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	-	70	-	100

Objectives:-

- The aim of the discrete mathematics is the study of mathematical structures that are fundamentally discrete rather than continuous.
- In contrast to real numbers that have the property of varying "smoothly", the objects studied in discrete mathematics – such as integers, graphs, and statements in logic do not vary smoothly in this way, but have distinct, separated values.
- Discrete mathematics therefore excludes topics in "continuous mathematics" such as calculus and analysis. Discrete objects can often be enumerated by integers.
- More formally, discrete mathematics has been characterized as the branch of mathematics dealing with countable sets (sets that have the same cardinality as subsets of the natural numbers, including rational numbers but not real numbers).




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Prerequisites

A Candidate for admission to the Bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline:

This Course is designed to enable student to acquire the understanding and practice The application how to solve discrete mathematics.

Sr. No.	Course Contents	Teaching hours
1	Unit-I:- Sets and functions Sets, operations on sets , relations ,functions , binary operations , algebraic structures , operations on functions.	10
2	Unit: II: - basics of graph theory Definition of graph, simple graph ,degrees of vertices ,equivalence relation, random graph model ,digraph , paths , sub graphs , direct graph ,trail , walk , vertex sequence , circuit , cycle, multiple paths .	8
3	Unit: III: - lattice theory Introduction , product sets , relations , properties of relation , reflexive ,symmetric , antysymmetric , irreflexive, transitive ,equivalence relation ,partition , partially ordered set, hasse diagram ,minimal member , maximal member ,lattice as poset , properties of meet and join , lattice as an algebraic system , product of two lattices , order preserving , order isomorphism , lattice homomorphism , lattice isomorphism ,sub lattice , complete lattice , bounded lattice .	14



4	Unit: IV:- Boolean algebra Properties of Boolean algebra, Boolean algebra of switching circuits, sub-Boolean algebra, homomorphism and isomorphism of Boolean algebra Boolean ring, direct product of two Boolean algebras, join irreducible element, atom, and the stone representation theorem.	10

Learning Outcomes:-

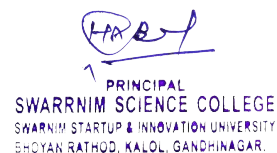
- In this Math student will understand the Concept of discrete Mathematics.
- They will learn Boolean expression, lattice, basics of graph theory and mathematical induction.

Teaching & Learning Methodology:-

- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties. Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge.
- Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include inquiry based learning exercises in international or intercultural contexts.
- Include group work, with groups representing diverse cultures and nationalities.

Reference Books:-

- Boolean Algebra and its Application – J. E. Whitesitt, Addison-Wesley Publishing Co. Inc.
- Foundation of Discrete Mathematics – K. D. Joshi, New Age International Limite Publishers, ISBN 81-224-0120-1.
- Logic and Boolean algebra – B. H. Arnold, P H Inc LCCN 62-19100.
- Introduction to Lattice Theory – D. E. Rutherford, University Mathematical Oliver and Boyd Ltd.
- Modern Applied Algebra - Garret Birkhoff and Thomas C Bartee, CBS Publishers and Distributors.
- Sets Lattices and Boolean Algebras - James C Abbott.
- Combinatorics including concepts of Graph Theory - V. K. Balakrishnan, Schaum's Outline Series, McGraw-Hill, INC.



E- Learning websites:-

- <http://www.freebookcentre.net/maths-books-download/Lecture-Notes-for-College-Discrete-Mathematics.html>
- https://edurev.in/studytube/Discrete-Mathematics-Class-Notes--Handwritten---En/1e99d2ca-6edf-4078-80a1-31d104ba010e_p
- <http://math.bit.edu.cn/docs/20200928043347839160.pdf>




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SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

ABSTRACT ALGEBRA

Subject Code: 253030504

B.Sc. Semester -5

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Student are evaluated on the basis of Midterm examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	--	70	-	100

Objectives

Because of its generality, abstract algebra is used in many fields of science. OBJECTIVE OF THIS COURSE: This course is intended to provide a first approach to the subject of algebra by **studying some basic algebraic structures, mapping between them and their substructures.**

Prerequisites

A Candidate for admission to the Bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline:

This Course designed for undergraduate and graduate students working on scientific, engineering, statistics, and mathematics majors This course serves as an introduction to numerical methods used to applied mathematics problems, with applications across the spectrum of description.




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Sr. No.	Course Contents	Teaching hours
1	Unit I:-Binary operations & groups Binary operations, division algorithm for integers, congruent modulo relation relation in $\mathbb{Z}$, definition and examples of groups, elementary properties of group, equivalent definition of a group, finite groups and their tables, commutative and non commutative groups	10
2	Unit II:- Subgroups and lattice diagrams Subgroups, definition and examples, normalize and centralizers, order of an element , order of a group, cyclic group generated by an element, lattice diagrams of finite groups, cosets and its properties, Lagrange's theorem and its application, Euler's theorem, mFermat's theorem	12
3	Unit III :- Permutations & normal subgroups Permutations, definition and examples, cycle, transposition, even and odd permutation, order of a permutation, inverse of a permutation, symmetric groups and alternating groups, examples, quotient group, normal subgroup: definition and Examples.	12
4	Unit IV :- Homomorphism & isomorphism of groups Isomorphism of groups: definition and examples, isomorphism and equivalence relation, cyclic groups, properties OG cyclic groups, isomorphism of cyclic groups, Homomorphism of groups: definitions and examples, kernel of a homomorphism, fundamental theorem of Homomorphism, Cahev's theorem, automorphism of groups	10



LEARNING OUTCOMES:-

- In this Math student will learn the concept of Group theory.
- Students will learn the concept of permutation.
- Students will learn Homomorphism & isomorphism of groups.
- Students will learn the fundamental theorem of homomorphism.

Teaching & Learning Methodology:-

- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge.
- Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include inquiry based learning exercises in international or intercultural contexts.
- Include group work, with groups representing diverse cultures and nationalities.

Reference Books:-

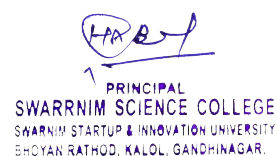
- I N Herstein, *Topics in Algebra*, Wiley Eastern Ltd.
- N. Jacobson, *Basic Algebra Vol I & II*, Hindustan Publishing company.
- Shanti Narayan, *A text book of Modern Algebra*, S.Chand & Co.
- P.B.Bhattacharya, S.K.Jain, S R Nagpal, *Basics Abstract Algebra, (second Edition) Cambridge University Press.*
- N.S. Gopalkrishna, *University Algebra*, Wiley Eastern, New Delhi MacLane Saunders and Birkhoff Garrett, *Algebra*, MacMillan, New York.
- G.F.Simmons, *Introduction to Topology and Modern Analysis*, MacGrawHill Inc., U.S.A.

E-LEARNING WEBSITES:-

http://www.universityofcalicut.info/SDE/Abstract_algebra.pdf

<https://pkalika.in/2019/10/21/abstract-algebra-linear-algebra/>

<http://math.nevai.net/courses/mas4301/misc/syllabus.pdf>



SWARNIM STARTUP & INNOVATION UNIVERSITY
SCHOOL OF SCIENCE
DEPARTMENT OF MATHEMATICS

CODE: 253030505

B.Sc.: SEM 5

Practicals list (practical of paper 501&502)

Unit I:

1. Application of De-Moivre's theorem (to find the roots of an equation and simplify common statements)
- 2 Verification of Cauchy-Riemann equations (Cartesian & polar form).
- 3 Find the harmonic conjugate of a function and hence find corresponding analytic function.
1. If $f(z) = u + iv$ is an analytic function then find $f(z)$ when $u, u - v, u + v$ is given

Unit II:

2. Problems on transformation under function $w = \frac{1}{z}$
3. Problems on verification of conformality.
4. Find the Fourier series of functions –I.
5. Find the Fourier of functions-II.

Unit III:

6. Solve Linear programming problem by graphical method for two variable problem (3 problems)
7. Solve Linear Programming Problem by simplex method-I (3 problems)
8. Solve Linear Programming Problem by big-M method (3 problems)
9. Solve Linear Programming Problem by Two-phase method (3 problems)

Unit IV:

10. Using duality solve Linear Programming Problem (3 problems)
11. Using modi method to solve Transportation problem (Balanced) (3 problems)
12. Using modi method to solve Transportation problem (Unbalanced) (3 problems)
13. Using "Hungarian method" to solve Assignment problem (Balanced and Unbalanced) (3 Problems)



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DEPARTMENT OF MATHEMATICS

CODE: 253030505

B.Sc.: SEM 5

Practical's list (practical of paper 503&504)

Unit I:

1. Examples of binary relation.
2. Examples of reflexive and irreflexive relation
3. Examples of symmetric, antisymmetric & transitive relative.
4. Examples of partial ordering relation
5. Examples based on hasse diagram
6. Examples based on properties of lattice.
7. Examples of group theory.
1. Subgroup and illustrations, Lagrange's theorem and its applications.

Unit II:

1. Examples based on Lattice
2. Examples of Sublattice,
3. Examples of Homomorphism
4. Examples of Boolean Algebra
5. Examples of Subalgebra
6. Examples of Normal subgroup, Quotient group isomorphism

Unit III:

1. To simplify Boolean expression.
2. To find equivalent Boolean expression
3. To find minterms and maxterms in Boolean algebra.
4. To find value of Boolean expression
5. To check the homomorphism between to Boolean algebra.
6. Examples of Isomorphism of group
7. Examples of cyclic groups.

Unit IV:

1. Examples of Definite integral & contours, line integrals.
2. Examples of cyclic group.
3. Examples of kernel of homomorphism
4. Examples based on the Cauchy's theorem.




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

FERMENTATION TECHNOLOGY- I

CODE: 253040501

B.Sc. 5th SEM

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	-	70	-	100

Objectives: -

- To provide basic knowledge of bioprocess technology in the industry, how to isolate the micro-organisms, its preservation. How the strain can be improved for industrially important organisms. What are primary and secondary screening, how to isolate enzymes producing microbes.
- Need to know the importance of strain improvement, what different methods can be used for strain improvement. Students get to know about the use of precursors in the fermentation process.
- This study gives idea about the bioreactor design. Types of bioreactor used in the industry. how the sterilization of media and air can be done. Importance of mass transfer and determination of $K_L a$, inoculum development.
- The student will get an idea about kinetic of substrate and utilization of batch, types of fermentation i.e fed batch and batch fermentation. What can be control system for monitoring the fermentation process.
- To provide the idea about down streaming process how to get end product in the fermentation.

Prerequisites:-

Student must be passed second year B.Sc in Microbiology as major subject along with the knowledge of biology.

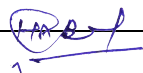
Course outline:-




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Sr. No.	Course Contents	Number of Hours
1.	Introduction to fermentation technology - Fundamental concepts of fermentation - Chronological development in industrial microbiology - Introduction to the component parts of fermentation process - Range of fermentation processes	10
2.	Industrially important microorganisms - SCREENING: (A) Characteristics of industrially important microorganisms (B) Primary screening of organic acid producers, Primary screening of antibiotics, growth factors, and enzyme producers. (C) Significance of secondary screening - STRAIN IMPROVEMENT (A) STRAGIES i. Selection of induced mutants ii. Selection of recombinants (B) Strain improvement for modification of properties other than yield (C) Preservation: Principle, methods and quality control	10
3.	Fermenter Design & Fermentation Process - Stirred tank bioreactor (A) Basic functions of fermenter and design (B) Structural components of fermentor (C) Devices of aeration and agitation (D) Devices for monitoring pH, temerpature, foam and dissolved oxygen - Types of fermentation - Submerge (Batch, Fed batch and Continuous). - Solid state fermentation.	10
4.	Fermentation media and inoculum development - Fermentation media (A) Principles of media formulation (B) Media ingredients: water, carbon sources, nitrogen sources, minerals, growth factors, buffers, chelators, precursors, inducers, inhibitors, antifoam agents - Methods of sterilization (A) Use of high pressure steam: principle, batch and Continuous sterilization process	10




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	(B) Use of filtration: principle, types of filter. Inoculum development: general principles for development of seed culture for bacterial, yeast and fungal processes	
		40

Learning Outcomes:

- Student will learn about the bioprocess technology in the industry, how to isolate the micro-organisms, its preservation. How the strain can be improved for industrially important organisms. Types of substrate used for fermentation and about medium optimization.
- Provide an idea about the bioreactor design. Types of bioreactor used in the industry. how the sterilization of media and air can be done. Importance of mass transfer and determination of $K_L a$, inoculum development.
- Get knowledge about kinetic of substrate and utilization of batch, types of fermentation i.e fed batch and batch fermentation. What can be control system for monitoring the fermentation process.
- To provide the idea about down streaming process how to get end product in the fermentation. What different methods can be used for down streaming process.

Teaching & learning Methodology:

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.



Basic Text & Reference Books:

- Principles of Fermentation Technology : Whitaker & Stanbury Comprehensive
- Biotechnology : Murray Moo Young
- Methods in Industrial Microbiology : Sikyta
- Fermentation Microbiology and Biotechnology, El Mansi and Bryc




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

BACTERIAL METABOLISM

Subject Code: 253040502

B.SC. Semester -5

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	-	70	-	100

Objectives

- To provide students the basic knowledge of Bacterial metabolism.
- The purpose of the course is to give student to introduction of enzyme kinetics, chemoheterotrophic, chemoautotrophic, phototrophic metabolism and biosynthesis.
- To provide an understanding of various pathways about metabolism process like TCA cycle, PPP pathways Glycolysis pathway etc.

Prerequisites

Student Must have studied B.Sc. with microbiology as a major subject and knowledge of basic Bacterial Metabolism.

Course outline




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Unit No.	Course Contents	Teaching hours
1	Enzymes and Energy: - Enzyme kinetics (A) Michaelis-Menten equation. (B) Lineweaver-Burk plot and its significance - Metabolic regulation: Types and Significance. - Energy: its generation and conservation. - Modes of ATP generation.	10
2	Chemo heterotrophic Metabolism: - Utilizable substrates. - Catabolism of glucose. - TCA Cycle. - Catabolism of Fatty acids and Proteins.	10
3	Chemoautotrophic and Phototrophic metabolism: - Physiological groups of chemoautotroph's. - Generation of ATP and reducing power in chemoautotrophs, Phototrophic metabolism. - Types of photophosphorylation-Cyclic and Non-cyclic photophosphorylation. - Pathway for CO₂ fixation. Calvin-Benson cycle.	10
4	Biosynthesis: - Principles governing biosynthesis. - Assimilation of ammonia, nitrate, molecular nitrogen & sulfate. Biosynthesis of saturated and unsaturated fatty acids. - Biosynthesis of Phospholipids. - Methods of studying of Biosynthesis.	10
		40



Learning Outcomes

- The students will be able to understand the Knowledge of the Bacterial Metabolism to understand concepts of various pathways like PPP pathway, glycolysis pathways, TCA cycle etc.
- Student should be able to understand basic concepts of enzymes and energy, chemo heterotrophic metabolism, chemoautotrophic and phototrophic metabolism, Biosynthesis.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

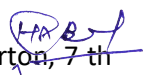
Books Recommended

- General Microbiology, Stanier, R. Y., Ingrahm, J. L., Wheelis, M. L. and Painter, P. R. 5th edn. (1995), Mac Millan Press Ltd., Hong Kong.



Prescott, Harley, and Klein's Microbiology, J. M. Willey, L. M. Sherwood, C. J. Woolverton, 7th Edition (2008), McGraw Hill Higher Education- USA .

Principles of Microbiology, R. M. Atlas, 2nd Edition (Indian Edition) (2015), McGraw Hill.


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SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

Enzymology

Subject Code: 253040503

B.Sc. Semester-5

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	-	30	-	70	-	100

Objectives

- To provide students basic knowledge of Enzymology.
- The purpose of the course is to introduce students to methods of microbiology and to develop required microbiological skills which will be helpful in their future.
- The present course opens the door to all of the abundant careers in and out of the area of biological sciences including health/ medical / Environmental Sciences.

Prerequisites

Student Must have Basic knowledge about terminology Enzymes and their industrial applications.

Course outline




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Unit. No.	Course Contents	Teaching hours
1	Enzymology - General characteristics and classification, Terminology: Holoenzymes, coenzymes, Apo enzymes, cofactors, activators, inhibitors, units of enzyme activity, isoenzymes - Turn over number, specific activity - First order and zero order reactions - Structure of active site of enzymes, specificity of enzyme action- Types and factors affecting enzyme activity. Brief introduction of allosteric enzymes	10
2	Enzyme kinetics - Derivation of Michaelis and Menten equation and its modifications Line Weaver & Burk plot - Eadie-Hofstee and Hannes & Woolf plots - Enzyme Inhibition –competitive - Non-competitive, uncompetitive, mixed & substrate inhibition.	10
3	Enzyme immobilization - Types of immobilization - Methods of immobilization - Application, Advantages & limitations of immobilization - Introduction to reverse micelles and whole cell immobilization	10
4	Industrial Important Enzymes - Sources and applications of enzymes- - Amylase, Protease and Lipase in industries (detergent, leather, food, dairy, Textile and medical). - Methods of Industrial production of enzymes.	10
		40



Learning Outcomes

- The students will be able to understand and deals with the biochemical nature and activity of enzymes and is a subject that has relevance to students from a wide range of disciplines.
- Student should be able to understand basic concepts of the present day scope and applications of enzymology.
- The course is designed to give students an understanding of procedures involved in purification of enzymes, enzymes assays and quantitative evaluation of the influencing parameters such as concentrations of substrate / enzyme, pH, temperature and effects of inhibitors on enzyme activity.
- This is a course where the topics to be studied include enzyme active sites / mechanisms of enzyme action; enzyme kinetics and regulation; Isozymes and their clinical significances /function relationship etc as tools for understanding functions of enzymes.

Teaching & Learning Methodology

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended




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- Enzymes: Biochemistry, Biotechnology, Clinical Chemistry 2nd Edition, *authored* by Trevor Palmer and Philip Bonne(2007)
- Textbook of biochemistry – Vasudevan Shreekumari(2017)
- Biochemistry – Lehninger 6th edition(2013)
- Topics in Enzyme & Fermentation Biotechnology Volumes by Wisemen(1983)
- Biology of Industrial Microorganisms A.L. Duncun(2016)
- Molecular Industrial Mycology Leong & Berka(1992)




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

BIOSAFETY, BIOETHICS & IPR

Subject Code: 253040504

B.Sc. Semester -5

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	3	3	3	30	-	70	-	100

Objectives

- To provide students basic knowledge of Biosafety & Risk assessment, Regulatory affairs, Bioethics and IPR
- The purpose of the course is to give students to introduction of biosafety and biosafety levels, GLP, GMP, QC and QA and also about Bioethics.
- To provide an understanding of Intellectual property and intellectual property rights, Patent process about novel innovation.

Prerequisites

Student must have studied Second year (SY) of B.Sc. with Microbiology as a major subject and knowledge of basic microbiology.

Course outline




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Sr. No.	Course Contents	Teaching hours
1	Biosafety • Introduction of Biosafety • Mechanisms of Biosafety: Standard Laboratory practices & Containment strategies • Biosafety levels • Biosafety guidelines in India • Laboratory biosecurity concept • Risk and Risk assessment	10
2	Regulatory affairs • Good Laboratory Practices • Good Manufacturing Practices • Basic principles of Quality Control and Quality Assurance • Guidelines of QA and QC (raw materials, sterilization, media, products) • Validation study • Role of culture collection center, public health laboratories and regulatory agencies	10
3	Bioethics • Basics of bioethics • Principles of bioethics • Regulatory concerns • International codes and guidelines in India • Role of NGOs in biological regulations	10
4	Intellectual property rights • Introduction of intellectual property • International organization of IP • Types of IPR • Benefits, problems and management of IPR • Patent process • International harmonization of patent law • Patents of biotechnological process and their protection • Indian scenario • Infringement, case studies	10
		40



Learning Outcomes

- The students will be able to apply the knowledge of the biosafety to understand concepts of various fields like research fields, fermentation industries, food industries, analytical laboratories, QC and QA, etc.
- Student should be able to understand basic concepts of biosafety levels, Risk and Risk assessment, Biosecurity, basic knowledge of GLP and GMP, fundamentals of Quality control and Quality assurance, basic introduction and principles of bioethics as well as get some idea about intellectual properties and rights.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the theoretical data and live examples clearly and concisely that incorporates the stylistic conventions used by microbiologists and researchers worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

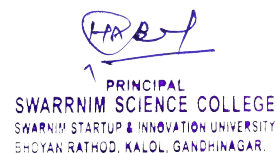
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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc.) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended



Deepa Goel., & Shomini Parashar. (2013) *IPR, Biosafety and Bioethics*
2. R. Mohan Joshi. (2006) *Biosafety and Bioethics*



3. Michael R.W. Brown., & Peter Gilbert. (1995) *Microbiological Quality Assurance*
4. B.D. SINGH., (2003). *Biotechnology – expanding horizons*, Kalyani publication, Chapter 8
5. R Radhakrishnan., & S. Balasubramanian.(2008) *Intellectual Property Rights: Text and Cases*
6. V K Ahuja. (2015) *Intellectual Property Rights in India*




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BHOYAN RATHOD, KALOL, GANDHINAGAR.

SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

Mathematical Physics, Quantum & Classical Mechanics-1

Subject Code: 53050501

B.Sc. Semester 5

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	50	50	-	150

Objectives

- Develop a solid grasp of core concepts and applications of differential equation, 2nd order differential equation, classical mechanics and quantum mechanics. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites

Basics of calculus and mathematics, classical mechanics and quantum mechanics.




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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Differential equations: Some partial differential equations in physics, the method of Separation of variables, separation of Helmboltz equation in Cartesian coordinates, in spherical polar and cylindrical Coordinates, Laplace's equation in various coordinates, Choice of coordinate system and separability of a partial differential equation, Parabolic coordinates system, Prolate Spheroidal coordinates system, various examples based on the separation of variables.	12
2	2nd order differential equations: Ordinary and Singular points, Series solution around an ordinary point, Series solution around a regular singular point: the method of Frobenius, Getting a second solution, Alternative method of getting the second solution, System of linear first order differential equations, Non-linear differential equations, related examples.	12
3	Classical Mechanics: Lagrangian Formulation: Introduction, Constraints, holonomic and non-holonomic constraints, scleronomous and rheonomous constraints, generalized coordinates, D'alembert's principle, Lagrange's equations, a general expression for kinetic energy, Symmetries and the laws of conservation, Cyclic or ignorable coordinates (including illustrations), Velocity dependent potential of electromagnetic field, Rayleigh's dissipation function. Motion of a rigid body: Introduction, Euler's theorem, Angular momentum and kinetic energy, The inertia tensor, Euler's equations of motion, Torque free motion, Euler's Angles, Motion of a symmetric top, Nutational motion.	14
4	Quantum Mechanics: Exactly soluble Eigenvalue problems: Introduction, the simple harmonic oscillator, the Schrödinger equation and energy eigenvalues, the energy eigenfunctions, properties of stationary states, the abstract operator method, Coherent states, the angular momentum operators, the eigenvalue equation for L^2 , separation of variables, admissibility conditions on solutions, eigenvalues, the eigenfunctions, Spherical harmonics, Physical interpretation, Parity. Angular momentum in stationary states of systems with spherical symmetry	14



Learning Outcomes

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology

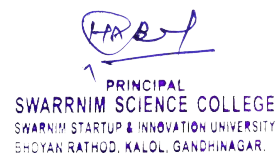
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The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
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- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Mathematical Physics by P.K. Chattopadhyay, New Age International Publishers (2006)
- Mathematical Methods for Physicists by G. Arfken, Academic Press
- Introduction to Classical Mechanics by R. G. Takawale and P. S. Puranik, Tata McGraw-Hill Publishing Co. Ltd.
- Classical Mechanics by A. B. Bhatia, Narosa Publication
- A Text Book of Quantum Mechanics by P. M. Mathews and K. Venketeshan, Tata McGraw-Hill Publishing Co. Ltd.
- Quantum Mechanics : Theory and Applications by A. Ghatak and S. Lokanathan, Macmillan India Limited



E-Resources

- The Flying Circus of Physics 2nd edition by Jearl Walker, Wiley India
- Six Ideas that shaped physics by Thomas A Moore, McGraw Hill education
- <http://www.howstuffworks.com/> -- Tech stuff
- How things works by Louis A Bloomfeild, Wiley Publications
- Physics of Everyday Phenomena by W. Thomas Griffith, Juliet Brosing, McGraw Hill Education
- Latest journals like BBC Knowledge, How things work-everyday technology explained by National Geographics.
- <http://www.sciencefairadventure.com/>




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2SWARNIM STARTUP & INNOVATION UNIVERSITY (SSIU)

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

Electronic Spectra-1, Solid State Physics & Stat. Mech-1

Subject Code: 253050502

B.Sc. Semester 5

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	50	50	-	150

Objectives

- Develop a solid grasp of core concepts and applications of molecular spectra, Raman spectra, quantum statistics and solid state physics. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

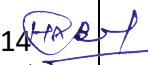
Prerequisites

Fundamentals of spectroscopy, quantum mechanics and solid state physics.




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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Types of Molecular Spectra and Molecular Energy States: Separation of electronic and nuclear motion - The Born Oppenheimer approximation, types of molecular spectra. Pure Rotational Spectra: Salient features of Rotational spectra, Molecular requirement for rotation spectra, experimental arrangement, Molecule as a rigid rotator, explanation of rotational spectra (without the process of solving Schrodinger equation to get energy formula), the non-rigid rotator, Isotope effect on rotational spectrum, tunable laser and pulse laser - introduction Vibrational - Rotational Spectra: salient features of vibrational - Rotational spectra, Molecule as a harmonic oscillator, Molecule as anharmonic oscillator, Vibrational frequency and force constant for anharmonic oscillator, Fine structure of Infrared bands: Molecule as vibrating rotator, Diatomic molecule as symmetric top, Thermal distribution of vibrational and rotational levels.	14
2	Raman Spectra : Nature of the Raman spectra, experimental arrangement for Raman spectra, Classical theory of Raman effect, Quantum theory of Raman effect, Raman spectra and Molecular structure, Infrared spectra versus Raman spectra, Laser as intense source. Classification of Molecular Electronic States: Molecular electronic states, Symmetry properties of electronic eigenfunctions (symmetry classification of electronic states) Fluorescence and Phosphorescence: Luminescence, Mechanism of fluorescent emission, Mechanism of phosphorescent emission, Fluorescence spectrum compared with Raman spectrum.	14
3	Formulation of Quantum Statistics: Density matrix, Liovilles theorem in Quantum Statistical Mechanics, Condition for Statistical equilibrium, Ensemble in Quantum Mechanics, Problems Bose Einstein and Fermi Dirac Distributions: Symmetry of wave functions, the Quantum Distribution functions, the Boltzmann limit of Boson and Fermions Gases, Evaluation of the Partition function, Partition function for Diatomic Molecules (a) translation partition function (b) rotational partition function (c) vibration partition function (d) electronic partition function Equation of state for an ideal gas, The quantum mechanical Para magnetic susceptibility, problems	14
	Solid State Physics: Elastic constants and elastic waves: Analysis of elastic strains, Dilation, stress components, Elastic compliance and stiffness constants, Elastic energy density, elastic stiffness constants of cubic crystals, Bulk modulus and compressibility. Elastic waves in cubic crystals, waves in the [100] direction, waves in the [110] direction. Free electron Fermi gas: Introduction, Energy levels in one	14  PRINCIPAL SWARNIM SCIENCE COLLEGE SWARNIM STARTUP & INNOVATION UNIVERSITY BHOYAN RATHOD, KALO, GANDHINAGAR.

	dimension, Effect of temperature on the Fermi-Dirac distribution, Free electron gas in three dimensions and density of states, Heat capacity of the electron gas and experimental heat capacity of metals, Electrical conductivity and ohm's law, Experimental electrical resistivity of metals, Thermal conductivity of metals, ratio of thermal to electrical conductivity.	

Learning Outcomes

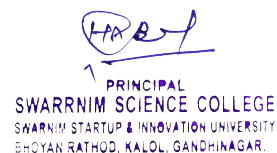
- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology:-

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.



Books Recommended

- Atomic and Molecular Spectra : Laser by Rajkumar, Kedar Nath & Ram Nath
- Fundamentals of Statistical Mechanics by B. B. Laud, New Age International Publishers
- Introduction to Solid State Physics by C. Kittel, (Eight Edition) John Wiley and Sons
- Elements of Solid State Physics by J. P. Srivastava, Prentie-Hall of India Private Limited, New Delhi

Resources

- The Flying Circus of Physics 2nd edition by Jearl Walker, Wiley India
- Six Ideas that shaped physics by Thomas A Moore, McGraw Hill education
- <http://www.howstuffworks.com/> -- Tech stuff
- How things works by Louis A Bloomfeild, Wiley Publications
- Physics of Everyday Phenomena by W. Thomas Griffith, Juliet Brosing, McGraw Hill Education
- Latest journals like BBC Knowledge, How things work-everyday technology explained by National Geographics.
- <http://www.sciencefairadventure.com/>




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SWARNIM STARTUP & INNOVATION UNIVERSITY (SSIU)

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

Nuclear physics-1 & Electrodynamics-1

Subject Code: 253050503

B.Sc. Semester 5

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	50	50	-	150

Objectives: -

Physics students will:

- Develop a solid grasp of core concepts and applications of electromagnetic induction, Electromagnetic radiation, alpha, beta ray and gamma rays. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites

Fundamentals of Electromagnetics and Nuclear Physics.




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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Electromagnetic induction: Hysteresis, Maxwell's equations, Decay of free charge, Potentials of electromagnetic fields, More about the Lorentz gauge condition, Field energy and Field momentum. Electromagnetic waves: Plane waves in non-conducting media, Polarizations, Energy flux in a plane wave, Radiation pressure and Momentum, Plane waves in conducting medium, Skin effect.	12
2	Electromagnetic Radiation: Retarded Potential, Radiation from an oscillating dipole, Linear Antenna, Lienard-Wiechert Potentials, Potentials for a charge in uniform motion – Lorentz formula, Fields of an accelerated charge, Radiation from an acceleration charged particle at low velocity, Radiation when the velocity and acceleration of the particles are collinear, Radiation from a charged particle moving in a circular orbit, Electric quadrupole radiation.	12
3	Alpha and Beta Rays: Alpha Rays: Range of alpha particles, Disintegration energy of the spontaneous alpha decay, Alpha decay paradox - barrier penetration. Beta Rays: Introduction, Continuous Beta ray spectrum - difficulties encountered to understand it, Pauli's Neutrino Hypothesis, Fermi's theory of Beta decay, the detection of neutrino, Parity non-conservation in Beta decay.	12
4	Gamma Rays and The liquid drop model of the nucleus: Gamma Rays: Introduction, Gamma-ray emission – selection rules, Internal conversion, Nuclear isomerism. The liquid drop model of the nucleus: Introduction, Binding energies of nuclei : plot of B/A against A., Weizsacher's semi empirical mass formula Mass parabolas: prediction of stability against Beta decay for members of an isobaric family, Stability limits against spontaneous fission, Barrier penetration - decay probabilities for spontaneous fission, Nucleon emission.	14

Learning Outcomes

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.



Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology:-

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

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- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Introduction to Electromagnetics by D.J.Griffiths by PHI publication.
- Electromagnetics by B. B. Laud, 2nd Editon, Wiley Eastern Ltd
- Nuclear Physics - An Introduction by S.B. Patel, New Age International
- Nuclear Physics by D. C. Tayal, Himalaya Publisher

E-Resources

- The Flying Circus of Physics 2nd edition by Jearl Walker, Wiley India
- Six Ideas that shaped physics by Thomas A Moore, McGraw Hill education
- <http://www.howstuffworks.com/> -- Tech stuff
- How things works by Louis A Bloomfeild, Wiley Publications
- Physics of Everyday Phenomena by W. Thomas Griffith, Juliet Brosing, McGraw Hill Education
- Latest journals like BBC Knowledge, How things work-everyday technology explained by National Geographics.
- <http://www.sciencefairadventure.com/>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

Linear Electronic Circuits-1

Subject Code: 253050504

B.Sc. Semester 5

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	50	50	-	150

Objectives: -

Physics students will:

- Develop a solid grasp of core concepts and applications of differential equation, 2nd order differential equation, classical mechanics and quantum mechanics. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites

Basics of Electronic circuits.

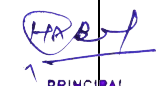



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Course outline

Sr. No.	Course Contents	Teaching Hours
1	General amplifier characteristics: Introduction, concept of amplification, amplifier notations, current gain, voltage gain, power gain, amplifier input resistance, amplifier output resistance, maximum power transfer, conversion efficiency, classes of amplifier operation, harmonic distortion, three point method of calculating harmonic distortion, five point method of calculating harmonic distortion, oscilloscope display of an amplifier dynamic transfer curve, measurement of harmonic distortion, other types of amplifier distortion, decibels, other equations for decibel computation, zero dB reference level, use of voltmeter as dB indicator, voltmeter range correction factor, impedance correction factor, frequency response curves, amplifier bandwidth, phase relationship in amplifier square wave testing.	14
2	Frequency response of a transistor amplifier: Low frequency response of a transistor amplifier: Effect of an emitter by pass capacitor on low frequency response, effect of coupling capacitor on low frequency response, cascading of CE stages, mid frequency gains, low frequency response of cascaded stages amplifier, low frequency response to a square wave, transformer coupled transistor amplifier, low frequency response of TC amplifier, step response of a TC amplifier. High frequency response of a transistor amplifier: High frequency model for a CE amplifier, approximate CE high frequency model with a resistive load, CE short circuit current gain, high frequency current gain with a resistive load, high frequency response of cascaded CE stages, amplifier high frequency response to a square wave high frequency response of a transformer coupled amplifier.	14
3	Circuit analysis, design and Flip-Flop: Circuit analysis and design: Boolean laws and theorems, sum of products method, truth table to Karnaugh map, pairs, quads and octets, Karnaugh simplification, don't care conditions, product of sums method product of sums simplification, Exclusive OR gate. FLIP- FLOP: RS flip flop, clocked RS flip flop, D flip flop, Edged triggered D flip flop, JK flip flop, JK master slave flip flop	12
4	Network Transformations: Reduction of complicated network, conversion between T and π sections, bridge T network, the lattice network, superposition theorem, the reciprocity theorem, thevenin's theorem, Norton theorem, maximum power transfer theorem, compensation theorem. Resonance : Definition of Q, the figure of merit, series resonance, Bandwidth of the series resonant circuit, parallel resonance or antirsonance, current in antiresonant circuits, Bandwidth of antiresonant circuits.	12




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Learning Outcomes

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology

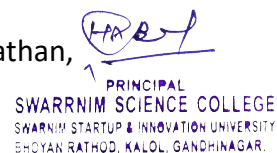
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- Introduction to Classical Mechanics by R. G. Takawale and P. S. Puranik, Tata McGraw-Hill Publishing Co. Ltd.
- Classical Mechanics by A. B. Bhatia, Narosa Publication
- A Text Book of Quantum Mechanics by P. M. Mathews and K. Venketeshan, Tata McGraw-Hill Publishing Co. Ltd.
- Quantum Mechanics : Theory and Applications by A. Ghatak and S. Lokanathan, Macmillan India Limited



E-Resources

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- Six Ideas that shaped physics by Thomas A Moore, McGraw Hill education
- <http://www.howstuffworks.com/> -- Tech stuff
- How things works by Louis A Bloomfeild, Wiley Publications
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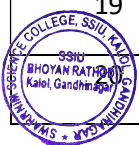
DEPARTMENT OF PHYSICS

PHYSICS

B.Sc. Semester 5

Practical List

Sr. No.	Practical Name
1	Acceleration due to gravity by Kater's pendulum (fixed knife edges).
2	To determine melting point of a substance by platinum resistance thermometer using Callender- Griffiths bridge
3	Characteristics of G.M. Tube
4	Viscosity by Log decrement
5	Hall effect
6	Refractive index by total internal reflection using Gauss eye piece
7	Fabry-Perot etalon. Determination of the thickness of air film and wavelength of light using spectrometer
8	Michelson interferometer. To determine the wavelength of monochromatic light
9	To measure a threshold current of a LASER diode at room temperature
10	An optical method of determining dielectric constant, dipole moment and polarizability of a polar liquid using Hollow prism
11	Mutual Inductance by Ballistic Galvanometer
12	Determination of capacity of Schering Bridge
13	Determination of Curie temperature of ferroelectric ceramic
14	I -V Characteristics of Solar Cell and to determine fill-factor, voltage-factor and efficiency
15	Determination of unknown frequency using Wein Bridge
16	Hartley Oscillator. Measurement of frequency by C.R.O. (Transistorized).
17	Series and parallel resonance. To find the band width and Q value of a coil.
18	Frequency response of CE amplifier
19	RS Flip flop using gates (IC 7400, 7402) and D Flip flop using IC 7474
	A.C. Circuit analysis by C.R.O. Measurement of frequency and phase difference



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SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF SCIENCE ENVIRONMENTAL SCIENCE

CODE: 253000503

SEMESTER 2

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	50	70	-	150

Objectives: - To provide a comprehensive knowledge for awareness of environment conservation and hazard management.

Prerequisites:- Environment Conservation & Hazard Management

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Earth Science	6
2	Global Environmental Issues	10
3	Natural Resources and Management	6
4	Biomass Energy	8

Learning Outcomes:- At the closing stage of the course, the students will be able to understand the importance of environment conservation and the concepts of hazard management.

Teaching & Learning Methodology:- The Syllabus for Environmental Studies includes classroom teaching. The syllabus is divided into four units covering 30 lectures. The units are classroom teaching based to enhance knowledge skilled and attitude to environment.




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Books Recommended:

1. R. R. Mahitcha – “Environment Conservation and Hazard Management”, Atul Prakashan.
2. Solanki and Chetan Singh – “Renewable Energy Technologies”, PHI Learning.
3. Izrael Y.A. – “Ecology and Control of the Natural Environment”, Kluwer Academic Publisher.
4. Sharma, Sanjay K. – “Environment Engineering and Disaster Management”, Laxmi Publications.
5. Earnest, Joshua and Wizelius, Tore – “Wind Power Plants and Project Development, PHI Learning.
6. Anandita Basak – “Environmental Studies”, Pearson Publication.
7. K. S. Valadia – “Coping with Natural Hazards Indian Context”, Orient Longman Publication.
8. Edward S. Rubin – “Engineering and Environment”, McGraw Hill Publication

SYLLABUS

Unit-1

Ecology and Environment: Importance of environment and scope, Engineering and Environment issues, The natural system, Biotic and Biotic components and processes of natural system, Eco system, Food chain, webs and other biological Systems, Causes of environmental pollution, Pollution due to solid waste, Water pollution, Air pollution, The noise as pollution, Pollution of land due to industrial and chemical waste, Radiation and its effects on vegetables and animals

Unit-2

Solar power: Features of solar thermal and PV systems, Types of solar cookers and solar water heaters, Solar PV systems and its components and their working, Types of solar PV cells, Rating and Costing.

Unit-3

Seismic engineering and disaster management: Introduction of Seismic engineering and its application, Features of disasters such as floods, Earthquakes, Fires, Epidemics, Gas/radioactive leaks etc., Management and Mitigation of disasters.

Unit-4

Sustainable development: Concept of sustainable development, Natural resources, Abiotic and Biotic resources, Principles of conservation of energy and management, Need of renewable energy, Growth of renewable energy in India and the world, Concept of waste management and recycling.



SWARRNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF Biotechnology

Fermentation Technology-II

CODE: 253010601

B.Sc. 6th Sem

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	-	70	-	100

Objectives:-

- To provide the idea about down streaming process how to get end product in the fermentation. Different methods used for separation of products from fermentation broth.
- Students will get an idea about quality control of the fermented products made using different methods.
- To provide students basic knowledge of Microbial Biotechnology. It covers up general concept of microbial production and fermentation of various products.
- The purpose of the course is to give knowledge about production process using fermentation technology and microorganisms of antibiotics, enzymes, industrial alcohol, organic acids, vitamins, SCP, as well as mushrooms.

Prerequisites:-

Students must have passed 2nd year B.Sc in Microbiology along with basic knowledge of biology




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BHOYAN RATHOD, KALOL, GANDHINAGAR.

Course outline:-

Sr. No.	Course Contents	Number of Hours
1.	Downstream processing • Introduction • Removal of microbial cells and suspended solids (A) Foam separation (B) Precipitation (C) Filtration (D) Centrifugation • Cell disruption methods (A) Physico-mechanical methods (B) Chemicals methods • Product concentration and purification (A) Liquid -liquid extraction (B) Membrane processes • Finishing stages (A) Drying (B) Crystallization • Effluent treatment	10
2.	Quality control of fermentation products- • Detection and assay of fermentation products (A) Physical assays: Titration and gravimetric analysis, turbidity and cell yield determination (B) Chemical assay: Chromatography, spectrophotometry (C) Biological assays: Microbial assay • Microbial quality assurance (A) Sterility testing (B) LAL test • Fermentation economics	10
3.	Fermentation production of : • Alcohol • Cheese • Baker's Yeast • Glutamic acid • Citric acid	10
4.	Fermentative production of: • Penicillin and its conversion to semisynthetic derivatives, • Cyanocobalamin • Steroids • Amylase • carotenoids	10



Learning Outcomes:

- To provide the idea about down streaming process how to get end product in the fermentation. What different methods can be used for down streaming process.
- The students will be able to apply the knowledge of the Microbial production to understands concepts of various fields like food and dairy industries, pharmaceutical industries, Fermentation industries, beverages industries, etc.
- Student should be able to understand basic concepts of various products like alcohol, cheese, amino acids like glutamic acid, citric acid fermentation economics.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the theoretical data clearly and concisely that incorporates the stylistic conventions used by Microbiologists, biotechnologist, researchers and scientists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc.) to support key concepts/knowledge. Particularly at the start of a program/module



or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. **"Principles of Fermentation Technology**, Stanbury P F, Whitaker A and Hall SJ, (1995) 2nd edition, Pergamon Press, London, UK.
2. **Industrial Microbiology: An Introduction**, Waites, M J and Morgan N L, (2002) Blackwell Science.
3. **Biotechnology: A Textbook of Industrial Microbiology**, Crueger W and Crueger A, (2000) 2nd edition, Panima Publishing Corporation, New Delhi, India.
4. **Fermentation Microbiology and Biotechnology**, El-Mansi E M T, Bryce CFA, Dahhou B, rd Sanchez S, Demain AL, Allman AR (eds), (2011) 3rd edition, CRC Press; Taylor and Francis Group, Boca Raton.
5. **Industrial Microbiology**, Casida LE, Jr. (1968), Wiley Eastern Ltd, New Delhi, India.




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SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

Enzymology and Kinetics

Subject Code: 253010602

B.Sc. Semester-6

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	-	70	-	100

Objectives

- To provide students basic knowledge of Enzymology.
- The purpose of the course is to introduce students to methods of microbiology and to develop required microbiological skills which will be helpful in their future.
- The present course opens the door to all of the abundant careers in and out of the area of biological sciences including health/ medical / Environmental Sciences.

Prerequisites

Student Must have Basic knowledge of Enzymes and their industrial application.



Course outline


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Unit No.	Course Contents	Teaching hours
1	Enzymology - General characteristics and classification Terminology: Holoenzymes, coenzymes, Apo enzymes, cofactors, activators, inhibitors units of enzyme activity and isoenzymes - Turn over number, specific activity first order and zero order reactions Structure of active site of enzymes, specificity of enzyme action Types and factors affecting enzyme activity - Brief introduction of Allosteric enzymes	10
2	Enzyme kinetics - Derivation of Michaelis and Menten equation and its modifications Line Weaver & Burk plot - Eadie-Hofstee and Hannes & Woolf plots - Enzyme Inhibition – competitive, non competitive - Uncompetitive, mixed & substrate inhibition.	10
3	Enzyme immobilization - Types of immobilization - Methods of immobilization - Application, advantages & limitations of immobilization. - Introduction to reverse micelles.	10
4	Industrial enzymes: - Sources and applications of enzymes- - Amylase, protease and lipase in industries (detergent, leather, food, dairy, Textile and medical). Industrial production of enzymes.	10
		40



Learning Outcomes

- The students will be able to understand and deals with the biochemical nature and activity of enzymes and is a subject that has relevance to students from a wide range of disciplines.
- Student should be able to understand basic concepts of the present day scope and applications of enzymology.
- The course is designed to give students an understanding of procedures involved in purification of enzymes, enzymes assays and quantitative evaluation of the influencing parameters such as concentrations of substrate / enzyme, pH, temperature and effects of inhibitors on enzyme activity.
- This is a course where the topics to be studied include enzyme active sites / mechanisms of enzyme action; enzyme kinetics and regulation; Isozymes and their clinical significances /function relationship etc as tools for understanding functions of enzymes.

Teaching & Learning Methodology

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.




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Books Recommended

- Enzymes: Biochemistry, Biotechnology, Clinical Chemistry 2nd Edition, *authored* by Trevor Palmer and Philip Bonne(2007)
- Textbook of biochemistry – Vasudevan Shreekumari(2017)
- Biochemistry – Lehninger 6th edition(2013)
- Topics in Enzyme & Fermentation Biotechnology Volumes by Wisemen(1983)
- Biology of Industrial Microorganisms A.L. Duncun(2016)
- Molecular Industrial Mycology Leong & Berka(1992)




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

MOLECULAR BIOLOGY-II

Subject Code: 253010603

B.Sc. Semester -6

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	-	30	-	70	-	100

Objectives

- To provide students basic knowledge of Molecular biology about eukaryotes.
- The purpose of the course is to give students to introduction of replication, transcription and translation in eukaryotes.
- To provide an understanding of DNA damage and repair system and also get idea about transposons and its applications.

Prerequisites

Student must have knowledge about basic molecular biology with basic idea about central dogma of life.




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Course outline

Unit No.	Course Contents	Teaching hours
1	Replication in eukaryotes - Genome organization and DNA packaging - Replication in Eukaryotes-Problems associated with eukaryotic replication - Enzymes & Proteins involved in replication with its function	10
2	Transcription in Eukaryotes - Central Dogma: The flow of genetic information - Initiation, Elongation and Termination. - Types of RNA polymerase - Types of promoter, enhancers & silencers - Post Transcriptional modification-types of introns, splicing of RNA, t-RNA, r-RNA, modification of 5' and 3' ends.	10
3	Translation in Eukaryote - Eukaryotic ribosome - Initiation, Elongation and Termination - Post-translational modification - Protein targeting	10
4	Mutation and DNA repair - Types of mutation: Spontaneous & Induced mutation - Effect of mutation in protein coding gene: Forward, Reverse & Suppressor mutation - DNA repair mechanisms: Direct, Indirect & SOS repair system - Transposable elements: Structure, Properties, Insertion Sequences (IS), Tn elements, Transposon mutagenesis, Application of transposons	10
		40

Learning Outcomes

- The students will be able to apply the knowledge of the Molecular biology to understand concepts of various fields like research fields, Gene manipulation, Genetic engineering, etc.
- Student should be able to understand basic concepts of Replication, transcription and translation in eukaryotes, protein targeting, DNA mutation and repair mechanisms, transposons, application of transposons.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the theoretical data clearly and concisely that incorporates the stylistic conventions used by biotechnologist worldwide.



Teaching & Learning Methodology

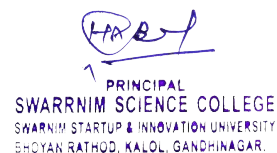
We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc.) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Lynne Cassimeris, Viswanath R Lingappa, George Plopper (Eds) (2011). Lewin's Cells (II Edn). Jones and Bartlett Publishers.
2. Gerald Karp (2008). Cell and Molecular biology: Concepts and experiments (V Edn). John Wiley & Sons.
3. James D Watson, Tania A Baker, Stephen P Bell, Alexander Gann, Michael Levine, Richard Losick (2009). Molecular biology of the gene (V Edn). Pearson.
4. Wayne M Becker, Lewis J Kleinsmith, Jeff Hardin (2007). The world of the cell (VI Edn). Pearson



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

BIOSAFETY, BIOETHICS & IPR

Subject Code: 253010604

B.Sc. Semester -6

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	-	70	-	100

Objectives

- To provide students basic knowledge of Biosafety & Risk assessment, Regulatory affairs, Bioethics and IPR
- The purpose of the course is to give students to introduction of biosafety and biosafety levels, GLP, GMP, QC and QA and also about Bioethics.
- To provide an understanding of Intellectual property and intellectual property rights, Patent process about novel innovation.

Prerequisites

Student must have studied Second year (SY) of B.Sc. with Microbiology as a major subject and knowledge of basic microbiology.




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Course outline

Sr. No.	Course Contents	Teaching hours
1	Biosafety • Introduction of Biosafety • Mechanisms of Biosafety: Standard Laboratory practices & Containment strategies • Biosafety levels • Biosafety guidelines in India • Laboratory biosecurity concept • Risk and Risk assessment	10
2	Regulatory affairs • Good Laboratory Practices • Good Manufacturing Practices • Basic principles of Quality Control and Quality Assurance • Guidelines of QA and QC (raw materials, sterilization, media, products) • Validation study • Role of culture collection center, public health laboratories and regulatory agencies	10
3	Bioethics • Basics of bioethics • Principles of bioethics • Regulatory concerns • International codes and guidelines in India • Role of NGOs in biological regulations	10
4	Intellectual property rights • Introduction of intellectual property • International organization of IP • Types of IPR • Benefits, problems and management of IPR • Patent process • International harmonization of patent law • Patents of biotechnological process and their protection • Indian scenario • Infringement, case studies	10
		40

Learning Outcomes

- The students will be able to apply the knowledge of the biosafety to understand concepts of various fields like research fields, fermentation industries, food industries, analytical laboratories, QC and QA, etc.



- Student should be able to understand basic concepts of biosafety levels, Risk and Risk assessment, Biosecurity, basic knowledge of GLP and GMP, fundamentals of Quality control and Quality assurance, basic introduction and principles of bioethics as well as get some idea about intellectual properties and rights.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the theoretical data and live examples clearly and concisely that incorporates the stylistic conventions used by microbiologists and researchers worldwide.

Teaching & Learning Methodology

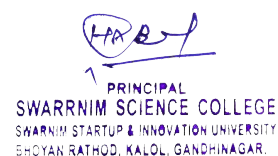
We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

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- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc.) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Deepa Goel., & Shomini Parashar. (2013) *IPR, Biosafety and Bioethics*
2. Raj Mohan Joshi. (2006) *Biosafety and Bioethics*
3. Michael R.W. Brown., & Peter Gilbert. (1995) *Microbiological Quality Assurance*
4. B.D. SINGH., (2003). *Biotechnology – expanding horizons*, Kalyani publication, Chapter 8
5. R Radhakrishnan., & S. Balasubramanian.(2008) *Intellectual Property Rights: Text and Cases*
6. V K Ahuja. (2015) *Intellectual Property Rights in India*



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Organic Chemistry-C-II

CODE : 253020601

B.Sc. 6th Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	50	70	-	150

Objectives:- To provide basic knowledge Chemistry

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	(A) Synthetic Dyes Classification of Dyes- Anionic and Cationic dyes, Mordant and Vat dyes, Reactive and Dispersed dyes, Synthesis of Alizarin, Malachite green, Indigo, Congo red, Eosin. (B) Explosives Preparation of RDX, PETN, Nitroglycerine, Tetryl. (C) Pesticides: Preparation of Aldrine, Malathion, Parathion, Methoxychlor.	14
2	(A) Synthetic Drugs General Classification, Chemotherapy, Antipyretics, Analgesics, Hypnotics, Sedatives, Anaesthetics, Antimalerials, Antiseptics, Cardiovascular drugs. (Minimum two illustrations of each, only names without structures). Methods of preparation and uses of Antipyrine, Phenacetin, n-Hexyl resorcinol, Alprazolam, Zaleplon,	14



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	Benzocaine, Lidocaine, Chloroquine, Atenolol, Sulphadiazine, Trimethoprim and Tolbutamide. (B) Vitamins Structure and Biochemistry of Vitamin-A (A1) (Retinol), Vitamin-B6 (Pyridoxine).	
3	(A) Alkaloids Classification, General method of determining structure, analytical and synthetic methods, structure of Coniine, Nicotine, Atropine and Papaverine. (B) Isoprenoids (Terpenoids) Classification, General method of determining structure, Isoprene rule, Chemistry of Citral, α -Terpineol, Camphor and their synthesis, study of reactions of β -carotene (No Synthesis).	14
4	(A) Stereo Chemistry Concept of prostereo isomerism and chiral synthesis (Asymmetric Induction), Cram's rule, Prelog's generalization, Prelog's rule and assignment of configuration. (B) Stereochemistry of compounds other than Carbon Stereo chemistry of the compounds containing Nitrogen. Phosphorus and Sulphur	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

- (1) Organic Chemistry: I. L. Finar, Vol-II, 5th Edition, Pearson Education Ltd.
- (2) Organic Chemistry: Morrison & Boyd, 6th Edition, Prentice Hall of India Pvt. Ltd.
- (3) Stereochemistry of carbon compounds: E. L. Eliel, Wiley Eastern Ltd.
- (4) Stereochemistry and mechanism through solved problems: P. S. Kalsi, New Age International.
- (5) Stereochemistry of Organic Compounds: Principles and Applications: D. Nasipuri; New Academic Science; 4th Revised Edition.
- (6) Organic Chemistry: Hendrickson, Cram, Hammond, Mc Graw-Hill.
- (7) Organic Chemistry: 6th Edition, John McMurry, Brooks Cole, International Edition.
- (8) Organic Chemistry: T.W. Graham Solomons and Craig B. Fryhle Wiley, 8th Edition.
- (9) Organic Chemistry: Francis A. Carey, Mc Graw-Hill, 7th Edition.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Inorganic Chemistry-C-II

CODE : 253020602

B.Sc. 6th Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	50	70	-	150

Objectives:- To provide basic knowledge Chemistry

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Chemical bonding (II) The Huckel Molecular Orbital (HMO) theory, variation principle, solution of Secular equation, HMO treatment to ethylene molecule, allylic cation, allylic free radical and allylic anion, Hybridization: Hybridization wave functions of sp, sp ² and sp ³ .	14
2	(A) Term symbol Russel Saunders coupling and determination of Term symbols of the ground state. Calculation of number of microstates. Pigeon hole diagram of p ² and d ² configurations. Hund's rule. Hole formulation. (B) Electronic spectra of metal complexes Electronic spectra of transition metal complexes, Laporte orbital and spin selection rules. Orgel energy level diagram of d ⁵ and combined diagrams of d ₁ - d ₉ , d ₂ - d ₈ , d ₃ - d ₇ , d ₄ - d ₆ and their spectra. Jahn Teller distortion. Spectrochemical series.	14
3	(A) Metal carbonyls Mono and poly-nuclear metal carbonyls: Ni(CO) ₄ , Fe(CO) ₅ , Cr(CO) ₆ ,	14




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	$\text{Fe}_2(\text{CO})_9$, $\text{Fe}_3(\text{CO})_{12}$, $\text{Co}_2(\text{CO})_8$, $\text{Mn}_2(\text{CO})_{10}$, $\text{Ir}_4(\text{CO})_{12}$, $\text{Co}_4(\text{CO})_{12}$. Metal nitrosyl and metal carbonyl hydrides. Application of IR spectra in the determination of structure of metal carbonyls. (B) Organometallic compounds Definition, classification, synthesis (general methods), properties, structure and application of organometallic compounds of Mg, Al and Be, Structure of Ferrocene and dibenzene chromium.	
4	Quantum chemistry Setting up of operators for different observables, Hermitian operator, important theorems concerning Hermitian operator, Particle in a three dimensional box, The rigid Rotator, The Schrodinger equation in spherical polar coordinates for hydrogen atom, separation of variables, solution of R, Θ and Φ equations	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

- (1) Concise Inorganic Chemistry: J.D. Lee; Wiley India, 5th Edition (1996).
- (2) 'Shriver and Atkins' Inorganic Chemistry: Atkins, Overton, Rourke, Weller, Armstrong;
- (3) Oxford University Press, 5th Edition (2011).
- (4) Advanced Inorganic Chemistry: F.A. Cotton and Wilkinson G.; John Wiley, 5th Edition (1988).
- (5) Introductory Quantum Chemistry: A.K. Chandra; Tata- McGraw Hill, 4th Edition (1994).
- (6) Quantum chemistry: R.K. Prasad; New Age International, 4th Edition (2010).
- (7) Electron and chemical bonding: H. B. Grey, W.A.Benjamin. INC, New York.
- (8) Inorganic chemistry: James E. Huheey, 4th Edition, Wesley Publishing Company.
- (9) Mechanism of Inorganic reaction: Basalo and Pearson, 2nd Edition, Wiley Eastern Pvt Ltd.
- (10) Advanced Inorganic chemistry: (Vol. 1) Satya Prakash, Tuli, Basu and Madan; S. Chand
- (11) Advanced Inorganic chemistry: Gurdeep Raj; Goel Publishing House, 23rd Edition (1998).




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Physical Chemistry-C -II

CODE : 253020603

B.Sc. 6th Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	50	70	-	150

Objectives:- To provide basic knowledge Chemistry

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Thermodynamics Colligative properties: Boiling point elevation and freezing point depression. Molal elevation constant (K _b) and Molal depression constant (K _f), Calculation of absolute value of entropy using third law of thermodynamics, Law of mass action using chemical potential, Partial molar quantity.	14
2	Electrochemistry Concentration cell: Cell with and without transference, Electrode concentration cell, Gas electrode concentration cell, Activity and activity coefficient determination, Define liquid junction potential and how it can be avoided, Equation for liquid junction potential, Decomposition potential, Overvoltage, Tafel equation	14
3	(A) Phase Rule Binary system : Zn-Cd and Pb-Ag, Zeotropic and azeotropic mixtures, Steam distillation, Zone refining.	14



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	(B) Osmosis Desalination and reverse osmosis, Electrodialysis, Electrochemistry and pollution control, Removal of Cu, Ag and Fe from waste water.	
4	(A) Photochemistry Laws of Photochemistry : Grotthuss-Draper Law, Einstein Law, Quantum yield, Reasons for high and low quantum yield, Fluorescence and Phosphorescence, Chemiluminescence, Photosensitized reactions. (B) Metallic Corrosion Types of corrosion, Electrochemical series, Corrosion in acidic and neutral medium, Differential aeration principle, Atmospheric corrosion, Prevention of corrosion by various factor.	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

- (1) Physical Chemistry: G. M. Barrow, 5th Edition, McGraw-Hill education, India.
- (2) Advanced Physical Chemistry: Gurdeep Raj, 35th Edition (2009), Goel / Krshina Publishing House.
- (3) Principles of Physical Chemistry: Puri, Sharma and Pathania, 42nd Edition, Vishal Publishing Company.
- (4) Polymer Science: Gowariker, Viswanathan and Sreedhar, 1st Edition (2012 reprint) New Age International.
- (5) Essentials of Nuclear Chemistry: Arnikar, 4th Edition (2012 reprint), New Age International.
- (6) Physical Chemistry: Atkins, 9th Edition. Oxford University Press.
- (7) Advanced Physical chemistry: Gurtu and Gurtu, 11th Edition , Pragati Prakashan.
- (8) Physical chemistry: Levine, 6th Edition, McGraw-Hill education, India.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Analytical Chemistry-C -II

CODE : 253020604

B.Sc. 6th Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	50	70	-	150

Objectives:- To provide basic knowledge Chemistry

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	(A) Errors and treatment of Analytical data: Significant figures, Accuracy and precision, Types of errors and minimization of errors. Ways of expressing accuracy and precision. Rejection of a result, Test of significance (Q-Test, Student t-Test and F-Test) correlation coefficient. Literature of Analytical Chemistry. (B) Organic reagents used in quantitative Analysis Separation of methods with 8-Hydroxy Quinoline, Cupferron and DMG	14
2	(A) Chromatographic methods: General principle, classification of chromatographic separation. Ion exchange chromatography (Ion Exchange equilibria, Types of Ion Exchange capacity, Application of Ion Exchange resins). Gas Chromatography, Instrumentation and evolution of data. High Performance Liquid Chromatography (HPLC) Principle and Instrumentation.	14



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	(B) Solvent Extraction Separation: Principles of solvent extraction, choice of solvent, distribution coefficient, distribution ratio, percentage (%) extraction. The extraction process, solvent extraction of metals, selective extraction and separation efficiency.	
3	(A) Polarography: Introduction, Principle, electrode, Types of currents, Determination of half wave potential, Ilkovic equation, methods of determining concentration (Standard addition method and Calibration method) (B) Potentiometry: The scope of potentiometric titrations, Precipitation and neutralization titrations, Graphical method including Gran's plot for selecting end point, Differential titration, Dead stop titration, Ion selective Electrode, various types of Ion selective Electrodes and use of Calcium ion selective electrode.	14
4	Miscellaneous Titrations: (A) Acid Base Titrations: Titration of polyprotic acid and mixture of acids, titration of salts, Differential Alkali titration. (B) Redox titration: Titration involving Iodine: iodimetry and iodometry, Titration with reducing agents and oxidising agents, metallic reductors. (C) Complexometric titration: EDTA titration techniques-Direct, Back, Displacement and Indirect Titration, Masking, Demasking agent, ligand effect and Hydrolysis of EDTA complex, Auxiliary complexing agent- EDTA titration with an auxiliary complexing agent.	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

- (1) Analytical Chemistry: Gary D. Christian, 6th Edition; Wiley & Sons
- (2) Fundamentals of Analytical Chemistry: D. A. Skoog, D. M. West and F. J. Holler, 9th Edition, Cengage Learning.
- (3) Instrumental Methods of analysis: (CBS) H.H. Willard, L.L. Merritt, J.A. Dean
- (4) Solvent extraction in Analytical Chemistry: G.H. Morrison, F. Friese, John Wiley & Sons, NY.
- (5) Instrumental Methods of Inorganic Analysis: A.I. Vogel, ELBS
- (6) Chemical Instrumentation: A Systematic approach- H.A. Strobel
- (7) The principles of ion-selective electrodes and membrane transport: W.E. Morf




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

MATHEMATICS-601 ANALYSIS II

Subject Code: 253030601

B.Sc. Semester -6

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Student are evaluated on the basis of Mid term examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	-	70	-	100

Objectives

- To provide students the Concept of Riemann integration, Infinite series and Taylor's series, different type of function.
- The aim of this subject is to present the important ideas in advanced calculus using multiple methods to students whose principal interest lies outside the field of mathematics.
- It is a subject which provides a vital arena where students can see the interaction of mathematics and machine computation.

Prerequisites

A Candidate for admission to the Bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.




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Course outline: This Course designed for undergraduate and graduate students working on Riemann integration and Infinite series.

Sr. No.	Course Contents	Teaching hours
1	Unit I Riemann Integration Definition of the integral, Properties of the integral Existence theory (monotone, continuous functions etc. (includes Riemann sums) Fundamental theorem Integration by parts and change of variable, Mean value theorems (Weierstrass's Form and Bonnet's Form) (First and Second)	14
2	Unit: II Infinite series Basic Theory (covers upto comparison test), Series with positive terms (Condensation Test, Pringsheim's Test) Absolute convergence (includes alternating series), ratio and root tests with $\limsup$ And $\liminf$	12
3	Unit: III Infinite Series –II Rearrangement of series, Cauchy Product of Series, Merten's theorem Power Series Improper integrals of the first and second kind.	10
4	Unit: IV Taylor Series Taylor's Theorem with Lagrange and Cauchy form of remainders, Expansions of exponential, logarithmic and trigonometric functions Binomial series theorem Power series solutions of differential equations	10

Learning Outcomes



After Successfully Completion of the Course the student will be

- Student can learn to solve the Riemann Integration, Infinite series and Taylor Series.
- Appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.
- Describe fundamental properties of the real numbers that lead to the formal development of real analysis.
- Comprehend rigorous arguments developing the theory underpinning real analysis.
- Demonstrate an understanding of limits and how they are used in sequences, series, differentiation and integration;
- Construct rigorous mathematical proofs of basic results in real analysis;

Teaching & Learning Methodology

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. E.Kreyszing , Advanced Engineering Mathematics , Fifth edition , New Age International (P) Ltd., New Delhi , 1997.
2. B.S.Grewal, Higher Engineering Mathematics.




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3. Mathematical Analysis by S.C. Malik, Wiley, Eastern Ltd., New Delhi
4. Mathematical Analysis by T.M. Apostol, Narosa Publishing House, New Delhi
5. A course of mathematical Analysis by Shanti Narayan , S.Chand & Co., New Delhi

E-Resources :

- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics.
<https://swayam.gov.in/> and <https://nptel.ac.in/>
- <http://www.freebookcentre.net/maths-books-download/Real-Analysis-Lecture-Notes-by-Itay-Neeman.html>
- <http://www.freebookcentre.net/maths-books-download/Real-Analysis-Notes-by-Manonmaniam-Sundaranar-University.html>
- <http://www.freebookcentre.net/maths-books-download/Real-Analysis-Notes-by-Prof.-Sizwe-Mabizela.html>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

MATHEMATICS-602 ABSTRACT ALGEBRA II

Subject Code: 253030602

B.Sc. Semester -6

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Student are evaluated on the basis of Mid term examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	-	70	-	100

Objectives

- To provide students the Concept of Ring, Subring and its properties, Polynomial Ring and Field.
- The aim of this subject is to present the important ideas in advanced calculus using multiple methods to students whose principal interest lies outside the field of mathematics.
- It is a subject which provides a vital arena where students can see the interaction of mathematics and machine computation.

Prerequisites




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A Candidate for admission to the bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline: This Course designed for undergraduate and graduate students working on Ring and Field. This course serves as an introduction to Ring and Field to Pure mathematics .

Sr. No.	Course Contents	Teaching hours
1	Unit I Rings Definition and examples, commutative ring, division ring, unity and unit elements of a ring, Field, properties of a ring, Boolean ring, Finite rings. Integral Domain: Zero divisor, Definition and examples of Integral Domain (Finite and of infinite order), Characteristic of a ring	14
2	Unit: II Subrings Definition and examples, necessary and sufficient criterion for subring, Ideals: Definition and examples, necessary and sufficient criterion for ideal, principal ideal ring, quotient ring and its operation tables Homomorphism: Definition and some examples, Kernel of homomorphism, Isomorphism of rings, Fundamental theorem on homomorphism, homomorphism and characteristic	12
3	Unit: III Polynomial ring Introduction and definition of polynomial, degree of polynomial, operation between polynomials, Integral domain $D[x]$, different types of polynomials, factorization of polynomials, Division algorithm for polynomials, irreducibility of polynomial over field, Remainder and factor theorem, solution of polynomial equation, zero of polynomial, c , rational zero of polynomial.	10



4	Unit: IV Field Field, Subfield, Extension field, The field of quotients and integral domain, Prime fields, Finite fields, Maximal ideals, Prime ideals and their characterization through quotient ring.	10

Learning Outcomes

After Successfully Completion of the Course the student will be

- Student can understand the concept of Ring , Subring , Polynomial Ring , Field, Factorization of a ring, Homeomorphism and Isomorphism of a ring they can apply different properties on them
- Student able to solve the real word problem by using Ring and Field.
- Students able to solve integration and differentiation of series..
- In Ring .
- Student will understand Field ,integration and differentiation of a series.
- Identify the degree, leading coefficient, and leading term of a polynomial expression

Teaching & Learning Methodology

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs.
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.




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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Abstract Algebra by .Scott M Lalonde.
2. Contemoorary abstract algebra-Joseph A. Gallian(Fourth edition).
3. Abstract Algebra by John Perry.
4. Mathematical Analysis by T.M. Apostol, Narosa Publishing House, New Delhi
5. A course of mathematical Analysis by Shanti Narayan , S.Chand & Co., New Delhi

E-Resources :

- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics.
<https://swayam.gov.in/> and <https://nptel.ac.in/>
- <https://open.umn.edu/opentextbooks/textbooks/217>
- <https://ocw.mit.edu/courses/mathematics/18-703-modern-algebra-spring-2013/lecture-notes/>
- <https://www.freebookcentre.net/maths-books-download/Notes-on-Abstract-Algebra-by-John-Perry.html>

<https://www.freebookcentre.net/maths-books-download/Notes-on-Abstract-Algebra-by-Scott-M.-LaLonde.html>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

MATHEMATICS-603 ANALYSIS III

Subject Code: 253030603

B.Sc. Semester-6

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Student are evaluated on the basis of Mid term examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	-	70	-	100

Objectives

- To provide students the Concept of Matric space, Continuity and connectedness and integration and differentiation of series.
- The aim of this subject is to present the important ideas in Analysis-III using multiple method to student whose principal interest lie outside the field of mathematics.
- It is a subject which provide a vital arena where students can see the interaction of mathematics and machine computation.

Prerequisites

A Candidate for admission to the bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.




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Course outline: This Course designed for undergraduate and graduate students working on Metric Spaces and integration and differentiation of series. This course serves as an introduction to Metric spaces used to Pure mathematics .

Sr. No.	Course Contents	Teaching hours
1	Unit I Metric Spaces Definition and Examples, Open Sets, Closed Sets, Convergence, Completeness and Baire's Theorem.	10
2	Unit: II Continuity, Compactness and Connectedness Compact sets, Connected sets, Continuous functions, Continuity and compactness Continuity and connectedness	10
3	Unit: III Uniform Convergence, Pointwise Convergence Uniform Convergence, Uniform Convergence and Continuity, Uniform Convergence and Differentiation Term by Term Integration of Series, Term by Term Differentiation of Series	12
4	Unit: IV Power series (advanced), Abel's limit theorem, multiplication of power series (Euler's formula), Taylor's series, Weierstrass approximation theorem, exponential, logarithmic and trigonometric functions	12

Learning Outcomes

After Successfully Completion of the Course the student will be

- Demonstrate understanding of the basic concepts, theorems and calculations of Normed, Metric Spaces.




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- Demonstrate understanding of the open-set definition of continuity and its relation to previous notions of continuity, and applications to open or closed sets.
- Demonstrate understanding of the basic concepts, theorems and calculations of the concepts of Compactness, Connectedness and Completeness (CCC).
- Demonstrate understanding of the connections that arise between CCC, their relations under continuous maps, and simple applications.

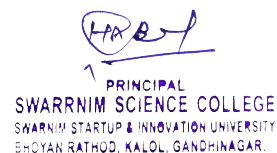
Teaching & Learning Methodology

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. E.Kreyszing , Advanced Engineering Mathematics , Fifth edition , New Age International (P) Ltd., New Delhi , 1997.
2. B.S.Grewal, Higher Engineering Mathematics.
3. Mathematical Analysis by S.C. Malik, Wiley, Eastern Ltd., New Delhi
4. Mathematical Analysis by T.M. Apostol, Narosa Publishing House, New Delhi
5. A course of mathematical Analysis by Shanti Narayan , S.Chand & Co., New Delhi
6. W A Sutherland, *Introduction to Metric and Topological Spaces*, OUP.



7. T Copson, *Metric Spaces*, CUP.
8. W Rudin, *Principles of Mathematical Analysis*, McGraw Hill.

E-Resources :

- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics.
<https://swayam.gov.in/> and <https://nptel.ac.in/>
- https://www.mathcity.org/msc/notes/metric_spaces_notes
- https://msu.edu/~schenke6/Lecture_Notes/921_Lecture_Notes.pdf



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

MATHEMATICS-604 GRAPH THEORY

Subject Code:253030604

B.Sc. Semester-6

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Student are evaluated on the basis of Mid term examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	-	70	-	100

Objectives

- To provide students the Concept of vector Graph, Representation of a graph and Matrix Representation of a graph . .
- The aim of this subject is to present the important ideas in Graph Theory using multiple method to student whose principal interest lie outside the field of mathematics.
- It is a subject which provide a vital arena where students can see the interaction of mathematics and machine computation.

Prerequisites

A Candidate for admission to the bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.




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Course outline: This Course designed for undergraduate and graduate students working on Graph Theory . This course serves as an introduction to Graph and Matric representation of Graph used to applied mathematics problems. .

Sr. No.	Course Contents	Teaching hours
1	Unit I Introduction of Graphs Definition and elementary properties of graphs, Isomorphism of graphs, Sub graphs, Walks, Paths and circuits, Connected graphs, Euler graphs, Operations on graphs, Hamiltonian circuits, Definition and properties of tree.	10
2	Unit: II Graph Representation Centres in a tree, Rooted and Binary tree, Spanning trees, Fundamental circuits, cut set and its properties, Planar graphs and Representation of planar graphs.	12
3	Unit: III Cut set ,connectivity and Seperability Planar graphs and their different representation , Dual of a planar graph ,Euler's formula , Kuratowski's first and second non-planar graph, vector space associated with a graph , Circuit subspace and cut sets subspace Orthogonal space.	12
4	Unit: IV Matrix Representation of a graph Vertex coloring , Chromatic number ,Index number and partition , Cyclic graph and demyelization of cyclic graphs ,Matrix representation of a graph, Adjacency matrix, Incidence matrix, Path matrix circuit matrix ,fundamental circuit matrix and cut set matrix, relationship of these matrices ,rank of the adjacency matrix.	12

Learning Outcomes

After Successfully Completion of the Course the student will be

- Demonstrate knowledge of the syllabus material.




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- Write precise and accurate mathematical definitions of objects in graph theory.
- Use mathematical definitions to identify and construct examples and to distinguish examples from non-examples.
- Validate and critically assess a mathematical proof.
- Use a combination of theoretical knowledge and independent mathematical thinking in creative investigation of.
- Reason from definitions to construct mathematical proofs.
- Write about graph theory in a coherent.

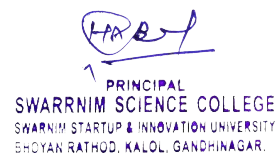
Teaching & Learning Methodology

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Graph theory with application to engineering and computer science by Narsingh Deo.1993, Prentice Hall of India Pvt. Ltd.
2. Foundation of Discrete Mathematics, K.D. Doshi, New Age International Ltd. Publishers.
3. A first look at Graph theory, by Clark.
4. Discrete Mathematics Structures with application to computer science, by Trembly I.P &



Manohar R.

5. Elements of Discrete Mathematics by L.Liu, Me Edition) by L.Liu, Me.
6. Discrete Mathematics, by Vasta, Vikas Publications.
7. Introduction Graph Theory, By R.J.Willson.
8. Discrete Mathematics Structure, By. Dugragi N.

E-Resources :

- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics.
<https://swayam.gov.in/> and <https://nptel.ac.in/>
- <https://cs.bme.hu/fcs/graphtheory.pdf>
- <https://www.geeksforgeeks.org/mathematics-graph-theory-basics-set-1/>
- <http://www.personal.psu.edu/cxg286/Math485.pdf>




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SWARNIM STARTUP & INNOVATION UNIVERSITY

SCHOOL OF SCIENCE

DEPARTMENT OF MATHEMATICS

CODE: 253030605

B.Sc.: SEM 6

Practical's list (practical of paper 601&602)

List of Practical's:

Unit 1

1. Verification of rings, commutative ring and ring with unity. Finite ring and their operation tables.
2. Examples of ideals and integral domain.
3. Examples of finite fields and extension fields.
4. Construction of quotient ring and their operation tables.

Unit 2

1. Find the g.c.d of two given polynomial and express it as a linear combination of these two polynomials.
2. Check the irreducibility of polynomial over the given field
3. Factorization of polynomial and the rational zeros of given polynomial.
4. Examples of maximal and ideals

Unit 3

1. Definition and evaluation of Reimann integral by various methods
2. Verification MVTs and problems based on fundamental theorem of integration
3. Convergence of infinite series of positive terms.
4. Absolute convergence, root and ratio tests using limit inferior and superior

Unit 4

1. Power series, radius of convergence
2. Improper integrals
3. Power series expansion of function
4. Power series solution of differential equation




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SCHOOL OF SCIENCE

DEPARTMENT OF MATHEMATICS

CODE: 253030605

B.Sc.: SEM 6

Practicals list (practical of paper 603&604)

List of Practicals:

Unit 1

1. Metric spaces, examples.
2. Uniform convergence of sequences
3. Uniform convergences of series, term by term differentiation and integration
4. Multiplication of power series.

Unit 2

1. Properties of exponential, logarithmic function
2. Problems based on compact and connected spaces.

Unit 3

1. Using the adjacency matrix, determine whether the given graph is connected or not.
2. Determine whether the given graph is connected or not using fusion algorithm.
3. Find a minimal spanning tree of a given connected weighted graph using krusakal's algorithm.
4. Find a minimal spanning tree of a given connected weighted graph using prim's algorithm.

Unit 4

1. Find the shortest path between vertices of a given graph using breadth first search algorithm.
2. Find shortest path between two vertices of a given connected graph using back – tracking algorithm.
3. Find a shortest path between two vertices of a given connected weighted graph using dijkstra's algorithm
4. Construct an Euler tour in a graph using fleury's algorithm.



SWARRNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

Fermentation Technology-II

CODE: 253040601

B.Sc. 6th Sem

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	-	70	-	100

Objectives:-

- To provide the idea about down streaming process how to get end product in the fermentation. Different methods used for separation of products from fermentation broth.
- Students will get an idea about quality control of the fermented products made using different methods.
- To provide students basic knowledge of Microbial Biotechnology. It covers up general concept of microbial production and fermentation of various products.
- The purpose of the course is to give knowledge about production process using fermentation technology and microorganisms of antibiotics, enzymes, industrial alcohol, organic acids, vitamins, SCP, as well as mushrooms.

Prerequisites:-

Students must have passed 2nd year B.Sc in Microbiology along with basic knowledge of biology




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Course outline:-

Sr. No.	Course Contents	Number of Hours
1.	Downstream processing • Introduction • Removal of microbial cells and suspended solids (A) Foam separation (B) Precipitation (C) Filtration (D) Centrifugation • Cell disruption methods (A) Physico-mechanical methods (B) Chemicals methods • Product concentration and purification (A) Liquid -liquid extraction (B) Membrane processes • Finishing stages (A) Drying (B) Crystallization • Effluent treatment	10
2.	Quality control of fermentation products- • Detection and assay of fermentation products (A) Physical assays: Titration and gravimetric analysis, turbidity and cell yield determination (B) Chemical assay: Chromatography, spectrophotometry (C) Biological assays: Microbial assay • Microbial quality assurance (A) Sterility testing (B) LAL test • Fermentation economics	10
3.	Fermentation production of : • Alcohol • Cheese • Baker's Yeast • Glutamic acid • Citric acid	10
4.	Fermentative production of: • Penicillin and its conversion to semisynthetic derivatives, • Cyanocobalamin • Steroids • Amylase • carotenoids	10



Learning Outcomes:

- To provide the idea about down streaming process how to get end product in the fermentation. What different methods can be used for down streaming process.
- The students will be able to apply the knowledge of the Microbial production to understands concepts of various fields like food and dairy industries, pharmaceutical industries, Fermentation industries, beverages industries, etc.
- Student should be able to understand basic concepts of various products like alcohol, cheese, amino acids like glutamic acid, citric acid fermentation economics.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the theoretical data clearly and concisely that incorporates the stylistic conventions used by Microbiologists, biotechnologist, researchers and scientists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc.) to support key concepts/knowledge. Particularly at the start of a program/module or for



key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. **“Principles of Fermentation Technology**, Stanbury P F, Whitaker A and Hall SJ, (1995) 2nd edition, Pergamon Press, London, UK.
2. **Industrial Microbiology: An Introduction**, Waites, M J and Morgan N L, (2002) Blackwell Science.
3. **Biotechnology: A Textbook of Industrial Microbiology**, Crueger W and Crueger A, (2000) 2nd edition, Panima Publishing Corporation, New Delhi, India.
4. **Fermentation Microbiology and Biotechnology**, El-Mansi E M T, Bryce CFA, Dahhou B, rd Sanchez S, Demain AL, Allman AR (eds), (2011) 3rd edition, CRC Press; Taylor and Francis Group, Boca Raton.
5. **Industrial Microbiology**, Casida LE, Jr. (1968), Wiley Eastern Ltd, New Delhi, India.




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

MEDICAL MICROBIOLOGY

Subject Code: 253040602

B.SC. Semester -6

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	3	3	3	30	-	70	-	100

Objectives

- To provide students the basic knowledge of medical microbiology
- The purpose of the course is to introduce students to Introduction of Normal flora of the human, various disease caused microorganism, antigen antibody interaction, and detail study in various diseases.
- To provide an understanding of the various bacterial disease of like skin, eye, digestive system, nervous system, respiratory system etc.

Prerequisites

Student Must have studied B.Sc. with Microbiology as a major subject and knowledge of basic medical microbiology.

Course outline




PRINCIPAL
SWARNIM SCIENCE COLLEGE
SWARNIM STARTUP & INNOVATION UNIVERSITY
BHOYAN RATHOD, KALOL, GANDHINAGAR.

Unit No.	Course Contents	Teaching hours
1.	Introduction of medical microbiology: - Introduction: Normal microflora of human body, nosocomial infections, carriers, septic shock, septicemia, pathogenicity, virulence factors, toxins, biosafety levels. Morphology, pathogenesis, symptoms, laboratory diagnosis. - Preventive measures and chemotherapy of gram positive bacteria: <i>S.aureus</i>, <i>S.pyogenes</i>, <i>B.anthraxis</i>, <i>C.perferinges</i>, <i>C.tetani</i>, - Basic of Bioethics and biosafety guideline related to Contamination, decontamination, disposal and safety from infectious Sources.	10
2.	Morphology, pathogenesis, symptoms, laboratory diagnosis. preventive measures and chemotherapy caused by gram negative bacteria: <i>E.coli</i>, <i>N. gonorrhoea</i>, <i>N. meningitidis</i>, <i>P.aeruginosa</i>, <i>S. typhi</i>, <i>S. dysenteriae</i>, <i>Y. pestis</i>, <i>B. abortus</i>, <i>H. influenzae</i>, <i>V. cholera</i>.	10
3.	Antigens and Antibody: Antigens: Antigen processing and presentation, properties of antigen, Hapten and the study of antigenicity microbes as antigen, antigen recognition and MHC molecules. Antibodies: Structure and function, clonal selection, antibody diversity, Monoclonal antibodies and its clinical application.	10
4.	Bacterial disease. - Bacterial disease of skin & Eyes. - Bacterial disease of Digestive system. - Bacterial disease of nervous system. - Bacterial disease of Respiratory tract.	10
		40



Learning Outcomes

- The students will be able to understand Normal flora of human body , Bioethics and Biosafety guideline , disease caused microorganism , and many bacterial disease in medical microbiology .
- Student should be able to understand basic concepts of blood cells, Antigen antibody reaction and disease caused bacteria.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, and/or in writing the results of theoretical and laboratory experiments in a clear and concise manner that incorporates the conventions used by Microbiologist worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Prescott, Harley, and Klein's Microbiology, J. M. Willey, L. M. Sherwood, C. J. Woolverton, 7 th Edition (2008), McGraw Hill Higher Education- USA.
- Principles of Microbiology, R. M. Atlas, 2nd Edition (Indian Edition) (2015), McGraw Hill Education (India) Private Limited –New Delhi.
- Baker and Silvertown's Introduction to Medical Laboratory Technology, Baker F J, Silvertown R E, Pallister C J, 7th edition (1998), Butterworths-Heinemann, Oxford, UK.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

IMMUNOLOGY-II

Subject Code: 253040603

B.Sc. Semester -6

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	-	70	-	100

Objectives

- To provide students the ability to fundamentals of immunology, immune system, immune response and immune disorders.
- The purpose of the course is to give students to introduction of complement system, cells and organs of immune system, antigens and antibodies as well as immune reactions.
- To provide an understanding of immunology of transplantation, autoimmunity, autoimmune diseases, etc.

Prerequisites

Student must have studied Second year (SY) of B.Sc. with Microbiology as a major subject and knowledge of basic biology.

Course outline




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Unit No.	Course Contents	Teaching hours
1	Host Defense Mechanisms: - Phagocytosis - Complement - Inflammation - Cytokines - Acute Phase Proteins - Cells, Tissues and Organs of the Immune System.	10
2	Specific Immune Responses: I - Antigens - Hapten - Cluster of Differentiation Molecules - Humoral and Cell Mediated Immunity. Recognition of Foreignness. - T Cell Biology - T Cell receptors - Types of T Cells, T Cell Activation.	10
3	Specific Immune Responses: II - Antibodies - (Immunoglobulins - Definition, Structure and Function, Classes of Immunoglobulins. - Antigen-Antibody Reactions: General Features, Measurement of Antigen and Antibody. - Serological Reactions: Precipitation Reactions, Definition, Mechanism - Lattice Hypothesis. Applications-Precipitation in Liquid Medium. - Agglutination reactions- Definition, Applications-Slide agglutination test, Tube agglutination test, Passive agglutination test. - Primary and Secondary Antibody response. - Diversity of Antibodies - Clonal Selection Theory - Monoclonal Antibody Technology.	10
4	Immune Disorders: - Immuno Deficiency - Hypersensitivity Autoimmunity - Mechanism & Classification of Autoimmune diseases. - Immunology of Transplantation: Classification of - Transplants - Allograft reaction (mechanism) Factors favoring Allograft survival. - Graft v/s Host reaction. I - Immunology of Malignancy.	10




 PRINCIPAL

Learning Outcomes

- The students will be able to apply the knowledge of the immunology, cells and organs of immune system, host defense mechanisms, specific immune responses and immune disorders.
- Student should be able to understand basic concepts of complement system, immune reactions like Ag-Ab reactions, serological reactions, agglutination reactions and also get knowledge about different types of immunity.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the theoretical data and laboratory experiments clearly and concisely that incorporates the stylistic conventions used by microbiologists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

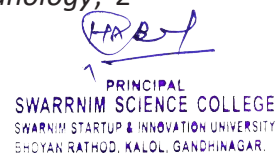
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc.) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Coleman, R.M., Lourbard, M.F and Sicard, R.E., (1992). *Fundamental immunology*, 2nd edition

2. Kuby, J. (1997). *Immunology*, W.H Freeman and co., New York.

3. I.M. (1988). *Essential of Immunology*, Black Well Scientific Publishers.



SWARNIM STARTUP & INNOVATION UNIVERSITY
SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

Environmental Microbiology

Subject Code: 253040604

B.Sc. Semester- 6

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	-	70	-	100

Objectives:-

- To provide basic knowledge of microbes in environment.
- The main goal is to know and understand the role of microbes in biogeochemical processes in different ecosystems. The students will learn the basic microbiological principles, the methods in microbial ecology and their theoretical and practical use.
- The knowledge can give the base for understanding processes and changes in the environment.
- The students can get some skills to recognise the ecological problems and critical evaluation of the human impacts on pollution, climate changes and as well as environmental protection.
- The lectures will be implemented with individual practical work in the laboratory and presentations of the seminars.
- The students can get general competences in microbial ecology.

Prerequisites:-

- Student must have studied 2years B.Sc. with microbiology/Biotechnology as a major subject and knowledge of basic microbiology.

Course outline:-




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Unit No.	Course Contents	Teaching Hours
1.	Nitrogen fixation - Symbiotic & asymbiotic nitrogen fixation. - Nitrogenase- Structure & mechanism. - Biofertilizers- Definition, Azotobacter & Rhizobia (With Production) - Microbial insecticides.	10
2.	Biodeterioration & Bioremediation - Biodeterioration of wood, paint & metal. - Bioremediation-introduction. - Bioremediation of petroleum hydrocarbon & chlorinated compounds. - Microbial enhanced oil recovery..	10
3.	Concept of xenobiotics & recalcitrance. - Biomagnification. - Biodegradation of environmental pollutants.(ABS, Chlorinated hydrocarbons, Oil pollutants.) - Biodegradable polymers.	10
4.	Introduction to biofuels. - Renewable & nonrenewable energy resources. - Biofuels: types (a) Biogas - substrate, microorganisms & production. - Advantages & disadvantages of Biogas production. (b) Hydrogen (c) alcohol	10
		40



Learning Outcomes:

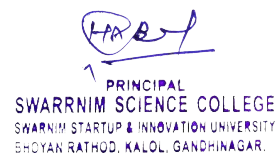
- At the end of the course the student would have basic knowledge of microbiology techniques and bacteria.
- Students will get the basic knowledge how to prepare and perform sampling and microbial analyses to determine the abundance, growth rate and microbial community composition together with the basic environmental parameters.
- The knowledge can be used to prevent infections and to protect human and environmental health.
- Students will get basic knowledge to determine the role of microbes:
 - in different habitats,
 - in different biogeochemical cycles,
 - to determine their role in nutrient cycling
 - to determine water quality,
 - in degradation of natural organic compounds and selected pollutants in the environment.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

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- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.



Books Recommended

- RM Atlas *Principles of Microbiology*
- Prescott LM *Microbiology*
- BD Singh. (2003) *Fundamentals of genetics.*
- HK Das. (2004) *Textbook of biotechnology*




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SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

Mathematical Physics, Quantum & Classical Mechanics-2

Subject Code: 253050601

B.Sc. Semester 6

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	50	50	-	150

Objectives

Develop a solid grasp of core concepts and applications of differential equation, 2nd order differential equation, classical mechanics and quantum mechanics. They learn how physics and other disciplines have impacted and continue to impact each other and society

They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites

Basics of calculus and basic Quantum Mechanics




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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Some special functions in Physics Bessel functions, Bessel functions of the second kind, Henkel functions, Spherical Bessel functions, Legendre polynomials, Associated Legendre polynomials and spherical harmonics, Hermite polynomials, Laguerre polynomials, The gamma function, the Dirac delta function, examples.	14
2	Variational principle Lagrange's and Hamilton's equations : Introduction, Configuration space, Some techniques of calculus of variation, the delta-notation, Applications of the variational principle, Hamilton's principle, Equivalence of Lagrange's and Newton's equations, Advantages of the Lagrangian formulation -Electromechanical analogies, Lagrange's undetermined multipliers, Lagrange's equation for non-holonomic systems, Applications of the Lagrangian method of undetermined multipliers, Hamilton's equations of motion, some applications of the Hamiltonian formulation, Phase space, Comments on the Hamiltonian formulation.	14
3	Three dimensional square well potential Solutions in interior region, Solutions in the exterior Region and Matching, Solution of the radial Equation: energy levels, Stationary state wave functions, Discussion of bound states, Solution of confluent hypergeometric functions, non localized states, solution in parabolic coordinates, the anisotropic oscillator, the isotropic oscillator, normal modes of coupled systems of particles, a charged particle in a uniform magnetic field	14
4	Representations, Transformations and Symmetries Quantum states, state vectors and wave function, The Hilbert space of state vectors, Dirac notation, Dynamical variables and linear operators, Representations, Continuous basis - The Schrödinger representation, Degeneracy, Labeling by commuting observable, change of basis, Unitary transformations, Unitary transformation induced by change of coordinate system: translation, Unitary transformation induced by Rotation of coordinate system, The algebra of Rotation generators, transformation of dynamical variables, Symmetries and conservation laws, the space inversion, time reversal.	14



Learning Outcomes

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

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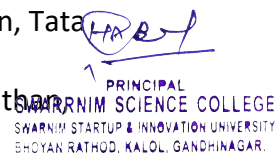
Books Recommended

- Mathematical Physics by P.K. Chattopadhyay, New Age International Publishers (2006)
- Mathematical Methods for Physicists by G. Arfken, Academic Press
- Introduction to Classical Mechanics by R. G. Takawale and P. S. Puranik, Tata McGraw-Hill Publishing Co. Ltd.
- Classical Mechanics by A. B. Bhatia, Narosa Publication
- A Text Book of Quantum Mechanics by P. M. Mathews and K. Venketeshan, Tata

McGraw-Hill Publishing Co. Ltd.

Quantum Mechanics : Theory and Applications by A. Ghatak and S. Lokanathan

Macmillan India Limited



E-Resources

- The Flying Circus of Physics 2nd edition by Jearl Walker, Wiley India
- Six Ideas that shaped physics by Thomas A Moore, McGraw Hill education
- <http://www.howstuffworks.com/> -- Tech stuff
- How things works by Louis A Bloomfeild, Wiley Publications
- Physics of Everyday Phenomena by W. Thomas Griffith, Juliet Brosing, McGraw Hill Education
- Latest journals like BBC Knowledge, How things work-everyday technology explained by National Geographics.
- <http://www.sciencefairadventure.com/>




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SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

Electronic Spectra-2, Solid State Physics & Stat. Mech-2

Subject Code: 253050602

B.Sc. Semester 6

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	50	50	-	150

Objectives: -

Physics students will:

- Develop a solid grasp of core concepts and applications of differential equation, 2nd order differential equation, classical mechanics and quantum mechanics. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites

Basics of Spectroscopy Properties of solids.




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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Electronic Spectra Electronic Spectra, salient features, formation of electronic spectra, Vibrational (Gross) structure of electronic band system in emission, electronic band spectra in absorption, Rotational structure of electronic bands; Rotational structure of three branch bands; observed intensity distribution (vibrational) in band systems : Franck-Condon principle; explanation of intensity distribution in absorption bands from Franck-Condon principle. Explanation of intensity distribution in emission bands : Condon parabola. Line intensities in a band: Rotational intensity distribution. Quantum mechanical Exploring Franck-Condon principle.	14
2	Transport Phenomena Introduction, Mean collision time, Scattering cross-section, viscosity, electrical conductivity, thermal conductivity, thermionic emission, photoelectric effect, molecular collision, effusion, diffusion, Brownian motion, Einstein's relation for mobility	12
3	Theory of Dielectrics Polarization, Dielectric constant, Local Electric field, Dielectric polarizability, Sources of polarizability, theory of electric polarizability and optical absorption, ionic polarization, polarization from dipole orientation, dielectric losses, Applications to optical phonon modes in ionic crystals, the longitudinal optical mode, the transverse optical mode, the interaction of electromagnetic waves with optical modes, application to the motion of electrons in polar crystals.	14
4	Diamagnetism and paramagnetism Langevin's theory of diamagnetism, Langevin's theory of paramagnetism, theory of atomic magnetic moment, Hund's Rule, Quantum theory of magnetic susceptibility: A quantum mechanical formulation, Diamagnetism, Paramagnetism, application to magnetic ions in solids: effect of the crystal field, van Vleck paramagnetism, Pauli paramagnetism, Nuclear paramagnetism, Cooling by adiabatic demagnetization, magnetic resonance, ESR, NMR, Spin relaxation, line width and line shape	14



Learning Outcomes

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

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Books Recommended:

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- Mathematical Methods for Physicists by G. Arfken, Academic Press
- Introduction to Classical Mechanics by R. G. Takawale and P. S. Puranik, Tata McGraw-Hill Publishing Co. Ltd.
- Classical Mechanics by A. B. Bhatia, Narosa Publication
- A Text Book of Quantum Mechanics by P. M. Mathews and K. Venketeshan, Tata McGraw-Hill Publishing Co. Ltd.
- Quantum Mechanics : Theory and Applications by A. Ghatak and S. Lokanathan, Macmillan India Limited



E-Resources:

- The Flying Circus of Physics 2nd edition by Jearl Walker, Wiley India
- Six Ideas that shaped physics by Thomas A Moore, McGraw Hill education
- <http://www.howstuffworks.com/> -- Tech stuff
- How things works by Louis A Bloomfeild, Wiley Publications
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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

Nuclear physics-2 &

Electrodynamics-2

Subject Code: 253050603

B.Sc. Semester 6

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	50	50	-	150

Objectives

- Develop a solid grasp of core concepts and applications of differential equation, 2nd order differential equation, classical mechanics and quantum mechanics. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites

Basics of Elctrodynamics and Nuclear Physics.




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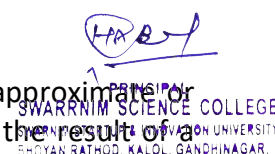
Course outline

Sr. No.	Course Contents	Teaching Hours
1	Motion of charged particles in Magnetic & Electric field: Microscopic & Macroscopic description, Maxwell's equation & charge conservation, Motion of a charged particle in electric & Magnetic fields , Uniform magnetic field & Oscillating electric field, Drift velocity in a gravitational field, Magnetic field varying in space & time : adiabatic variance of the magnetic moment, Inhomogeneous magnetic field : gradient drift & curvature drift, peculiarity of drift motions, Converging magnetic field : magnetic mirror, Longitudinal adiabatic invariant, Periodic magnetic field : Gyro relaxation effect, Motion of magnetic lines of force.	14
2	Characteristics of plasma in magnetic field: Description of plasma as gas mixture, Properties of plasma in a magnetic field, Force on plasma in magnetic field, Current in magnetized plasma, Diffusion in a magnetic field, Collisions in fully ionized magnetoplasma, Pinch effect, Oscillations and waves in the Plasma. Application of Boltzmann-Vlasov equation on plasma: Boltzmann equation , Fokker-Planck equation, Debye screening, Equilibrium distribution function and Boltzmann's H-theorem, Application of B-V equation to longitudinal waves: Dispersion relations. , Initial value problem: Landau damping, Cyclotron damping, Excitation, two-stream instability: Beam plasma instability, Pinch instability, Plasma sheath, Non-linear effects	14
3	Nuclear Energy Introduction, Neutron induced fission, Asymmetrical fission - mass yield, Emission of delayed neutrons by fission fragments , Energy released in the fission of U235 , Fission of lighter nuclei, Fission chain reaction, neutron cycle in a thermal nuclear reactor, Nuclear reactors.	12
4	Nuclear Physics in other areas of Physics The Mossbaur effect, some experiments using Mossbaur effect, Natural Fusion - energy production in stars, Possibility of controlled fusion. Elementary particles: The four basic forces, Particles and antiparticles, Families of particles, conservation laws , particle interactions and decays , energetics of particle reactions, the quark model, the standard model, Numerical Examples.	12

Learning Outcomes:



Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.



- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology

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- How things works by Louis A Bloomfeild, Wiley Publications
- Physics of Everyday Phenomena by W. Thomas Griffith, Juliet Brosing, McGraw Hill Education



Latest journals like BBC Knowledge, How things work-everyday technology explained by National Geographics.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

Linear Electronic Circuits-2

Subject Code: 253050604

B.Sc. Semester 6

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	50	50	-	150

Objectives: -

Physics students will:

- Develop a solid grasp of core concepts and applications of differential equation, 2nd order differential equation, classical mechanics and quantum mechanics. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites

Basics of Electronic circuits and digital electronics.




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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Negative Feedback in transistor amplifier General theory of feedback, reasons for negative feedback, loop gain, types of negative feedback in transistor circuits, Transistor Oscillators: Introduction, Effect of positive feedback, requirements for oscillations, the phase shift oscillator, Wien bridge oscillator, LC oscillators, Colpitts and Hartley oscillators with analysis	14
2	Field effect transistor amplifier: Advantages and disadvantages of the FET, Basic construction of the JFET, Characteristics curve of the JFET, Principle of operation of the JFET, Effect of the VDS on channel conductivity, Channel ohmic region and pinch off region. Characteristics parameters of the FET, Common source AC amplifier Operational Amplifier: The basic operational amplifier, the differential amplifier, offset error voltages and currents, the basic operational amplifier application,	14
3	Arithmetic circuits : Binary addition binary subtraction, unsigned binary number, sign magnitude numbers, 2's complement representation, 2's complement arithmetic building blocks the adder - subtractor, binary multiplication and division, Digital comparator, decoder, demultiplexer, data selector, encoder.	14
4	Regulated Power Supply: Introduction, stabilization, limitations of Zener diode regulator, Transistor series voltage regulator, transistor shunt voltage regulator, a series regulator with two transistors, current regulator Electronic Instruments : Cathode ray oscilloscope: CRO, CRT, electron gun, deflecting plates, screen, methods of focusing, deflection systems, mathematical expression for electrostatic deflection sensitivity, electromagnetic deflection system, magnetic deflection in CRT, Time base (without circuits), CRO Parts, operation of a typical oscilloscope control, uses of CRO.	14

Learning Outcomes

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.



Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Mathematical Physics by P.K. Chattopadhyay, New Age International Publishers (2006)
- Mathematical Methods for Physicists by G. Arfken, Academic Press
- Introduction to Classical Mechanics by R. G. Takawale and P. S. Puranik, Tata McGraw-Hill Publishing Co. Ltd.
- Classical Mechanics by A. B. Bhatia, Narosa Publication
- A Text Book of Quantum Mechanics by P. M. Mathews and K. Venketeshan, Tata McGraw-Hill Publishing Co. Ltd.
- Quantum Mechanics : Theory and Applications by A. Ghatak and S. Lokanathan, Macmillan India Limited

E-Resources

- The Flying Circus of Physics 2nd edition by Jearl Walker, Wiley India
- Six Ideas that shaped physics by Thomas A Moore, McGraw Hill education
- <http://www.howstuffworks.com/> -- Tech stuff
- How things works by Louis A Bloomfeild, Wiley Publications
- Physics of Everyday Phenomena by W. Thomas Griffith, Juliet Brosing, McGraw Hill Education
- Latest journals like BBC Knowledge, How things work-everyday technology explained by National Geographics.
- <http://www.sciencefairadventure.com/>



SWARNIM STARTUP & INNOVATION UNIVERSITY (SSIU)

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

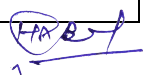
PHYSICS

B.Sc. Semester 6

Practical list

Sr. No.	Practical Name
1	Acceleration due to gravity by Kater's pendulum (variable knife edge)
2	e/k by power transistor.
3	Rubber tubing.
4	Susceptibility of ferromagnetic substance by Quink's method (Magnetic fluid).
5	To find the value of permeability of free space
6	Michelson interferometer - To determine "d"
7	To calibrate the spectrometer using Edser-Butler plate.
8	Absorption spectrum of Iodine molecule
9	To determine the charge on electron by Millikan's experiment.
10	Determination of dead time of G.M. tube. Comparison of relative intensities of different sources using G.M. Tube
11	OPAMP Applications: Adder and Subtractor.
12	Heaviside mutual inductance bridge.
13	Self-inductance of a coil by Rayleigh's method.
14	Use of Excel for data analysis and graph plotting.
15	Study of voltage regulated circuit using IC7805
16	Half adder, Full adder and subtractor using IC 7483.
17	Frequency response of a common source FET amplifier.
18	Colpitts oscillator.
19	Negative feedback amplifier using transistor.
20	Nibble Multiplexer and 8:1 Multiplexer




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF SCIENCE

ENVIRONMENT CONSERVATION & HAZARD MANAGEMENT

CODE: 253000603

SEMESTER 1

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	50	70	-	150

Objectives: - To provide a comprehensive knowledge for awareness of environment conservation and hazard management.

Prerequisites:- Environment Conservation & Hazard Management

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Ecology and Environment	6
2	Solar power	10
3	Seismic engineering and disaster management	6
4	Sustainable development	8

Learning Outcomes:- At the closing stage of the course, the students will be able to understand the importance of environment conservation and the concepts of hazard management.

Teaching & Learning Methodology:- The Syllabus for Environmental Studies includes classroom teaching. The syllabus is divided into four units covering 30 lectures. The units are classroom teaching based to enhance knowledge skilled and attitude to environment.




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Books Recommended:

1. R. R. Mahitcha – “Environment Conservation and Hazard Management”, Atul Prakashan.
2. Solanki and Chetan Singh – “Renewable Energy Technologies”, PHI Learning.
3. Izrael Y.A. – “Ecology and Control of the Natural Environment”, Kluwer Academic Publisher.
4. Sharma, Sanjay K. – “Environment Engineering and Disaster Management”, Laxmi Publications.
5. Earnest, Joshua and Wizelius, Tore – “Wind Power Plants and Project Development, PHI Learning.
6. Anandita Basak – “Environmental Studies”, Pearson Publication.
7. K. S. Valadia – “Coping with Natural Hazards Indian Context”, Orient Longman Publication.
8. Edward S. Rubin – “Engineering and Environment”, McGraw Hill Publication

SYLLABUS

Unit-1

Ecology and Environment: Importance of environment and scope, Engineering and Environment issues, The natural system, Biotic and Biotic components and processes of natural system, Eco system, Food chain, webs and other biological Systems, Causes of environmental pollution, Pollution due to solid waste, Water pollution, Air pollution, The noise as pollution, Pollution of land due to industrial and chemical waste, Radiation and its effects on vegetables and animals

Unit-2

Solar power: Features of solar thermal and PV systems, Types of solar cookers and solar water heaters, Solar PV systems and its components and their working, Types of solar PV cells, Rating and Costing.

Unit-3

Seismic engineering and disaster management: Introduction of Seismic engineering and its application, Features of disasters such as floods, Earthquakes, Fires, Epidemics, Gas/radioactive leaks etc., Management and Mitigation of disasters.

Unit-4

Sustainable development: Concept of sustainable development, Natural resources, Abiotic and Biotic resources, Principles of conservation of energy and management, Need of renewable energy, Growth of renewable energy in India and the world, Concept of waste management and recycling.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Functional Analysis

Subject Code: 256050301

M.Sc. Semester - 3

Teaching & Evaluation Scheme

This program leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding of the fundamental and advanced content in Mathematics which will be determined by his /her particular choice of courses, according to his/her particular needs and interests.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives :

When one has completed this degree he / she will be able to demonstrate the following skills:

- To be familiar with Normed Space, Banach Space, Inner Product Space and Hilbert Space.
- Study Riesz representation theorem as an application.
- To be familiar with operators.

Prerequisites :

A Candidate for admission to the Master of Science (Mathematics) must have a 10+2 Science and Bachelor degree with mathematics Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline: The objective of this course is to provide knowledge of Introduction to Normed and Banach Space, Some Theorems on Normed and Banach Space, Introduction to Inner Product Space and Hilbert Space, Operators .




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Sr.No.	Course Contents	Teaching hours
1	Unit 1 Introduction to Normed and Banach Space: Normed linear spaces , Banach spaces and examples, Quotient space of normed linear spaces and its completeness, Bounded linear transformations, normed linear spaces of bounded linear transformations.	12
2	Unit 2 Some Theorems on Normed and Banach Space: Hahn Banach theorem, dual spaces with examples, second conjugate space. Open mapping theorem and closed graph theorems.	10
3	Unit 3 Introduction to Inner Product Space and Hilbert Space: Definitions examples and properties of Inner-Product space and Hilbert spaces, Orthogonal complements, Orthonormal sets in a Hilbert space, Bessel's inequality.	12
4	Unit 4 Operators: Conjugate space, Riesz representation theorem, Operators on Hilbert space, Adjoint of an operator, Self-adjoint operator, Normal and unitary operators.	12

Learning Outcomes :

On successful completion of the course, students should be able to

- Familiar with Normed Space, Banach Space, Inner Product Space and Hilbert Space.
- Able to define / give a Norm or Inner product to certain space.
- Able to study some applications of Banach Space and Hilbert Space.

Teaching & Learning Methodology :

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Mathematical Modeling

Subject Code: 256050302

M.Sc. Semester -3

Teaching & Evaluation Scheme

This program leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding of the fundamental and advanced content in Mathematics which will be determined by his /her particular choice of courses, according to his/her particular needs and interests.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives :

The objective of this subject is :

- When one has completed this degree he / she will be able to demonstrate the following skills:
- The overall objective of this course is to provide an introduction to the process of mathematical modeling while giving students an opportunity to develop and construct appropriate models for various problem situations.
- Analyze given models to uncover underlying assumptions.
- Investigate particular problems to find out what has already been done toward developing solutions.

Prerequisites :

A Candidate for admission to the Master of Science (Mathematics) must have a 10+2 Science and Bachelor degree with mathematics Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.




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Course outline: The objective of this course is to provide knowledge of Two species population models and Epidemic and other type of modeling .

Sr.No.	Course Contents	Teaching hours
1	Unit 1 Introduction : Introduction to the subject its scope and limitation, Classification of models, Techniques of mathematical modeling, Characteristics of mathematical modeling, Dimensional homogeneity, An arithmetic model of gravity, Simple population growth model, Logistic population growth model, Decreasing of temperature model, Diffusion model, Compartment model.	14
2	Unit 2 Two species population models: Prey predator model for population dynamics, Geometric interpretation and stability of Prey predator model, Competition model, Epidemic models: SI model, SIS model, ISI Model, Epidemic model with removal .	10
3	Unit 3 Biological Models: Diffusion of glucose in the blood stream, Genetics model, Hardy Weinberg law and ratio for genetics, Genetics model for blood group, Richardson's model for arms race. Business model, EOQ model, Even price adjustment model.	12
4	Unit 4 Traffic models: Macroscopic Highway traffic model, Microscopic Highway traffic model: Linear car following model, Non-Linear car following model, To find out stopping distance of a car.	10

Learning Outcomes :

On successful completion of the course, students should be able to

Students learn to use the modeling process to translate problem situations to mathematical expressions,

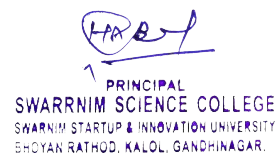
Use a variety of mathematical resources and tools to study problem situations.

Use appropriate technology to assist in the problem-solving process.

Take an analytical approach to problems in their future endeavors .

Teaching & Learning Methodology :

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:



- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. □ J. N. Kapur, Mathematical Modeling, Wiley Eastern Ltd., 1988.
2. □ J. N. Kapur, Mathematical Models in Biology and Medicine, East West press Pvt Ltd., 1992 .
3. □ Braum, Colemem & Drew, Differential Equation Models, Springer Verlag, 1983.
4. □ Martin Braun, Differential Equation and their application, Springer Verlag, 1977.
5. Dym & Lvey, Principles of Mathematics Modeling, Academic Press - 1980.
6. □ Haberman, Mathematical Model, Prentice- Hall Inc., 1977.
7. Bhupendra Sinh and Neenu Aggarwal, Bio Mathematics, Krishna Prakashan.

E-Resources

- cims.nyu.edu/~cfgranda/pages/OBDA_fall17/notes...
- www.sxccal.edu/mathematics-lecture-notes
- <https://users.math.msu.edu/users/gnagy/teaching/la.pdf>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Partial Differential Equation

Subject Code: 256050303

M.Sc. Semester - 3

Teaching & Evaluation Scheme

This program leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding of the fundamental and advanced content in Mathematics which will be determined by his /her particular choice of courses, according to his/her particular needs and interests.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives :

When one has completed this degree he / she will be able to demonstrate the following skills:

- To understand the concept of second order partial differential equations.
- Introductions to boundary value problems.

Prerequisites :

A Candidate for admission to the Master of Science (Mathematics) must have a 10+2 Science and Bachelor degree with mathematics Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline: The objective of this course is to provide knowledge of Second order differential equation and boundary problem .




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Sr. No.	Course Contents	Teaching hours
1	Unit 1 Introduction : Origin of second order partial differential equations, linear second order partial differential equations with constant coefficients, solutions for $f(x; y)$ to be polynomial, exponential, Sin/Cos functions, general method for homogeneous equations.	10
2	Unit 2 Classification of second ordered partial differential equations: Classification of second order partial differential equations and canonical form. Non-linear second order partial differential equations, Solution by Monge's method, Special case and General case.	12
3	Unit 3 Second order partial differential equations with variable coefficients: Second order partial differential equations with variable coefficients, method of changing variables for special type of equations. Separation of variable Method: Solution of three special equations – Laplace, Wave and Diffusion equation, Solution of these equations in different coordinate systems.	12
4	Unit 4 Boundary value problems: Dirichlet boundary value problems, Neumann boundary value problems, Maximum and minimum principles, Harnack's theorem, Green's function.	12

Learning Outcomes :

On successful completion of the course, students will be able to :

- Recognize some standard types of partial differential equations.
- Know the techniques for solving second order partial differential equations.
- Identify and solve Dirichlet boundary value problems and Neumann boundary value problems .

Teaching & Learning Methodology :

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:




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- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Differential Equations, JPH Pub., J.L. Bansal , H.S. Dhami
2. Elementary Course in Partial Differential Equations, Amarnath, T., Narosa Publ. House, New Delhi, 1997.
3. Elements of Partial Differential Equations, Sneddon, I. N., McGraw- Hill Publ. Co., 1957.
4. Higher Engineering Mathematics, Grewal, B. S. and Grewal, J. S., (36th Edition), Khanna Publ., New Delhi, 2000.
5. Advanced Differential Equations, Raisinghania, M. D., S. Chand & Co., 1995.
6. Partial Differential Equations, Phoolan Prasad and Ravindran, R., Wiley Eastern.

E-Resources

- cims.nyu.edu/~cfgranda/pages/OBDA_fall17/notes...
- www.sxccal.edu/mathematics-lecture-notes
- <https://users.math.msu.edu/users/gnagy/teaching/la.pdf>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

TOPOLOGY – I

Subject Code: 256050304

M.Sc. Semester -3

Teaching & Evaluation Scheme

This program leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding of the fundamental and advanced content in Mathematics which will be determined by his /her particular choice of courses, according to his/her particular needs and interests.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives :

The objective of this course is

- This course aims to teach the fundamentals of point set topology and constitute an awareness of need for the topology in Mathematics.

Prerequisites :

A Candidate for admission to the Master of Science (Mathematics) must have a 10+2 Science and Bachelor degree with mathematics Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility .

Course outline: The objective of the course is to introduce some Topological space , Continuous function , Connectedness , Compactness that appear in different areas of Topology .




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Sr. No.	Course Contents	Teaching hours
1	Unit – 1 Topological Spaces: Topological spaces, Basis and sub basis for a topology, The order topology, Subspace topology, Closed set, Limit points.	10
2	Unit – 2 Continuous Functions: Continuous functions, Homeomorphisms, The pasting lemma, Map into products, The metric topology, The sequence lemma, Uniform limit theorem, The quotient topology.	12
3	Unit – 3 Connectedness: Connected spaces, Path connected spaces, Connected sets in the real line, Components and path components, Locally connected spaces and path connected spaces.	12
3	Unit – 4 Compactness: Compact spaces, Compact sets in the real line, Limit point compactness, Locally compact spaces, One point compactification.	12

Learning Outcome :

On successful completion of the course, students should be able to

Student will be able to define topology and its construction

Student will be able to distinguish open and closed subset.

Student will be able to construct closure, interior and boundary of a set

Students will be able to identify given space is connected or not.

Students will be able to identify given space is compact or not.

Teaching & Learning Methodology :

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.




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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. unkres, Topology, Prentice Hall of India, 2nd edition, 2011.
2. Simmons G. F., Introduction to Topology and Modern Analysis, McGraw-Hill Co., Tokyo, 1963.
3. Willards, S., General Topology, Addison-Wesley, Reading, 1970.
4. J. N. Sharma, J. P. Chauhan, Topology, Krishna Prakashan Media (P) Ltd., 43rd edition, 2013.
5. J. Dugundji, Topology, Prentice- Hall of India, 1975.
6. C. O Christonson and W. I Voxman, Aspects of Topology, Marcel-Dekker Inc 1977.
7. J. L. Kelley, D. Van Nostrand, General Topology, 1950.

E-Resources

- cims.nyu.edu/~cfgranda/pages/OBDA_fall17/notes...
- www.sxccal.edu/mathematics-lecture-notes.
- <https://users.math.msu.edu/users/gnagy/teaching/1a.pdf>



**SWARNIM STARTUP & INNOVATION UNIVERSITY
SWARNIM SCIENCE COLLEGE**

**DEPARTMENT OF MATHEMATICS
MATHEMATICAL PRACTICALS**

Subject Code: 256050305

M.Sc. Semester -3

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Student are evaluated on the basis of Mid term examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
-	12	-	12	8	-	200	-	-	200

Learning Objectives:

- To understand basic concepts of complex analysis
- To understand the concept of Variational problems with fixed and moving boundaries.
- Give introductory idea of integral equation
- To understand Fredholm integral equation and its solution.
- To develop basic concepts of research methodology
- To understand basic concepts of topology
- Give idea of basic inventory control models
- Develop the knowledge of queuing theory
- Formulate and solve different replacement and maintenance models
- Study sequencing techniques.

Outline of the Course:




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This course contains only problem solving sessions

Sr. No	Topics
	Compulsory Subjects
1.	Examples on topological spaces.
2.	Examples on Mathematical modeling
3.	Examples on hypothesis testing.
4.	Examples on continuous functions.
5.	Examples on connectedness.
6.	Examples on compactness.
7.	Examples on deterministic inventory control models
8.	Examples on queuing theory
9.	Examples on replacement and maintenance models
10.	Examples on sequencing problems

Learning Outcome :

On successful completion of the course, students should be able to

- Understand the meaning of inventory control as well as various forms and functional role of inventory.
- Calculate EOQ for minimizing for minimizing total inventory cost.
- Identify and examine situations that generate queuing problems
- Understand various components of a queuing system and description of each of them
- Make distinction between several queuing models and derive performance measure for each of them.

Teaching & Learning Methodology :

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.



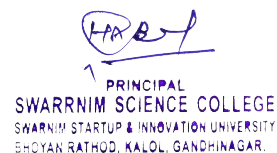

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Books Recommended

1. John Duncan, The Elements of Complex Analysis, John Wiley and Sons Ltd. London (1968).
2. J B Conway, Functions of one complex variables, 2nd edition, Springer Verlag, New York (1967) [Indian edition: Narosa Publication House, New Delhi (1982)].
3. Dr. Shailesh S. Patel, Dr. Narendra B. Desai, Complex Analysis and Numerical Techniques, Volume IV, Atul Prakashan
4. J. N. Kapur, Mathematical Modeling, Wiley Eastern Ltd., 1988.
5. J. N. Kapur, Mathematical Models in Biology and Medicine, East West press Pvt Ltd., 1992
6. Braum, Colemem & Drew. Differential Equation Models, Springer Verlag, 1983.
7. Martin Braun, Differential Equation and their application, Springer Verlag, 1977.
8. Dym & Lvey, Principles of Mathematics Modeling, Academic Press- 1980.
9. Haberman, Mathematical Model, Prentice- Hall Inc., 1977.
10. Bhupendra Sinh and Neenu Agrwal, Bio Mathematics, Krishna Prakashan.
11. How to write and publish a scientific paper by Day, R. A
12. Guide to write scientific papers by Garson, G. D.
13. Developing Bioinformatics computer skill by Gibas.
14. Instrumental methods of analysis by D. A Skoog.
15. J. R. Munkres, Topology, Prentice Hall of India, 2nd edition, 2011.
16. J. N. Sharma, J. P. Chauhan, Topology, Krishna Prakashan Media (P) Ltd., 43rd edition, 2013.
17. J. K. Sharma, "Operation Research- Theory and Application", 4th Edition, Macmillian Publishers India Ltd.

E-Resources

- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics.
<https://swayam.gov.in/> and <https://nptel.ac.in/>
- cims.nyu.edu/~cfgranda/pages/OBDA_fall17/notes...
- www.sxccal.edu/mathematics-lecture-notes.
- <https://users.math.msu.edu/users/gnagy/teaching/la.pdf>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

M.Sc. Semester -3

PAPER-1: Advanced Quantum Mechanics-I, Nuclear Physics-I and Instrumentation

Subject Code: 256040301

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- To provide basics of nuclear physics that involves the nuclear forces and formation of universe.
- The purpose of the course is to introduce students to understand the various quantum mechanical phenomena and to develop skills for solving problems in the same.
- To provide an understanding the various transducers and related instruments that are used in research as well as in the industry level.

Prerequisites

Student Must have studied B.Sc. with physics as a major subject and knowledge of basic mathematics.



Course outline


PRINCIPAL
SWARNIM SCIENCE COLLEGE
SWARNIM STARTUP & INNOVATION UNIVERSITY
BHOYAN RATHOD, KALOL, GANDHINAGAR.

Sr. No.	Course Contents	Teaching hours
1	Scattering theory: Kinematics of the scattering process: differential and total cross sections elastic and inelastic scattering, wave mechanical picture of scattering: the scattering amplitude, Green's functions: formal expression for scattering amplitude. The Born approximation, validity of the Born approximation, The Born series, The Eikonal approximation, Asymptotic behavior of partial waves: phase shifts, the scattering amplitude in terms of phase shift, the differential and total cross sections: optical theorem, Phase shifts: Relation to the potential, Potentials of finite range, Low energy scattering, scattering by a square well potential, scattering by a hard sphere, scattering by a coulomb potential, Complex potential and absorption.	14
2	Nuclear Properties Nuclear spin, electric moments, magnetic moments, a brief description of hyperfine structure of atomic spectra, effect of an external magnetic field on the hyperfine structure, determination of I from molecular band spectra, molecular beam resonance method – experiments on hydrogen and deuterium.	14
3	Two-body forces Deuteron: Excited states of the deuteron, neutron proton scattering at low energies, scattering length, spin dependence of neutron proton scattering, singlet state in n-p system, effective range theory in np scattering, tensor forces, magnetic moment and electric quadrupole moment of the deuteron, proton proton scattering at low energy, exchange forces, meson theory of nuclear forces.	14
4	Transducers, Measurement and control Transducers: Desired characteristics of transducer, Different transducers: Temperature, Capacitive, Magnetic field, LVDT, Optical, Piezoelectric, Pyrometer. Measurement and control: Types of noises in electrical systems, Signal to noise ratio, Enhancement of signal to noise ratio, Signal conditioning and recovery, Impedance matching, filtering and noise reduction, shielding and grounding, Phase sensitive detector and lock-in amplifier.	14



Learning Outcomes

The students will be able to understand the aspects of the quantum mechanical

phenomena in apply the mathematical skills to solve quantitative problems in the study of physics and enable to apply integral transform to solve mathematical problems of interest in physics.

- Student should be able to understand basic concepts of Quantum Mechanics, Postulates of Quantum Mechanics, Mathematical foundations of Quantum Mechanics, Schrödinger equation, Symmetries in Quantum Mechanics, Approximation methods and students should be able to Solve one dimensional Schrödinger equations, Solve Schrödinger equations for central potentials. Use time-independent perturbation theory, Use time-dependent perturbation theory.
- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.



Books Recommended


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SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

M.Sc. Semester-3

PAPER-2 Numerical Methods and Digital Electronics

Subject Code: 256040302

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The course aims to develop an understanding of Numerical methods which are for simplified treatments of many complex problems in physics and provides the foundation for the modern understanding of subject.
- To have an appreciation for the modern aspects of electronics; Digital electronics and related topics like conversion of analog to digital.

Prerequisites

Student must have studied B.Sc. with physics as a major subject and knowledge of basic mathematics and electronics.




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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Numerical Solution of Ordinary Differential Equations Introduction, Picard's method, Taylor's series method, Euler's method, Modified Euler's method, Runge's method, Runge-Kutta method, Predictor-corrector method, Milne's method, Adams-Bashforth method	14
2	Numerical Solution of Partial Differential Equations Introduction, Classification of second order equations, Elliptical equations, Solution of Laplace equation, Solution of Poisson's equation, Parabolic equations, Solution of one-dimensional heat equation, Solution of two-dimensional heat equation, Hyperbolic equations, Solution of wave equation.	14
3	Digital Electronics Parity generators and checkers, read only memory, programmable array logic. Clocks & Timers: Clock waveform, TTL clock, 555 Timer (internal block diagram) as Monostable Multivibrator and as Astable Multivibrator. Shift Registers: Types of registers, serial in - serial out, serial in - parallel out, parallel in - serial out, parallel in - parallel out, ring counter. Counters: Concept of asynchronous counters (IC 7493 Binary counter, IC 7490 Decade counter), Concept of synchronous counters (IC 74193-4-bit updown counter) Digital clock.	14
4	D/A and A/D Conversion Variable register network, Binary ladder, D/A converter, D/A accuracy and resolution, A/D converter - simultaneous conversion, counter method, continuous A/D conversion, A/D techniques, Dual slope A/D conversion, A/D accuracy and resolution, application of DAC & ADC, Displays: LED (seven segment), dot matrix, plasma, LCD.	14

Learning Outcomes

- The students will be able to apply the Variational principles to real physical problems. The students will be able to model mechanical systems, both in inertial and rotating frames, using Lagrange and Hamilton equations.
- The students will be able to work out equations of state and thermodynamic potentials for elementary systems of particles; and use and develop mean field theory for first and second order phase transitions.



- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

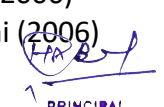
The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Numerical Methods in Engineering and Science, B.S. Grewal and J. S. Grewal, Khanna Publishers.
2. Numerical Methods, Balgurusamy, Tata McGraw-Hill Pub. Co. Ltd, New Delhi (2000)
3. Numerical Methods with Computer Programs in C++, Pallab Ghosh, Prentice-Hall of India
4. Private Limited, New Delhi (2006)
5. Digital Principles and Applications, Albert Paul Malvino , Donald P. Leach and Saha, Tata
6. McGraw-Hill Publishing Company Limited, New Delhi
7. Fundamentals of Digital Circuits, Anand Kumar, PHI Private Limited, New Delhi (2006)
8. Digital Logic and Computer Design, Morris Mano, PHI Private Limited, New Delhi (2006)




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

M.Sc. Semester-3

PAPER-3 Satellite Communication, Fiber Optics and Microprocessor– I Subject Code: 256040303

Teaching & Evaluation Scheme: -

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

Objectives

- Various techniques of modulation and different aspects of digital communication are included in this paper.
- Radio wave propagation is an important aspect of long-distance communication; different modes of radio wave propagation are covered in this paper. Satellite communication and optical fiber communication which revolutionized the communication systems are also covered this paper.
- Microprocessor is considered as the building block of modern computers. Microprocessor - I course covers an architecture, instruction sets including classification, buses, machine cycles, writing and executing of simple programs as well as pin and functional block diagrams of 8-bit 8085 Microprocessor.
- This course also includes some details of Microcomputer systems along with logic devices, and memory interfacing. Students can get some information about ASCII, and BCD codes.

Prerequisites

Student must have studied B.Sc. with physics as a major subject and knowledge of basic mathematics.




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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Radio Wave Propagation and Satellite communication Radio Wave Propagation: Propagation in free space - mode of propagation, microwave systems. Tropospheric Propagation - mode of propagation, radio horizon, super and sub refractions, attenuation in atmosphere, VHF/UHF radio system. Ionospheric propagation - ionospheric layers, effect of ionosphere on wave propagation, plasma frequency and critical frequency, secant law skip distance and MUF, optimum working frequency, virtual height, effect of earth's magnetic field, service range, ionospheric irregularities and disturbances, HF radio systems. Surface wave – mode of propagation, ground wave. Satellite communication: Kepler's laws, orbits, geostationary orbit, power systems, attitude control, station keeping, antenna look angles, limits of visibility, frequency plan and polarization, satellite antenna radiation pattern, transponders, uplink and downlink power budget calculations, overall budget calculations, multiple access methods, applications of satellite communication, satellite radio navigation, Indian communication satellites.	14
2	Fiber optic Communication Principle of light transmission in a fiber - propagation with in a fiber, fiber index profiles, Modes of propagation - overview of modes, key modal concepts, Maxwell's equations, waveguide equations for cylindrical fiber, wave equations for step index fiber, modal equation, modes in step index fiber, single mode fiber. Losses in fibers - absorption losses, leaky modes, mode coupling losses, bending losses, combined fiber losses. Dispersion - effect of dispersion on pulse transmission, intermodal dispersion, material (chromatic) dispersion, total dispersion and maximum transmission rates. Light sources and detectors for fiber optics. optical receiver circuit. Connectors and splices - losses in connectors and splices, connectors, fiber splices. Fiber optic communication link.	14
3	Microprocessor- based systems: Hardware and interfacing A programmable machine: device, Memory, Input/output, CPU. Block diagram of a Microcontroller, Advances in semiconductor Technology, Organization of Microprocessor-Based system. Microprocessor Instruction set and computer languages: Machine Language: 8085 Machine language, 8085 Assembly language. ASCII code, writing and Executing Assembly language program, High level languages, Block diagram of Translation High level language into Machine code, operating system. From large computer to Single chip Microcontrollers: Large Computers, Medium size computers, Microcomputers, personal computers, workstations, single board Microcomputers, Single chip	14



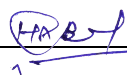
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	Microcomputers (Microcontrollers) Application: Microprocessor controlled Temperature system (MCTS): System hardware, Microprocessor-controlled Temperature system (MCTS) block diagram, Microprocessor, Memory, input (A/D converter) Temperature sensor, output including Fan, Header, LCDs, system software (Programs). Introduction to 8085 Assembly Language Programming: The 8085 Programming Model Hardware Model, Programming model: Registers, Accumulator, Flags, Program Counter (PC) and Stack Pointer (SP); Instruction classification: The 8085 instruction set, Data transfer operations, Arithmetic operations, logical operations, Branching Operations, Machine control operations and Review. Instruction, Data format and Storage: Instruction Work size: one byte, two byte, Three byte, Opcode format, Data format: ASCII Code, BCD code, Signed integer, Unsigned integers, Instruction and data storage: Memory. How to write Assemble and execute a simple program: Illustrative program: Addition of two hexadecimal numbers, including Flow chart, Manual assembly process and executing a program. Writing and hand assembling a program: Illustrative program: Subtracting two hexadecimal numbers and storing the result in Memory, writing Mnemonics, and Assembling Hex code, common errors.	
4	Microprocessor Architecture and Microcomputer Systems Microprocessor Architecture and Its Operations, Memory: Flip-Flop or Latch as a storage Element, Memory Map and Addresses, Examples, Memory Address Range of a 1K Memory chip, Memory Address Lines, Memory work size, Memory and Instruction Fetch, Memory classification: From static Memory to Flash Memory, Advances in Memory technology. Input and output (I/O) devices: I/Os with 8-bit Addresses (Peripheral-Mapped I/O), I/O with 16-bit Addresses (Memory-Mapped I/O) Logic devices for interfacing: Tri-state devices, Buffer, Examples of Tri-state buffer. Bidirectional buffer, octal buffer, Logic diagram and Function Table, Decoder, (2 to 4), (3 to 8), Examples of Decoders, Encoder (8 to 3), D-Flip-Flops: Latch and clocked; Examples of Latches (Registers), Logic diagram and Function Table. 8085 Microprocessor, Architecture and Memory interfacing: The 8085 MPU : The 8085 Microprocessor, Address bus, The 8085 Microprocessor pin out and signals, Multiplexed Address/data bus, Control and status signals, power supply and clock frequency, Externally initiated signals, Microprocessor communication and Bus timings, Examples of Data flow from Memory to MPU, Timing diagram, De-multiplexing the bus AD7-AD0, Generating control signals, A detail look at the 8085 MPU and its Architecture, The 8085A Microprocessor: Functional block diagram Example of Instruction decoding and execution, Example of an 8085-based Microcomputer: 8085 single-Board Microcomputer system, The 8085 Machine cycles and Bus timing, Op-code Fetch Machine cycle, Memory read Machine cycle with example and Timing diagram, How to recognize machine cycle.	14



Learning Outcomes


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- Predict propagation effects of electromagnetic waves in the terrestrial, atmosphere, space, and urban environments
- Compute link budgets and select antennas, frequencies, and paths for radio communication and radar systems
- Describe statistical characteristics of propagating signals
- Identify factors that hamper and enhance radio propagation in a variety of scenarios.

Teaching & Learning Methodology

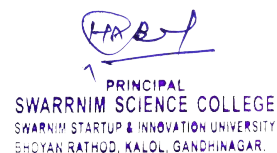
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- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended:

1. Roddy D. and Coolin J., Electronic communications, PHI, 2006
2. Kennedy G and Davis B. Electronic Communication systems, TMH 1999.
3. Tosmasi W., Advanced Electronic Communication system, PHI.
4. Keiser G, Optical fiber communications, MGH, 2000
5. Senior J.M., Optical Fiber Communications – Principles and practice, Pearson, 2007
6. Roddy D., Satellite communications
7. M.L. Gupta, Electronic and Radio engineering Dhanpat Rai & Sons, 1991
8. Microprocessor Architecture, Programming and Applications with 8085 Ramesh S. Gaonkar, Penram International Publishing India Private LTD. (Fifth edition)
9. Microprocessor, Microcomputer & their Applications, A.K Mukhopadhaya, NAROSA Publisher. Fundamentals of Microprocessors & Microcomputers B. Ram, Dhanpat Rai & Sons.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

M.Sc. Semester-3

PAPER-4 Electronic Communication – I

Subject Code: 256040304

Teaching & Evaluation Scheme: -

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

Objectives

- The transmission line theory bridges the gap between field analysis and basic circuit theory.
- The phenomenon of wave propagation on transmission lines is approached from an extension of circuit theory as well as from a specialization of Maxwell's equation.
- It covers lossy, lossless, short circuit, open circuit and quarter wave lines. Another important course on various antenna parameters and the basic operating principles of antennas is introduced.
- They will also learn about the different types of the antennas that are commonly used. Elements of analogue and digital communication systems are covered here in detail. Electronic communication is a very important area of electronics.
- Various techniques of modulation and different aspects of digital communication are included in this paper.

Prerequisites

Student must have studied B.Sc. with physics as a major subject and knowledge of basic mathematics and electronics.




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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Transmission Line Theory Lumped element circuit model for a transmission line, Field analysis of transmission lines, The terminated lossless transmission line, Smith chart. The quarter wave transformer, Generator and load mismatches, Lossy transmission lines.	14
2	Antenna Basic antenna parameters (radiation pattern, radiation resistance, directivity and gain), Half-wave dipole antenna, effect of ground on the radiation pattern of ungrounded antenna, antenna arrays, Yagi antenna, antenna system employing parabolic reflectors, frequency independent log-parabolic antenna.	14
3	Analog Modulation Amplitude modulation: Theory of amplitude modulation, Frequency spectrum of AM wave, AM modulator and detector. Single side band modulation: Single sideband principle, FET balanced modulator, SSB generation: Filter method, Phasing method and Third method. Angle Modulation: Theory of frequency and phase modulation, frequency spectrum of FM wave. Reactance FM Modulator, Armstrong method of frequency modulation. Slope detector, Stagger tuned detector, Foster-Seeley discriminator, Ratio detector.	14
4	Pulse Modulation and Digital Communication Pulse Modulation: Pulse amplitude modulation, Pulse code modulation, PCM Receiver, Pulse time modulation, Pulse position modulation, Pulse width modulation. Synchronization, Probability of bit error in baseband transmission, matched filter, Bit-timing recovery, carrier recovery systems. Digital carrier systems: Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Continuous Phase Frequency Shift Keying (CPFSK), Minimum Shift Keying (MSK), Phase Shift Keying (PSK).	14

Learning Outcomes

- Understand and identify the fundamental concepts and various components of analog communication.
- Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.
- Describe analog pulse modulation techniques and digital modulation technique.
- Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.
- Describe basic components of communication system and concept of modulation needs.
- Classify different types of AM (Analog Modulation) techniques, their principles.



- Demonstrate different AM systems (generation and detection).
- Explain different types of angle modulation schemes (FM & PM), their generation and detection.
- Demonstrate the different types of multiplexing in communication system.
- Analyze the noise characteristics of a communication system using different modulation scheme.

Teaching & Learning Methodology: -

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended:

1. David M. Pozar, Microwave Engineering (Third Edition), Wiley- India.
2. J. D. Ryder, Networks, Lines and Fields, PHI Pvt. Ltd. New Delhi, 1991
3. G. P. Srivastava, V. L. Gupta, Microwave Devices and Circuit Design, PHI.
4. G. S. Raghuvanshi, Microwave Engineering, CENGAGE Learning.
5. E. C. Jordan and K. G. Balman, Electromagnetic waves and radiating systems, PHI
6. Roddy D. and Coolen J., Electronic communications, PHI, 2006
7. Kennedy G and Davis B. Electronic Communication systems, TMH 1999.

E-Resources

- SWAYAM / NPTEL portal online courses available of solid stste physics and experimental techniques. <https://swayam.gov.in/> and <https://nptel.ac.in/>
- <https://www.google.com/url?sa=t&source=web&rct=j&url=https://soaneemrana.org/newebmedia/ELECTRONICS%2520COMMUNICATION%2520SYSTEM%2520BY%2520GEO%2520KENNEDY.pdf&ved=2ahUKEwiG7bPgX8HzAhUCU30KHUdbDylQFnoECAUQAQ&usg=AOvVaw3QxNIGxYgHHr7CmIYNKh2k>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

ENZYMOLGY

CODE: 256030302

M.Sc 3rd SEM

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70		100

Objectives:-

- The objectives of the paper is students will get about the protein structure, classification of enzymes, terminology, enzyme activity and purification of enzymes and strategy for separation and purification.
- The student will get idea about the enzyme kinetics and mechanism. What is significance of Km, Vmax and Kcat and importance of steady state equilibrium. Enzyme inhibition and its types. Thermal kinetics.
- To provide the mechanism and action of enzyme and its role of activators. Allosteric regulation and its mechanism.
- The study will help in understanding the what are isoenzymes and physiological significance role of different types of enzymes.




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Course Outcome:

Unit	Description in Detail	Weightage (In Hours)
1	Introduction: Enzymology and historical developments in enzymology Protein Structure: Primary, secondary, tertiary and quaternary structure, techniques used in enzyme characterization Enzyme classification: IUB enzyme classification. Enzyme Activity: Principle and techniques of enzymatic analysis, factors affecting enzyme Activity, Extraction and Purification of enzyme: Objectives and strategy, separation techniques, test of purity.	08
2	Enzyme Kinetics: Bioenergetics and Catalysis Single substrate kinetics: Equilibrium and Steady state kinetics, significance of K_m , V_{max} & K_{cat} . Pre-steady state and Relaxation kinetics. Multisubstrate kinetics: General rate equation, compulsory order, random order and ping-pong mechanisms and their primary and secondary plots. Enzyme inhibition and its kinetics: Reversible and irreversible inhibition, competitive, noncompetitive and uncompetitive, mixed, partial, substrate and allosteric inhibition. Thermal kinetics: Effect of temperature on reaction rate, enzyme stability, Arrhenius equation and activation energy.	10
3	Mechanism of Enzyme Action: Enzyme activators, co-enzymes and co-factors in enzyme catalysis, Enzyme and substrate Specificity Investigation of active Centre, Factors affecting catalytic efficiency, Experimental approaches to determine enzyme mechanisms. Enzyme mechanisms: Lysozyme, Chymotrypsin, Carboxypeptidase, Restriction endonuclease, Aspartate trans carbomylase. Allosteric enzymes and sigmoidal	10



	kinetics: Protein ligand binding, Co-operativity, MWC & KNF models, Regulation of enzyme activity. Control of metabolic pathways.	
4	Isoenzymes and its physiological significance, Ribozymes and Abzymes Enzyme engineering: Chemical modification of enzymes: methods of modification of primary structure, catalytic and allosteric properties, use of group specific reagents. Enzyme Immobilization Enzymes in non conventional media, Enzymes sensors, Enzymes as analytical reagents.	08

Learning Outcomes:

- The students will be able to understand and deals with the biochemical nature and activity of enzymes and is a subject that has relevance to students from a wide range of disciplines.
- Student should be able to understand basic concepts of the present day scope and applications of enzymology.
- The course is designed to give students an understanding of procedures involved in purification of enzymes, enzymes assays and quantitative evaluation of the influencing parameters such as concentrations of substrate / enzyme, pH, temperature and effects of inhibitors on enzyme activity.
- This is a course where the topics to be studied include enzyme active sites / mechanisms of enzyme action; enzyme kinetics and regulation; Isozymes and their clinical significances /function relationship etc as tools for understanding functions of enzymes.

Teaching & Learning Methodology

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs



- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Basic Text & Reference Books:

1. *Enzymes: Biochemistry, Biotechnology, Clinical Chemistry 2nd Edition*, authored by Trevor Palmer and Philip Bonner Affiliated East-West Press Pvt. Ltd.
2. Textbook of biochemistry – Vasudevan Shreekumari
3. Biochemistry – Lehninger 6th edition
4. Fundamentals of Enzymologist: Nicholes C. Price and Lewis Stevens, Oxford Univ. Press.
5. Enzyme Structure and mechanism: Alan Fersht, Reading, USA.
6. The chemical kinetics of enzyme action: K. J. Laider and P. S. Bunting, Oxford University Press, London.
7. Enzymes: M. Dixon, E. C. Webb, C.J.R. Thorne and K. F. Tipton, Longmans, London.
8. Biochemistry: Lubert Stryer

E-Resources

- https://www.feedspot.com/infiniteress.php?_src=feed_title&followfeedid=4812449&q=site:https%3A%2F%2Fwww.nature.com%2Fsubjects%2Fbiochemistry.rss
- https://www.sciencedaily.com/news/matter_energy/biochemistry/
- <https://thebiochemistblog.com/>
- <https://www.longdom.org/microbial-biochemical-technology.html>
- <https://bmcbiochem.biomedcentral.com/>
- <https://www.slideshare.net/mohdsakharkar/enzyme-final>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

MICROBIAL BIOTECHNOLOGY

Subject Code: 256030301

M.Sc. Semester -3

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	--	100

Objectives

- To provide students basic knowledge of Microbial Biotechnology. It covers up general concept of microbial production and fermentation of various products.
- The purpose of the course is to give knowledge about production process of primary & secondary metabolites using fermentation technology and microorganisms.
- To provide an understanding of other microbial products such as microbial polysaccharides, beverages, polyhydroxyalkanoates, bio-surfactants and biotransformation of steroids.
- To understand the concepts of biomass production of microorganisms and its applications.

Prerequisites

Student must have studied First year (FY) of M.Sc. with Microbiology as a major subject and knowledge of basic biotechnology.




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SWARNIM SCIENCE COLLEGE
SWARNIM STARTUP & INNOVATION UNIVERSITY
BHOYAN RATHOD, KALOL, GANDHINAGAR.

Course outline

Unit No.	Course Contents	Teaching hours
1	Microbial production of primary metabolites - Amino acids: Glutamic acid, Lysine - Enzymes: Proteases, Amylases - Organic acids: Citric acid, Acetic acid - Industrial Alcohol	10
2	Microbial production of secondary metabolites - Antibiotics: Penicillin, Streptomycin - Vitamins: B₁₂, B₂ - Ergot Alkaloids - Carotenoid pigments: β-carotene, lycopene	10
3	Microbial production of other products & Biotransformation - Microbial polysaccharides: Xanthan, Alginate and Dextran - Beverages: Beer, Wine - Polyhydroxyalkanoates: PHA and PHB - Biosurfactants - Steroid transformation	10
4	Biomass production and applications - Fungal biomass- baker's yeast and single cell oil - Mushroom cultivation - Use of Algal biomass. - Microbial production for food and feed	10
		40

Learning Outcomes

- The students will be able to apply the knowledge of the Microbial production to understands concepts of various fields like food and dairy industries, pharmaceutical industries, Fermentation industries, beverages industries, etc.
- Student should be able to understand basic concepts of various products like amino acids, enzymes, vitamins, organic acids, industrial alcohol, beer, wine, microbial polysaccharides, Biosurfactants as well as biotransformation of steroids. Students also apply knowledge of mushroom cultivation, fungal biomass production, algal biomass and other microbial production for food and feed.



Access information on a topic from a variety of sources, and be able to learn new things on one's own.

- Communicate verbally, graphically, and/or in writing the theoretical data clearly and concisely that incorporates the stylistic conventions used by Microbiologists, biotechnologist, researchers and scientists worldwide.

Teaching & Learning Methodology

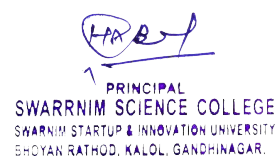
We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc.) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. A.N. Glazer and H. Nikaido. (2007) *Microbial Biotechnology. Fundamentals of Applied Microbiology*. (2nd edition)
2. E. M. T. El-Mansi, E. M. T. El-Mansi, C. F. A. Bryce, Arnold L. Demain, A.R. Allman (2006) *Fermentation Microbiology and Biotechnology* (2nd edition)
3. James.M. Jay, Martin J. Loessner, David. A. Golden (2005). *Modern Food Microbiology* 7th Edition (Food Science Texts Series)
4. Michael J. Waites, Neil L. Morgan, John S. Rockey, Gary Higton (2001). *Industrial Microbiology: An Introduction*



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

AGRICULTURAL MICROBIOLOGY

Subject Code: 256030304

M.Sc. Semester -3

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	--	100

Objectives

- To impart in-depth information on soil and agriculture
- To make the students understand the role of microbes in agriculture
- To give an overview on plant microbe interaction. To understand infection process and control measures
- To know the importance of bio-fertilizers and bio-pesticides and To make the students to know about various techniques involved in bio-fertilizers and bio- pesticides production

Prerequisites

Student must have studied First year (FY) of M.Sc. with Microbiology as a major subject and knowledge of basic biotechnology.




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Course outline

Unit No.	Course Contents	Teaching hours
1	Soil Microbiology - Composition of Lithosphere, - Soil Microbes & Factors influencing soil microbial population. - The soil environment-Distribution and abundance, generic groups and nutrition of bacteria, actinomycetes, fungi, algae, protozoa and viruses.	10
2	Microbial transformations of minerals Phosphorus, sulphur, iron and other elements - Chemistry, cycles mineralization and immobilization and oxidation/reduction	10
3	Microbes in agriculture - Biofertilizer: types, production and applications - Ammonia assimilation in Nitrogen-Fixing legume nodules- Hydrogen Metabolism, action of Hydrogenase - factors controlling the Legume - Rhizobium symbiosis - Azotobacter sp and Azospirillum sp and their functions - Cyanobacteria (BGA) and their associations in Nitrogen fixation - Phospahte solubilizing microbes - Mycorhizae and plant growth promoting rhizobacteria (PGPR) - Role of biofertilizers - Role of biofertilizer in integrated nutrient management	10
4	Plant pathogenic microorganisms - Algal, fungal, bacterial, viral, mycoplasma, Nematode diseases and symptoms - Mode of entry of pathogens and factors affecting disease incidence - Plant disease resistance and various control measures Phenolic compounds. - Interaction of plant pathogens with host. - Definition and History of Biopesticides – Viral (NPV, CPV & GV), bacterial (Bacillus thuringiensis, B.popillae & Pseudomonas sp.), Fungal (Entomophthora musca, Beaveria sp., Metarrhizium sp. & Verticillium sp.), Protozoan (Mattesia sp., Nosema sp., Octospora muscaedomesticae & Lambornella sp.)	10
		40



Learning Outcomes

- By the end of this course students will be able to understand the role of microbes in the different cycles and their role in agriculture. Also understand biological nitrogen fixation in symbiotic and non-symbiotic associations with plants.
- Student should be able to know the value, production, application and crop response of bio-fertilizers and bio-pesticides and to have an in-depth knowledge on bio-pesticides and their role in pest control.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the theoretical data clearly and concisely that incorporates the stylistic conventions used by Microbiologists, biotechnologist, researchers and scientists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

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- Provide learning materials in different formats (written, online, audio, video podcast etc.) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Gupta, S.K.2014 Approaches and trends in plant disease management. Scientific publishers, Jodhpur, India.
2. Jamaluddin *et al* 2013 Microbes and sustainable plant productivity. Scintific Publishers Jodhpur, India. G
3. Subba Rao, N. S. 1997. Biofertilizers in Agriculture and Forestry, III Ed., Oxford & IBH Publishing Co.Pvt.Ltd.,New Delhi.
- Subba Rao, N. S. 1995. Soil microorganisms and plant growth. Oxford & IBH Publishing Co.Pvt.Ltd. New Delhi.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

FOOD & DAIRY MICROBIOLOGY

CODE: 256030303

M.Sc 3rd SEM

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	--	100

Objectives:-

- To provide basic knowledge of food & dairy microbiology.
- In this course the meaning of food microbiology and interaction between microorganism and foods and how food spoilage will be study.
- The pathogenic and non-pathogenic microorganism that found in food and how can they contaminated the foods will be study, in the other hand mycotoxins which is one of the toxin secreted by fungi will be study
- After knowledge of contamination of foods by microorganism the way for preservation of foods from contamination will be study.
- To identify the causative agent in food known as microorganisms
- Understand the mechanism of their reaction in food to make it unsuitable for consumption
- To describe how some microbes proved to be beneficial in the production of food products
- To describe how some bacteria are used in the preservation of food rather than spoil it
- To identify the sources and causes of microbes causing food spoilage




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Prerequisites:-

- Student Must have studied B.Sc. with microbiology/biotechnology as a major subject and knowledge of basic biology

Unit	Description in Detail	Weightage (In hours)
1	1. Scope of food microbiology 2. Food as a substrate a) Microorganisms important in food microbiology- Bacteria, yeast & Moulds b) Factors influencing microbial growth in food.	04
2	1. Food spoilage a) General principles underlying food spoilage and contamination b) Spoilage of canned food, sugar products, vegetables, fruits, meat, milk & milk products, fish, sea food and poultry 2. Food Poisoning a) Indicator food borne pathogens b) Bacterial food borne infections and intoxications- <i>Clostridium</i>, <i>Escherichia</i>, <i>Salmonella</i>, <i>Shigella</i> c) General methods for diagnosis of infections, intoxication and preventive measures.	06
3	Food Preservation a) Principles of food preservation- Asepsis, removal of micro organisms, anaerobic conditions, high and low temperature, drying, irradiation b) Chemical and bio preservatives and food additives c) Food packaging and labeling.	06
4	Genetically modified foods. Biosensors in food research organizations/institutes in India. Recent food borne outbreaks. Food sanitation- Microbiology of food plant sanitation, water and milk testing food laws and quality control-HACCP, Codex alimentarius, PFA, FPO, MFPO, BIS, AGMARK.	08



Learning Outcomes:

- Describe the characteristics of foodborne, waterborne and spoilage microorganisms, and methods for their isolation, detection and identification.
- Explain why microbiological quality control programme are necessary in food production.
- At the end of the course, the students have acquired skills related to: the microbiological food control through appropriate and targeted applications of physical chemical and biological treatments; the use of basic microbiological methods for the evaluation of the microbial load in the different food matrices; the microbial monitoring of fermented foods; the use of selection scheme for starter cultures.

Teaching & Learning Methodology

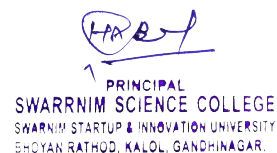
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- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Food microbiology, Frazier and Westhoff
- Food microbiology, Adam and Moss
- Dairy Microbiology By Robinson. Volume I and II
- Fundamental food microbiology, Bibek ray and Arun Bhuniya



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

MICROBIOLOGY PRACTICALS

Subject Code: 256030305

M.Sc. Semester-3

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
-	-	12	12	8	-	200	-	-	200

PRACTICAL LIST

Sr. No	Name of Practical's
1.	Primary screening of Amylase producing microorganisms
2.	Effect of temperature on enzyme activity
3.	Effect of pH on enzyme activity
4.	Effect of substrate concentration on enzyme activity
5.	Primary screening of organic acid producing microorganisms
6.	Alcohol Estimation
7.	MBRT




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8.	Sterility testing of food products
9.	Qualitative analysis of food products
10.	Production of biofertilizer
11.	Study of plant pathogens
12.	Study of Protein structure by using PDB
13.	Introduction to bioinformatics databases: NCBI, DDBJ, GenBank
14.	Isolation of symbiotic microorganism- <i>Rhizobium</i>
15.	Isolation of non-symbiotic microorganism- <i>Azotobacteria</i>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

Animal Tissue Culture and Pharmaceutical Biotechnology

CODE: 256010304

M.Sc 3rd SEM

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70		100

Unit 1: Animal tissue culture

- Primary culture and established cell line cultures
- Equipment and material for animal cell technology
- Basic media and techniques of mammalian cell culture
- Manipulation and application of animal cell culture

Unit 2: Bioprocess economics and IPR

- Expenses for industrial materials, equipment, product recovery and effluent treatments
- Cost recovery due to waste usages and recycling
- IPR and patent process
- Benefits, problems and management of IPR
- International harmonization of patent law




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➤ Patents of biotechnological process and their protection

➤ Indian scenario

Unit 3: Regulatory affairs

➤ Introduction to pharmacopoeia, good microbiological techniques and good laboratory practice (GLP)

➤ Basic principles of quality control (QA) and quality assurance (QC)

➤ Guidelines for QA and QC: raw materials, sterilization, media, stock cultures and products

➤ Validation study and toxicity testing

➤ Role of culture collection centre, public health laboratories and regulatory agencies

Unit 4: Biosafety and bioethics

➤ Biosafety guidelines

➤ Risk and risk assessment

➤ Biosafety levels, laboratory biosecurity concepts

➤ Introduction to drug design

➤ Pre-clinical and clinical trials

➤ Basics of bioethics principles, international codes and guidelines in India

➤ Ethics in post-genomic e



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

r-DNA Technology

Subject Code: 256010303

M.SC. Semester -3

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- To provide students the basic knowledge of R-DNA technology (Recombinant DNA technology).
- The purpose of the course is to give student to introduction of Recombinant DNA technology and its cover up scope of genetic engineering, Cloning, Recombinant, and PCR.
- To provide an understanding of Scope of genetic engineering, concept & important of genetic engineering, chemical synthesis of gene cloning & expression vectors, and PCR techniques.

Prerequisites

Student must have studied M.Sc. with microbiology as a major subject and knowledge of basic microbiology/Life science.

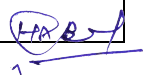



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Course outline

Sr. No.	Course Contents	Teaching hours
1.	Scope of Genetic Engineering, Concept and importance of Genetic Engineering; General strategies and Steps involved in gene cloning; Extraction and purification of DNA from bacteria, plant and animal cells; Restriction enzymes, DNA lipase and other enzymes involved in gene cloning; mRNA and cDNA preparation.	06
2.	Chemical synthesis of gene/DNA Cloning and expression vectors- Plasmids, λ -bacteriophages, M-13 based vectors, Phagemids, Cosmids, YAC, BAC, HAC/MAC, etc. Expression of cloned gene in heterologous host Introduction of DNA into different host systems.	06
3.	Recombinant selection and screening Southern blotting & hybridization, Northern analysis, Western blot analysis, Agarose gel electrophoresis, Pulse Field Gel Electrophoresis, Rotating Gel. Electrophoresis (RGE), Mapping Regulatory Sequences by in vivo expression assay Mapping of Protein Binding Site by DNase I Protection, Mobility Gel Shift Assay Protein Activity Assay – Yeast-one hybrid, Yeast-two hybrid and Yeast-three hybrid system. Phage display, Subtractive hybridization and cloning, HRT/HART, Chromosomal Walk. Characterization of Cloned genes .Restriction map, S1 mapping ,Denaturation mapping ,Heterogonous mapping DNA sequencing, Nucleic Acid Microarray, Metagenomics, Metabolism, gene therapy.	10
4	Polymerase chain reaction, Molecular markers Linkage mapping using meiotic recombination frequencies, Genomic mapping using radiation induced Chromosome rearrangement, Genomic mapping using DNA sequence polymorphism as genetic marker, In vitro Mutagenesis, Metagenomics, Metabolic engineering, Gene therapy Recombinant products- recombinant hormones ,recombinant DNA vaccines, Transgenic plants, Transgenic animals, Genetic Engineering Guidelines, Levels of Physical containment, Levels of Biological Containment, The Indian Guidelines.	10




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Learning Outcomes

- The students will be able to understand the Knowledge of r-DNA technology to understand concept of various fields like research, gene manipulation, genetic engineering, gene cloning, fermentation industries, etc.
- Student should be able to understand basic concepts of recombination, methods of genetic engineering, screening methods, enzymes involved in r-DNA technology, DNA sequencing, vectors, gene markers, transgenic plants and animals as well as gene therapy.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically and/or in writing the theoretical data clearly and concisely that incorporates the stylistic conventions used by microbiologists, biotechnologists, researchers and scientist worldwide.

Teaching & Learning Methodology

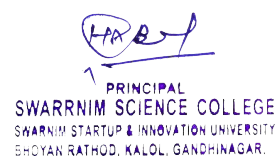
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- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Genomes TA Brown 3rd Edition
- Principles of Genetic Manipulation- Old & Primrose
- Genetic Engineering – Rastogi & Pathak
- Recombinant DNA technology by keya chaudhari



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

Biotechnology PRACTICALS

Subject Code: 256010305

M.Sc. Semester-3

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
-	-	12	12	8	-	200	-	-	200

PRACTICAL LIST

Sr. No	Name of Practical's
1.	Primary screening of Amylase producing microorganisms
2.	Effect of temperature on enzyme activity
3.	Effect of pH on enzyme activity
4.	Effect of substrate concentration on enzyme activity
5.	Primary screening of organic acid producing microorganisms
6.	Alcohol Estimation
7.	Isolation of DNA from Plant




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8.	Demonstration of Gel Electrophoresis
9.	Demonstration of PCR
10.	Demonstration of Animal tissue culture
11.	Sterility testing of pharmaceutical products
12.	Study of Protein structure by using PDB
13.	Introduction to bioinformatics databases: NCBI, DDBJ, GenBank
14.	Sequence alignment and analysis
15.	Primer designing from cDNA library



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

Department of Chemistry

Natural Products and Biomolecules

Subject Code: 256020301

M.Sc. Semester- III

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

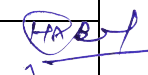
Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental organic chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Natural Pigment Natural colouring matter, general classification, method of synthesis, biosynthesis studies of anthocyanins (cyanine) flavones (chrysin) and flavanol (Quercetin), Porphyrin-structure, spectral properties and synthesis, general and structure determination of Haemoglobin, chlorophyll and Bilirubin.	14
	Alkaloids and Vitamins Alkaloids: General biogenetic studies of alkaloids, chemistry of	14  PRINCIPAL SWARNIM SCIENCE COLLEGE SHOYAN RATHOD, KALO, GANDHINAGAR.

	quinine, morphine , reserpine and colchicine Vitamins : Introduction, synthesis and biochemical function of vitamin B(Thiamine), Vitamin H and α -tocopherol (Vitamin E), vitamin C.	
3	Steroids and Hormones General biosynthesis studies of steroids, structure of cholesterol and ergosterol (No synthesis). Stereochemistry of steroids, chemistry of bile acids. Chemistry of androgens, oestrogens and gestrogens, their synthesis and biochemical role. Adrenocortical hormones, partial synthesis of cortisone.	14
4	Terpenoids and Carotenoids Classification, nomenclature, general methods of structure determination, chemistry and synthesis of abietic acid and gibberellic acid (gibberlin-A), farnesol, zingeberine and squalene. Biosynthetic studies on triterpenoids and tetraterpenoides.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Organic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology

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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
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SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Medicinal Chemistry

Subject Code: 256020302

M.Sc. Semester- III

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

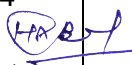
Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental organic chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Antibiotics Antibiotics that interfere with the biosynthesis of bacterial cell wall. A. The β -lactum antibiotics : Penicillin and cephalosporin B. Non lactum antibiotics (only name and structures) C. Bacitracin, vancomycin and cycloserine (only name and structures) Antibiotics that interfere with the protien biosynthesis in	14  PRINCIPAL SWARNIM SCIENCE COLLEGE SWARNIM STARTUP & INNOVATION UNIVERSITY BHOYAN RATHOD, KALOJ, GANDHINAGAR.

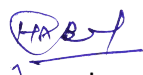
	microorganisms : non lactum antibiotics, tetracycline, chloroamphenicol Structure actively relationship (SAR) among penicillins and tetracyclins Non classifiable antibiotics (only structure and therapeutic uses) Synthesis of penicillin V, ampicillin, cephalosporin and chloroamphenicol.	
2	Psychoactive drugs CNS depressant: A. General and local anaesthetics B. Sedative and hypnotics Antipsychotic drugs A. Antidepressant B. Neuroleptics Synthesis of the following: Thiopental, amobarbital, diazepam, chlorzepan, alprazolam, glutethimide, nikethamide, procaine, lidocaine and dibucaine, Ibuprofen, meclizine sodium, novalgin, pethidine	14
3	Antimalarial and Antituberculosis drugs Antimalarials: Modern chemotherapy of malaria, 4-amino and 8-amino quinolins, 9-amino acridine. Synthesis of mefloquine, chloroquine, primaquine and daraprim Mode of action of antimalarial agents SAR of antimalarial agents Anti tuberculosis: Synthesis of only the following drugs: Isoniazid (INH), Ethionamide, Ethambutol, DDS (Dapsone)	14
4	Cardiovascular, diuretics and hypoglycemic agents Synthesis of amyl nitrate, diltiazem, atenolol, methyl dopa, tolbutamide, chlorpropamide, glibenclamide, acetazolamide, chlorothiazide, furosemide and ethacrynic acid.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Organic Chemistry.



Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.


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Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programmer/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs.
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programmer/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures.

Books Recommended

1. Burger's medicinal chemistry and drug design (5/e) 1997, vol 1 to 5 edited by Manfred E.Woltt (John wiley and sons Mc. New york)
2. Principles of medicinal chemistry by William A. Foye (ied), lea and febiys (Philadelphia)
3. Principles of medicinal chemistry vol I & II (5/e) F.S.kadam, K.R. Mahadic ad K.G.Bohra (Nirali publication)
4. Medicinal chemistry by ashutosh kar
5. The organic chemistry of drug synthesis vol I, II and III (1980) ed by D. lednicer and L.A. mitscher (Johyn wiley and sons, New york)
6. Wilson and Gisvold text book of organic medicinal and pharmaceutical chemistry (5/e,1982) by Robert Doerge (J.B. lippincoff company, phaladophia/ Toppan co.Ltd, Tokyo)
7. Topics in medicinal chemistry vol I & II by rabinowitz Myerson (interscience 1968)
8. The pharmaceutical basis of theraperutics by Geoman and Gilman (Mcmillan co.)

E-Resources

- <https://www.medicalnewstoday.com/articles/10278>
- <https://www.drugs.com/article/antibiotics.html>
- <https://medlineplus.gov/antibiotics.html>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Organic Spectroscopy
Subject Code: 256020303
M.Sc. Semester- III

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

- Chemistry majors must have a basic understanding of fundamental organic chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours




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1	UV & IR Spectroscopy UV: Electronic transitions, chromophores, auxochromes, bathochromic and hypsochromic shifts, solvent effects, Woodward rules for dienes, enones and aromatic compounds applications of U.V., instrumentation. I.R. Vibrational transitions, important group frequencies, factors	14

	affecting I.R. group frequency, applications of I.R. instrumentation	
2	NMR Elementary ideas of NMR integration, chemical shifts, Factors affecting, chemical shifts, coupling (first order, analysis) instrumentation and principles and instrumentation, FT, chemical shifts, spin-spin coupling different spin systems, mechanism of spin coupling. E.g. AB, ABX, factors affecting vicinal and geminal couplings, rate processes, long range couplings, spin decoupling, shift reagents, solvent shifts, nuclear overhauser effect. 2D NMR (COSY and HETCOR) applications.	14
3	C13 NMR and Mass spectrometry C13 NMR: elementary ideas, instrumental problems, chemical shift features of hydrocarbons, effect of substituent on chemical shifts olefinic, acetylenic, aromatic and carbonyl carbons, effects of coupling. Mass spectrometry: theory, instrumentation, modes of ionization, types of detectors, modes of fragmentation. Different types of ions, molecular ions, isotopic peaks, factors controlling fragmentation, hyphenated mass spectroscopy techniques.	14
4	Structural elucidation of drug molecules based on joint application of UV, IR, PMR, CMR and mass spectroscopy.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Organic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

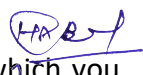
Teaching & Learning Methodology:-

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural




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differences in their previous educational experience, their individual learning approaches and needs.

- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.




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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures.

Books Recommended:

1. Spectroscopic methods in organic chemistry, D.H.Williams and Tan Fleming
2. Spectrometric identification of organic compounds, T.C.Morril R.M.Silverstein and G.Bassler, 6th edition, John Wiley and sons
3. Introduction to spectroscopy, D.L.Pavia, G.M.Lampman and G.S.Kriz, 3rd edn, Harcourt college publishers.
4. Organic spectroscopy by W.Kemp
5. Organic spectroscopy by P.S.Kalsi

E-Resources

- [https://www.itwreagents.com/iberia/en/sa_spectroscopy-uv-vis-ir#:~:text=The%20UV%20Vis%20spectroscopy%20is,between%20200%20and%20800%20nm\).&text=The%20IR%20spectroscopy%20is%20another%20very%20useful%20analytical%20tool%20for%20compounds%20characterization.](https://www.itwreagents.com/iberia/en/sa_spectroscopy-uv-vis-ir#:~:text=The%20UV%20Vis%20spectroscopy%20is,between%20200%20and%20800%20nm).&text=The%20IR%20spectroscopy%20is%20another%20very%20useful%20analytical%20tool%20for%20compounds%20characterization.)
- [https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Book%3A_Analytical_Chemistry_2.1_\(Harvey\)/10%3A_Spectroscopic_Methods/10.03%3A_UV/Vis_and_IR_Spectroscopy](https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Book%3A_Analytical_Chemistry_2.1_(Harvey)/10%3A_Spectroscopic_Methods/10.03%3A_UV/Vis_and_IR_Spectroscopy)
- <https://www.mps.mpg.de/phd/space-instrumentation-ir-uv-spectroscopy>
- <https://www.youtube.com/watch?v=MW4Pwjxxyt0>
- <https://www.youtube.com/watch?v=t5stvnKNXbg>
- <https://www.youtube.com/watch?v=t5stvnKNXbg>
- https://www.youtube.com/watch?v=H6_GgJN39vY
- <https://www.youtube.com/watch?v=EZYXmX8XGk>
- [http://sppu.in/Syllabi_PDF/revised_2009/sci/6%20%20\(5\)%20%20M.Sc.%20II,%20%20Dug%20Chemistry.pdf](http://sppu.in/Syllabi_PDF/revised_2009/sci/6%20%20(5)%20%20M.Sc.%20II,%20%20Dug%20Chemistry.pdf)
- https://www.researchgate.net/post/Which_is_the_best_spectroscopic_method_for_the_structure_elucidation_of_organic_molecule_without_the_help_of_other_method
- <https://www.arcjournals.org/pdfs/ijarcs/v2-i8/5.pdf>
- <https://www.sydney.edu.au/science/chemistry/~george/spectroscopy.html>
- <https://nptel.ac.in/content/storage2/courses/104106075/Week8/MODULE%2036.pdf>



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SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF Chemistry

Industrial Chemistry

Subject Code: 256020304

M.Sc. Semester - III

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

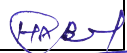
Prerequisites

Chemistry majors must have a basic understanding of fundamental organic chemistry.

Course outline

Sr. No.	Course Contents	Teaching hours
1	Basic principles Basic chemical data, batch versus continuous operation, design, flow charts, chemical process selection, safety, hazardous, fire toxic materials, research and development patents, good manufacturing practice and laboratory practice.	14




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2	Unit processes in organic chemistry Nitration, sulfonation, halogenation, amination and alkylation methods and industrial chemicals derived from benzene, naphthalene and anthracene using unit process.	14
3	Green chemistry -12 principles of green chemistry Green solvents- aqueous phase reactions Wurtz reaction, witting-Horner reaction, Michael reaction - Solid phase reactions: halogenation, aldol condensation, grignard reaction. - Ionic liquid as green solvent- hydrogenation, diels-alder reaction, o- alkylation and N-alkylation Green catalysts of green reagents (introduction)	14
4	Manufacture and uses of -Argochemicals (insecticides, fungicides, plant nutrients and plant hormones, Weedicides, pesticides) -Unit operations	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Organic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

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- Provide learning materials in different formats (written, online, audio, video, podcast, etc) to support key concepts/knowledge. Particularly at the start of a



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SWARNIM SCIENCE COLLEGE

ORGANIC CHEMISTRY PRACTICAL (256020305)

M.Sc. SEMESTER – III

Preparation of industrially important compounds by following name reactions (Mechanism, purification and characterization of the synthesized compounds)

1. Sandmeyer reaction
2. Pechmann reaction
3. Skraup synthesis
4. Riemeier-Tiemann reaction
5. Kolbe-smith reaction
6. Claisen-smith synthesis
7. Hoffman reaction
8. Diels-alder reaction
9. Green –bromination

Estimation

1. Drug assay (estimation of sulpha drug)
2. Non-aqueous titration
3. Nitrite value
4. Drug dissolution

Reference books:

1. Quantitative analysis by Arther I.Vogel
2. Quantitative analysis by V.K.Ahluwalia
3. Quantitative analysis by Mann and sanders




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

Cellular Biology

Subject Code :253010301

B.Sc. Semester -3

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives:-

- To provide basic knowledge of Applications of Biotechnology
- To provide students basic knowledge of cell biology
- Students will understand how these cellular components are used to generate and utilize energy in cells.
- Explain how DNA allows for the passage of genetic information between generations.
- Compare the structure of prokaryotic and eukaryotic genetic information storage molecules.

Prerequisites:-

- Student Must have studied 2years B.Sc. with microbiology/Biotechnology as a major subject and knowledge of basic microbiology.

Course outline:-




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Unit No.	Course Contents	Teaching Hours
1.	Structure of cell: - Chemistry and Ultra structure of cellwall, - Membrane, - Flagella and Cilia organells - Mitochondria, - Chloroplast, - Golgi bodies, - peroxysome, - Endoplasmic reticulum, - Ribosome, - Nature of Cytosol, - Cytoskeleton structures, - Cellular diversity at structural and compositional levels among Prokaryotes, Archeobacteria and Eukaryotes (Plant, Animal and Fungi)	10
2.	Cellular Metabolism: - Oxidation-Reduction, - Energy and carbons source utilization, Electron transport chain and ATP generation, - Metabolism: Anabolism, Catabolism, Respiration, Passive transport, Facilitated diffusion, Group translocation, - Enzymes: Properties, - Mechanism of catalysis, - Allosteric controls	10
3.	Cell Division: - Cell division, Phases, Mitosis, Growth and tumour, - Cell cycle, Senescence and Apoptosis	10
4.	Cell Expression: - Central dogma of life, - Concept of gene, Transcription, Translation and Expression, Operon model, Coordination of Metabolism at enzyme Activity and Synthesis levels, - Cell Communication: Single molecules, Receptors, junction, Plasmodesmata and cell signalling	10
		40



Learning Outcomes:

- At the end of the course the student would have basic knowledge of Applications of Biotechnology
- The student can make predictions about natural phenomena occurring during the cell cycle.
- The student can describe the events that occur in the cell cycle.
- The student is able to construct an explanation, using visual representations or narratives, as to how DNA in chromosomes is transmitted to the next generation via mitosis, or meiosis followed by fertilization.
- The student is able to represent the connection between meiosis and increased genetic diversity necessary for evolution.
- The student is able to evaluate evidence provided by data sets to support the claim that heritable information is passed from one generation to another generation through mitosis, or meiosis followed by fertilization.

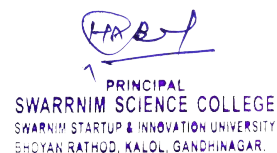
Teaching & learning Methodology:

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

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Books Recommended



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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

MOLECULAR BIOLOGY-I

Subject Code: 253010302

B.SC. Semester -3

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- To provide students the basic knowledge of molecular genetics of prokaryotes.
- The purpose of the course is to give students to introduction of replication, transcription, and translation in prokaryotes.
- To provide an understanding of DNA damage and repair system and also get idea about transposons and its applications.
- At the end of the course the students would have basic fundamentals of biotechnology.

Prerequisites

Student must have basic knowledge of molecular biology.

Course outline




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Unit No.	Course Contents	Teaching hours
1.	Prokaryotic Replication: • Definition, property and features of prokaryotic DNA. • Unidirectional, bidirectional. • Initiation, elongation and termination of replication. • Closed clamp and rolling model. • DNA damage and repair system.	10
2.	Prokaryotic Transcription: • Definition. • Concept of gene, promoter. • Initiation, Elongation, termination and anti-termination of transcription. • Post transcription modification. • Operon concept-Lac and Trp operon.	10
3.	Prokaryotic Translation: • Genetic code • Wobble Hypothesis An overview of translation in prokaryotes. • Initiation, elongation and termination of translation. • Post-translation modification	10
4.	Restriction Modification system: • Introduction, • Restriction enzymes, types, nomenclature, properties and examples (Eco RI, Bam HI, SmaI)	10
		40



Learning Outcomes

- The students will be able to apply the knowledge of the molecular biology to understand the concept of various fields like research fields, Gene manipulation, Genetic engineering, etc.
- Student should be able to understand basic concepts of Replication, Transcription, Translation, and restriction modification system in prokaryotes, DNA damage and repair mechanisms.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.

Teaching & Learning Methodology

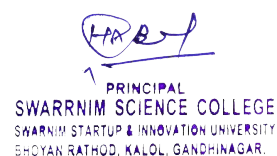
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- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc.) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Prescott, Harley, and Klein's Microbiology, J. M. Willey, L. M. Sherwood, C. J. Woolverton, 7 th Edition (2008), McGraw Hill Higher Education- USA
- Principles of Microbiology, R. M. Atlas, 2nd Edition (Indian Edition) (2015), McGraw Hill Education (India) Private Limited –New Delhi.



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SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

BIOTECHNOLOGY PRACTICALS

Subject Code: 256010303

B.Sc. Semester-3

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
-	-	12	12	8	-	200	-	-	200

PRACTICAL LIST

Sr. No	Name of Practical's
1.	Flagella staining
2.	Endospore Staining
3.	Isolation and Staining of Chloroplast
4.	Study of Mitosis stages
5.	Isolation of DNA from plant
6.	Isolation of RNA by Trizole method
7.	Lac Mutant




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SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

MICROBIOLOGY PRACTICALS

Subject Code: 256040303

B.Sc. Semester-3

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
-	-	12	12	8	-	200	-	-	200

PRACTICAL LIST

Sr. No	Name of Practical's
1.	Study of microbial diversity in soil by Winogradsky column
2.	Study of soil micro flora by buried slide method
3.	Microbiological analysis of soil (SPC)
4.	Quantitative bacterial analysis of water (SPC)
5.	Qualitative bacterial analysis of water (MPN)
6.	Measurement of moisture in soil sample
7.	Estimation of carbohydrate by DNSA method




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8.	Estimation of Protein by Folin-Lowery's method
9.	Study of Bacterial Growth curve
10.	Effect of antibiotics on bacterial growth



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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

MICROBIAL PHYSIOLOGY

Subject Code: 253040301

B.Sc. Semester -3

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- To provide students basic knowledge of Biochemistry and Metabolism.
- The purpose of the course is to give students an introduction of bacterial nutrition, uptakes of solutes, their growth requirements and growth measurements.
- To provide an understanding of energy production and regulation in cells, fundamentals of enzymology, etc.

Prerequisites

Student must have studied first year (FY) of B.Sc. with Microbiology as a major subject and knowledge of basic biology.



Course outline


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Unit No.	Course Contents	Teaching hours
1	Biomolecules - Chemical structure, properties, classification and Biological significance of Biomolecules: ➤ Carbohydrates ➤ Protein ➤ Lipids ➤ Nucleic acids	10
2	Enzymes - General introduction: Physical & Chemical properties - Structure of enzymes: Prosthetic group, Apo-enzyme, coenzyme, cofactors. - Localization of enzymes: Extra cellular and intra cellular - Nomenclature and classification of enzymes, IUB system of enzyme classification - Enzyme action: active site of enzymes - Mechanism of Enzyme action - Factors affecting on enzyme activity - Inhibition of enzyme activity: Competitive and Non competitive	10
3	Microbial Nutrition and Introduction to Metabolism - Types of Culture Media - Modes of Nutrition Uptake: Entry of nutrients in cell, Passive diffusion, facilitated diffusion and active transport - Classification of bacteria on the basis of growth supporting environmental factors such as oxygen, temperature, pH, osmotic pressure, salt and hydrostatic pressure - Introduction to microbial metabolism: Anabolism, catabolism, primary and secondary metabolism - Role of reducing power, precursor metabolites and energy rich compounds in cell metabolism	10
4	Microbial growth - Methods of reproduction in bacteria and new cell formation - Growth: Introduction to growth rate, generation time ➤ Criteria for growth measurement: Cell mass and Cell number, methods of their measurement ➤ Normal growth curve of bacteria ➤ Continuous growth and synchronous growth. - Chemotherapeutic agents as growth inhibitors: ➤ Principles of chemotherapy ➤ General mode of action of various chemotherapeutic agents: Sulfonamides, Antibiotics (penicillin, streptomycin, polymyxin)	10
		 40 PRINCIPAL



Learning Outcomes

- The students will be able to apply the knowledge of the physiology of microbes to understands concepts of various fields like research fields, fermentation industries, food industries, etc.
- Student should be able to understand basic concepts of culture media, modes of nutrition uptake, classification of bacteria based on physiological properties, physical and chemical properties of enzymes, mechanism of enzyme action, methods of reproduction in bacteria, growth and their measurements and chemotherapeutic agents, classification of biomolecules, anabolism, catabolism, primary and secondary metabolism, role of reducing power.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the theoretical data and laboratory experiments clearly and concisely that incorporates the stylistic conventions used by microbiologists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

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Books Recommended


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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

Soil & Water Microbiology

CODE: 253040302

B.Sc. 3rd Sem

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70		100

Objectives: -

- To provide basic knowledge of properties of soil its physicochemical characteristics, micro flora present in soil. What kind of interactions take place in soil.
- Student will learn about the importance of microorganism and its co-relation of soil & microbes.
- How the biogeochemical cycles run in the nature i.e rotation of various elements like nitrogen, sulfur, carbon, iron and phosphorus.
- Importance of soil fertility.
- To provide the importance of drinking water, how to check whether the water is potable or not, get to know different test like SPC,MPN, PA Test about qualitative and quantitative analysis of drinking water
- To provide the information of properties and types of waste water, what can be sources of the waste water.
- The purpose of the course is to provide the knowledge about the importance of treatment of waste water, how it can be treated by different methods and then disposed off in the environment.

Prerequisites

Student Must have studied S.Y B.Sc. with Microbiology as a major subject and knowledge of basic biology

Course outline:-




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BHOYAN RATHOD, KALOL, GANDHINAGAR.

Sr. No.	Course Contents	Number of Hours
1	Microbiology of soil - Physicochemical characteristic of soil: Soil as culture media and Soil micro flora - Methods of soil micro flora: - Direct microscopic methods, Agar plate technique, Enrichment culture technique, Buried slide technique and soil respiration technique - Microbial soil interactions: (A) Neutral, Positive and Negative associations (B) Interaction between plant roots and micro organisms (i) Rhizosphere and its significance (ii) Mycorrhiza	8
2	Microorganisms as Biogeochemical agents: - Biogeochemical transformations in soil: Mineralization and immobilization of elements - Rotation of elements in nature: (A) Nitrogen cycle (B) Sulfur cycle (C) Carbon Cycle (D) Iron cycle (E) Phosphorus Cycle - Soil fertility: Biofertilizers	10
3	Microbiology of drinking water: - Natural waters: Sources of contamination - Microbial indicators of fecal pollution (A) Coliforms as indicator (B) Methods for differentiation: IMViC test and Elevated temperature test (C) Microbial indicators other than coliforms - Nuisance organisms in water: Slime forming bacteria, Iron and Sulphur bacteria and Algae - Water borne diseases - Bacteriological examination of drinking water: (A) Sampling (B) Quantitative analysis: Total viable count, Membrane filter technique (C) Qualitative substrate test, P-A (Presence Absence test) - Purification of drinking water.	8
4	Microbiology of Wastewater: - Type of wastewater: Chemical and Microbiological characteristics of waste water - BOD, COD, TOD as indicators of untreated waste water, Pollution problems due to disposal of untreated waste. - Methods of wastewater treatment: (A) Primary treatment and secondary treatment: Principles and role of microorganisms in: Septic tank, Imhoff tank, trickling filters, activated sludge process and oxidation ponds. (B) Advanced treatment and Final treatment (C) Solid waste processing: Anaerobic sludge digestion and composting	10



Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Soil and Water Microbiology such as

- The students will learn about the properties of soil, nature of soil, types of soil present in the environment.
- Students get knowledge about how the microbes present in the soil interact with soil and help in increasing the soil fertility.
- This study will help them to know about the biogeochemical cycles running in nature how the elements are maintained in the environment and also how organism interact.
- The students will be able to understand the importance of drinking water, types of contaminants present in the water. With the help of practical also get to know about the how quality of water can be tested for its portability.
- The study will help in learning the quality, types, properties of waste water and also why waste water should be treated. Also learn about various methods like BOD, COD, TOC, TOD for treatment of waste water.

Teaching & Learning Methodology:-

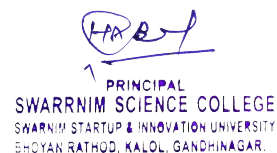
We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Basic Text & Reference Books:

1. Pelczar Jr, M J, Chan E C S, Krieg N R, (1986) Microbiology, 5th edn, McGraw-Hill Book Company, NY.
2. Alexander M, (1977), Soil Microbiology, 2nd Edition Krieger Publ. Co. Melbourne, FL
3. Atlas R M, (1977), Principles of Microbiology 2nd Edition, Wm. C. Brown Publ. Iowa USA



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Fundamentals of Organic Chemistry

CODE : 253020301

B.Sc.3rdSemester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

Objectives:- To provide basic knowledge Chemistry

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	[A] Carbohydrates: Introduction, classification of carbohydrates, osazone formation, epimerization, step up and step down reactions of monosaccharides, simple structures of glucose and fructose, Fischer's proof of configuration of D-glucose. [B] Amino acid : Introduction of amino acid, Classification and properties of amino acids, Zwitter ion , Isoelectric point, Strecker's and Gabreil pthalimide synthesis of amino acids.	14
2	[A] Electrophilic aromatic Substitution: Introduction, effect of substituent groups, determination of orientation and relative reactivity, classification of substituent groups, electrophilic substitution (ES) reactions.	14



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	(Nitration, Sulfonation, Halogenation, Friedel Craft alkylation and acylation), Orientation in mono and disubstituted benzene.	
3	[A] Heterocyclic Compounds Introduction, structure of Pyrrole, Furan and Thiophene, Paal Knorr synthesis and electrophilic substitution of Pyrrole, Furan and Thiophene, reactivity and orientation of electrophilic substitution reactions (ESR) in five membered heterocycles (Pyrrole, Furan and Thiophene) Structure of Pyridine, Electrophilic and Nucleophilic substitution reactions of pyridine. Basicity of pyridine.	14
4	Chemical Reactivity and Molecular Structure: (Acid- Base Properties) Acid-Bases, scale of acidity-basicity, Resonance effect, Hybridization, Inductive effect and electronic effects, steric effect and hydrogen bonding, Lewis acid and bases,	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

1. Robert Thornot Morrison and Robert Neilson Boyd, "**Organic Chemistry**", Prentice Hall of India Pvt Ltd, New Delhi, Sixth Edition, 1992.
2. Bhupinder Mehta, Manju Mehta, "**Organic Chemistry**", Prentice Hall of India Pvt Ltd, New Delhi, 2005.
3. James B Hedrickson Donald J. Cram and George S. Hammond, "**Organic Chemistry**", Mc-Graw-Hill Kogakusha, Ltd., Third Edition.
4. Arun Bahl, B. S. Bahl, "**Advance Organic Chemistry**", S. Chand & Company Ltd., New Delhi, First Edition, 2003.
5. I. L. Finar, "**Organic Chemistry**", Pearson Education Pet Ltd, New Delhi, First Edition, 2002.
6. G. Marc Loudon, "**Organic Chemistry**", Oxford University Press, Forth Indian edition, 2010.
7. P.S.Kalsi, "**Text book of Organic Chemistry**", MacMillan of India Pvt. Ltd., 1999.
8. P.L. Soni and H.M. Chawala, "**Text book of Organic Chemistry**", Sultan Chand & Sons



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Fundamentals of Analytical Chemistry CODE : 253020302

B.Sc.3rdSemester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	--	100

Objectives:- To provide basic knowledge Chemistry

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	[A] Basic concepts of Qualitative and Quantitative Analysis Introduction, Solubility product principle, Common ion effect, Separation of cations of each groups and separation of anions (acid radicals), Introduction of volumetric titration based on normality and morality of the solution, Conditions for volumetric analysis and types of titrimetric analysis. [B] Redox titration: Theory of redox titration, study of redox titration by electrochemical potential method, Ways of locating the end point for redox titration	8 6
2	Acid Base Titration: Theory of acid-base titration, Ways of locating the end point of an acid-base titration, Titration of strong acid with strong base, Titration of weak acid with strong base, Titration of weak base with strong	14



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	acid, Titration of weak base with weak acid, Factors determining the exact form of a pH curve.	
3	Complexometric Titrations : Theory of complexometric titration involving EDTA, Study of EDTA complex formation taking disodium salt of EDTA and effect of pH, Ways of locating the end point, Estimation of calcium and magnesium by complexometric titration by EDTA [B] Precipitation Titration [6 marks] Titration curves, Feasibility, Indicators, Mohr, Volhard and Fajans' Methods, Factors affecting solubility Precipitation Titration Titration curves, Feasibility, Indicators, Mohr, Volhard and Fajans' Methods, Factors affecting solubility	8 6
4	Precipitation Gravimetric [14 marks] Introduction, Precipitation, Digestion, Filtration, Washing of the precipitate, Drying and/or incineration of the precipitate, Weighing, Specific and selective precipitation, Organic precipitants, Masking or sequestering agent, Problems involved in precipitation gravimetry.	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

1. Dhruva Charan Dash, "Analytical Chemistry", PHI Learning Pvt. Ltd., New Delhi, 2011.
2. R.A.Day, A.L.Underwood, "Quantitative Analysis", Prentice-Hall of India Pvt.Ltd., New Delhi, 2004. (Sixth edition)
3. Gary D. Christian, "Analytical Chemistry", John Wiley & Sons, INC, New York, 1994. (Fifth edition)
4. Douglas A. Skoog, Donald M. West, F.James Holler, "Analytical Chemistry An Introduction", Saunders College Publishing, Harcourt Brace College Publishers, Philadelphia, 1994. (Sixth edition)
4. Y.Anjaneyulu, K.Chandrasekhar, Valli Manickam, "A Textbook of Analytical Chemistry", Pharma Book Syndicate, Hyderabad, India, 2006.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

SEMESTER-III

DEPARTMENT OF CHEMISTRY

CHEMISTRY PRACTICAL

(CODE : 253020303)

[A] ORGANIC MIXTURE

Organic Spotting and Estimation Organic spotting minimum eight compounds

Acids: Salicylic acid, Cinnamic acid, Anthranilic acid, Sulfanilic acid

Phenols: p-Nitrophenol, Beta-Naphthol

Bases: m and p – Nitroanilines, p-Toludine

Neutral : Solids:- Acetanilide, Glucose Liquids:- Acetophenone, Carbon tetrachloride (CCl₄), Methylacetate

[B] ANALYTICAL CHEMISTRY:

1. Nitrite by back titration.
2. Hardness of Water , Ca & Mg (Total Hardness) by EDTA
3. Estimation of MgCl₂ and Eriochrome Black – T (Back Titration)
4. estimation of calcium Gluconate (displacement titration)
5. Estimation of ferrous sulphate (redox titration)
6. Estimation of copper sulphate (redox titration)
7. Ba as BaSO₄(gravimetric analysis)
8. Estimation of NaCl by mohr's and volhard method.




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PHYSICS -301

Subject Code: 253050301

B.Sc. Semester 3

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

Objectives

- Develop a solid grasp of core concepts and applications of electronics, crystalline state, modern physics and wave optics. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites

Basic Mathematics and fundamentals of Physics.




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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Electronics: Basic characteristics of the Transistor: Basic Transistor amplifier, Two diode analogy for a transistor, Transistor input characteristics, Transistor collector characteristics, collector cut off current I_{CEO} , Forward current transfer ratio CE, Permissible operating area of a transistor CE, The basic common base amplifier, CB, Forward current transfer ratio CB, relation between α and β , collector cut off current I_{CBO} , physical explanation of CB and CE amplifying action, reduction of CE leakage current to I_{CO} , common collector amplifier, identifying the transistor leads	10
2	The common emitter amplifier: Graphical analysis of CE class A amplifier, input and output resistance, effect of adding a class A amplifier, conversion efficiency of class A amplifier with a direct coupled resistive load, phase relationship in CE amplifier, input waveform consideration, comparison of basic transistor amplifier Solid state electronics Devices: zener diode, zener diode specification, the voltage regulator circuit, design of a voltage regulator circuit, effect of supply voltage variation, zener break down mechanism, the tunnel diode, application of tunnel diode, the silicon controlled rectifier, the Uni junction transistor	12
3	Modern Physics and Elementary Quantum mechanics A. Historical origins of quantum theory, Difficulties with Classical : models, optical spectra Black body radiation, Frank- Hertz experiment, Stationary states of atoms. The correspondence principle, Bohr atom, Spectroscopic series, Quantisation of the orbits. The Elliptic Orbits, Particle in a box, rigid rotator, Harmonic oscillator, Short coming of an old quantum theory, Compton effect, particle diffraction, Wave packets and Einstein De Broglie relation B. The Schrodinger equation and stationary states, a free particle in one dimension, Generalization to three dimensions, Operator correspondence And the Schrodinger equation for a particle subjected to force, Physical Interpretation of wave function, Normalization, Non normalizable wave functions and box normalization, conservation of probability.	12
	Wave Optics A. Diffraction of Light (Fresnel class) : Frensel's half period zones, zone plate, difference between interference & diffraction, Fresnel & Fraunhofer diffraction. B. Fraunhofer class : Fraunhofer diffraction at two slits, diffraction at N slits, Plane diffraction grating, Dispersive power of grating, Grating at oblique incidence.	12



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	C. Resolving power of optical Instrument : Resolving power, Rayleigh's criterion of resolution, resolving power of telescope, relation between magnifying power & the resolving power of telescope, Resolving power of a plane diffraction grating, difference between resolving power & dispersive power of grating, comparison of prism & grating spectra.	

Learning Outcomes

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

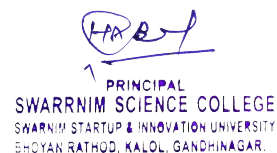
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- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.



Books Recommended

Introduction to Solid State Physics (7th Edition) by C. Kittel, Wiley (India)
Electronics Devices and Circuits By Allen Mottershed , PHI



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PHYSICS -302

Subject Code: 253050302

B.Sc. Semester 3

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

Objectives: -

Physics students will:

- Develop a solid grasp of core concepts and applications of fourier series, classical mechanics, nuclear physics and dielectrics. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites:-Engineering physics majors must have a basic understanding of fundamental physics and mathematics.




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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Dielectrics Polarization, Types of polarization, Types of dielectric materials, Laws of electrostatics field in presence of dielectrics, Energy of the field in the presence of a dielectric, Boundary conditions, Gaseous non polar dielectrics, Gaseous polar dielectrics, Non- polar liquids, Solid Dielectrics-Electrets, Electric Field, Stresses, Claussis-Mossotti equation	10
2	Magnetostatics : Types of magnetic materials, (diamagnetic, paramagnetic & ferromagnetic), Magnetic effects, The magnetic field, force on a current, Biot Savart law, The laws of magnetostatics, the magnetic potentials, Magnetic dipole in non-uniform magnetic field, Magnetic vector potential due to a small current loop, Magnetic media, Magnetisation, Magnetic field vector, Magnetic susceptibility & permeability, Boundary conditions, Uniformly magnetized sphere in external magnetic field, A comparison of static electric & magnetic fields	10
3	Classical Mechanics: Motion in a Central force field: General features of the motion, Motion in an inverse square law force field, Equation of the orbit, Kepler's laws of planetary motion Collision of particles : Elastic & inelastic scattering, Elastic Scattering Laboratory & Centre of mass system, Kinematics of elastic scattering in the laboratory system, inelastic scattering, cross-section, The Rutherford formula Moving Co-ordinate System : Rotating co-ordinate system, The Coriolis force, Motion on the earth, Effect of Coriolis force on freely falling particles	12
4	Nuclear Physics: A. Physical tools: Introduction, Interaction between particles & Matter, brief survey, Detectors for Nuclear particles (i) Proportional counter (ii) The Geiger counter (iii) Scintillation counter (iv) Solid state or semi-conductor detectors (v) Cloud & Bubble chambers (vi) Spark chamber; Particle Accelerators : Need for an accelerator of charged particles, (i) Van de Graff Generator (ii) The cyclotron (iii) Synchrotron (iv) The Betatron; Beta ray spectrometer B. Nuclear magnetic resonance (NMR), Introduction, The technique of NMR, Some experiments with NMR.	12



Learning Outcomes

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology

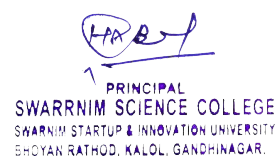
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- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Mathematical Methods in Physical Sciences by Mary L. Boas (John Willey & Sons)
- Mathematical Physics by H.K. Das, S. Chand Publishing Co
- Classical mechanics by R.G. Takewale & P.S. Puranik, Tata McGraw Hill
- Nuclear physics, An introduction by S. B. Patel, New Age International (P) Ltd
- Nuclear Physics by D.C. Tayal, Himalaya Publishing House
- Electromagnetics by B. B. Laud, Willey Eastern Limited
- Introduction to Electrodynamics by D. J. Griffith (3 edition), PHI learning



SWARNIM STARTUP & INNOVATION UNIVERSITY (SSIU)

SWARNIM SCIENCE COLLEGE

PHYSICS

B.Sc. Semester 3

Practical List

Sr. No.	Practical Name
2	Study of Resolving power of telescope.
3	Flatness of plate by Newton's ring.
4	Study of Numerical method of oscillatory motion.
5	Resolving power of telescope.
6	Wavelength of light using Hartmann formula.
7	Figure of Merit of a mirror galvanometer.
8	C1/C2 by Desauty's method
9	Zener diode as a voltage regulator
10	h-parameters of CE transistor.
11	Uni Junction Transistor
12	Load line and determination of Q point for BJT.
13	Absorption coefficient of liquid using photocell
14	Study of electron diffraction pattern
15	Resonance pendulum
16	Fourier Analysis
17	L by Maxwell's bridge
18	Liquid Lens



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Linear algebra

Subject Code: 253030301

B.Sc. Semester -3

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Student are evaluated on the basis of Mid term examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	-	-	30	--	70	-	100

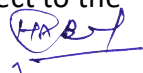
Objectives

- The aim of this subject is to present the important ideas in Linear equation using multiple method to student whose principal interest lie outside the field of mathematics.
- It is a subject which provide a vital arena where students can see the interaction of mathematics and machine computation.
- Student will demonstrate competence with the basic ideas of linear algebra and Partial derivatives including concept of linear system, basis, span, vector space, different type of solving series including Taylor's series, Fourier series.

Prerequisites

A Candidate for admission to the bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.




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Course outline: This Course is Designed to enable student to acquire the understanding and practice the application of calculus and Linear algebra and their properties .

Sr. No.	Course Contents	Teaching hours
1	<u>Unit: I</u> Definition and examples of vector space, subspaces, Necessary and sufficient condition to be a subspace, span of a set , Examples of subspaces, intersection, addition and direct sum of subspace , Intersection , addition and direct sum of subspaces.	10
2	<u>Unit: II</u> Finite Linear Combination, Linear dependence and linearly independence and their properties (with proof). Examples regarding Linear Dependence and independence . Dimension and Basis of a vector space , Dimensional Theorem.	8
3	<u>Unit: III</u> Linear Transformation : Defination and Examples , Range and kernal of a linear map and results regarding them . Rank and Nullity of a linear map , Rank - nullity Theorem , Examples for verification of Rank - Nullity Theorem . Inverse of a Linear map , Consequences of Rank-Nullity Theorem.	14
4	<u>Unit: IV</u> Matrix associated with a Linear map , Linear map associated with a Matrix . Linear operation in $\mu_{m,n}$, Only introduction of $L(U,V)$ and Isomorphism between $L(U,V)$ and $\mu_{m,n}$, Dimension theorem for $\mu_{m,n}$, and $L(U,V)$. Rank-Nullity of Matrices and verification of the Rank - Nullity Theorem for Matrices.	10



Learning Outcomes


 PRINCIPAL
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 SWARNIM STARTUP & INNOVATION UNIVERSITY
 BHOYAN RATHOD, KALOL, GANDHINAGAR.

After Successfully Completion of the Course the student will be

- Solve system of linear equation using multiple methods including Gaussian elimination and matrix inversion.
- Determine if the system is consistent and find its general solution .
- Row reduce a matrix to reduce echelon form.
- Determine a subspace of a vector space , null space , and a column space.
- Find the dimension of subspace spanned by the given vectors. .
- Understand the partial derivative and solve different order of partial derivatives .
- Understand different type of series and method to solve that series.
- Know about the Convergent and Divergent of the Series .

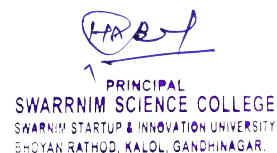
Teaching & Learning Methodology

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs.
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Linear Algebra by K.Hoffman and R. KunzaA text book of Modern Abstract Algebra by Shanti Narayan, S.Chand& Co., New Delhi.
2. Basic Linear Algebra with Mat lab by S.K.Jain, A.Gunawardena & P.B. Bhattacharya.
3. Linear algebra by I.N Herstein.
4. Differential Calculus by Shanti Narayan, S.Chand & co., New Delhi.
5. Differential Calculus by Gorakhprasad, Pothishala Pvt. Ltd., Allahabad.
6. Real Analysis by R.R. Goldberg, Oxford and I.B.H. Publishing Co. Pvt. Ltd.
7. Mathematical Analysis by S.C. Malik, Wiley, Eastern Ltd., New Delhi.
8. Linear Algebra by V Krishnamurthy , V P Mainra , J L Arora.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

NUMERICAL ANALYSIS

Subject Code: 253030302

B.Sc. Semester -3

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Student are evaluated on the basis of Midterm examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	-	-	30	--	70	-	100

Objectives :-

- The aim of this subject is to present the important ideas in Numerical Analysis using multiple methods to student whose principal interest lie outside the field of mathematics.
- It is a subject which provides a vital arena where students can see the interaction of mathematics and machine computation.
- Student will demonstrate competence with the basic ideas of numerical analysis and including concept of numerical analysis like solution to numerical, algebraic transcendental equations, finite differences, interpolation formula, numerical differentiation and integration, numerical solution to ordinary differential equations .

Prerequisites:-

A Candidate for admission to the Bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.




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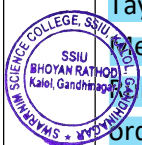
Course outline:

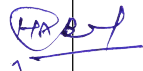
This Course designed for undergraduate and graduate students working on scientific, engineering, statistics, and mathematics majors This course serves as an introduction to numerical methods used to applied mathematics problems, with applications across the spectrum of disciplines.

Sr. No.	Course Contents	Teaching hours
1	Unit: I Solutions to numerical, algebraic and transcendental equations, Bisection Method, Newton's Iteration method, method of false Position, Rate of convergence of Newton- Rapson method.	10
2	Unit: II Interpolation: Finite differences, Forward, central and backward differences, Differences of a polynomial, Gregory Newton's forward and backward forward formula, Gauss forward and backward formula, Bessel's Formula, Stirling formula. Lagrange's Everett's formula (without proof).	12
3	Unit: III Interpolation with unequal Interval : properties of divided differences, Newton's divided difference formula , Inverse interpolation , Lagrange's interpolation formula , Numerical differentiation and Integration , derivatives using Newton's forward and Backward difference formula, Maximum and minimum values of a tabulated function. Trapezoidal rule, Simpson's (1/3) rd and (3/8) th rules.	12

Unit: IV

4	Numerical solution of ordinary differential equation:- Taylor's series Method for simultaneous first order differential equations, Taylor's series Method for higher order differential equations , Euler's method, modified Euler's method, Runge-kutta's method, Higher order Runge –Kutta Methods Runge-Kutta's methods for simultaneous first order equation, Runge-kutta's methods for second order equation, Picard	10



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	method.	

Learning Outcomes:-

After Successfully Completion of the Course the student will be

- Derive Numerical methods for various mathematical operation and tasks, such as interpolations, differentiations, integration, the solution of linear and nonlinear equations, and the solution of linear and nonlinear equation, and the solution of differential equations.
- Analyse and evaluate the accuracy of common numerical methods.
- Derive numerical methods for various mathematical operations and tasks , such as interpolation, differentiations, integrations , the solution of linear and nonlinear equations..

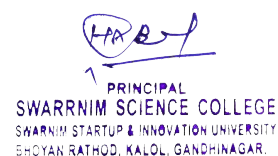
Teaching & Learning Methodology

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. S.S.Sastry, Introductory methods of Numerical analysis, Prentice hall of India, 1990.
2. Numerical Analysis by G. Shankar Rao.
3. Numerical Analysis, B.S.Grawal.
4. Numerical methods by Dr. P. kandasamy.
5. Introduction of Numerical analysis by Josef Stoer and Roland Bulirsch.
6. Analysis of Numerical Methods by Isaacson and Herbert Keller.



SWARNIM STARTUP & INNOVATION UNIVERSITY

Communication Skills – 1

CODE: 253000302

Sem 3

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
2	-	-	2		50	-	50	-	100

Objectives: -

- To develop employability Skills of the students
- To develop skills of data collection and interpretation skills
- To cultivate basic knowledge of grammar and also writing skills
- To develop reading habit of the inspirational non-fictions.

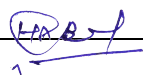
Prerequisites:-

- Being able to communicate effectively is the most important of all life skills; hence, students are expected to have good spirit for learning English as second language.

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	DEVELOPING EMPLOYABILITY SKILLS Drafting a job application letter- SWOT- Interviews- Interviewer- Interviewee- Types of interview questions- Types of interview: 1) Employment interview 2) Appraisal/ promotional interview 3) Telephonic interview	12
2	DATA COLLECTION AND INTERPRETATION SKILLS Primary and secondary sources of information- preparing questionnaires-Questionnaire on social and educational survey	8




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3	BASIC WRITING SKILLS Sentence structure- use of phrases and clauses in sentences- Importance of proper punctuations- Précis writing	12
4	"Stay Hungry stay foolish" By Bansal Rashmi, West land, CIIIE, IIM Ahmedabad.	10
	Total hours:	42

Learning Outcomes: -

- * Students will learn to write effective resume and job application
- * They will learn primary and secondary data and also their interpretation.
- * Students will learn basic grammar.
- * Students will cultivate reading habit of inspirational non fiction.

Teaching & Learning Methodology:-

- Power point presentation
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- It includes audio video clips that can provide ample number of exercise to the students
- Face- to face oral communication to provide a platform where they can perform and practice well.




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Number Theory

Subject Code: 256050401

M.Sc. Semester - 4

Teaching & Evaluation Scheme

This program leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding of the fundamental and advanced content in Mathematics which will be determined by his /her particular choice of courses, according to his/her particular needs and interests.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives :

The purpose of the course is :

- To give a simple account of classical number theory, prepare students to course in number theory and to demonstrate applications of number theory.

Prerequisites :

A Candidate for admission to the Master of Science (Mathematics) must have a 10+2 Science and Bachelor degree with mathematics Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline: The objective of this course is to provide knowledge of Linear Congruence and Number Theoretic Functions , Euler's Phi function and Primitive Roots , Quadratic Congruence, Fermat's last theorem and Sum of Squares




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Sr. No.	Course Contents	Teaching hours
1	Unit 1 Introduction Division algorithm, Greatest common divisor, Euclidean algorithm, Diophantine equation $ax + by = c$, Fundamental theorem of arithmetic.	10
2	Unit : 2 Linear Congruence and Number Theoretic Functions: Basic properties of congruence, Linear congruence, Chinese remainder theorem, Fermat's little theorem, Wilson's theorem, Fermat-Kraitchik factorization method, Number-Theoretic functions, Mobius inversion formula, Greatest integer function.	12
3	Unit : 3 Euler's Phi function and Primitive Roots: Euler's Phi function, Euler's theorem, Properties of the Phi function, Order of an integer modulo n, Primitive roots for primes, Composite numbers having primitive roots, The theory of indices, Euler's criterion, Legendre symbol and its properties.	12
4	Unit : 4 Quadratic Congruence, Fermat's last theorem and Sum of Squares: Quadratic reciprocity law, Quadratic congruence with composite moduli, The equation $x^2 + y^2 = z^2$, Fermat's last theorem, Sum of two squares, Sum of more than two squares.	12

Learning Outcomes :

On successful completion of the course, students should be able to

- Demonstrate their knowledge of divisibility, prime numbers and the Euclidean algorithm.
- Solve linear Diophantine equations and congruence of various types, and use the theory of congruence in applications.
- Prove and apply properties of multiplicative functions such as the Euler phi-function and of quadratic residues.
- Know how to express an integer in sum of two or more squares.

Teaching & Learning Methodology:

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Research Methodology

Subject Code: 256050402

M.Sc. Semester - 4

Teaching & Evaluation Scheme

This program leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding of the fundamental and advanced content in Mathematics which will be determined by his /her particular choice of courses, according to his/her particular needs and interests.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives :

When one has completed this degree he / she will be able to demonstrate the following skills:

- To describe the sample selection, describe the procedure used in designing the instrument and collecting the data, and provide an explanation of the statistical

procedures used to analyze the data.

Prerequisites :

A Candidate for admission to the Master of Science (Mathematics) must have a 10+2 Science and Bachelor degree with mathematics Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline: The objective of this course is to provide knowledge of Research and types of research, Introduction to Statistics , Statistical significance ,Scientific writing




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Sr. No.	Course Contents	Teaching hours
1	Unit 1 Introduction to Statistics: Definition and scope, Data collection, Classification, Tabulation of data and its graphical and diagrammatic presentation, Measures of central tendency, Dispersion and standard error, Probability distributions, Binomial, Poisson and normal distribution.	12
2	Unit 2 Statistical significance: Hypothesis testing, Types of error, Level of significance, Various test and Chi- square goodness of fit, Simple linear regression and Correlation analysis.	12
3	Unit 3 Statistical significance: Hypothesis testing, Types of error, Level of significance, Various test and Chi- square goodness of fit, Simple linear regression and Correlation analysis.	10
4	Unit 4 Research Knowledge : Scientific writing, Research proposal, Research paper, Review paper, Thesis, Conference Report, Book review and project report (any two), Reference writing, Scientific abbreviations, Preparation and delivery of scientific presentations, Research report/ Thesis formatting and typing (computing), Title page, Certificate, Declaration, Acknowledgement, List of table, Figures, Abbreviations and symbols, Chapters quotations, Table, Figures, Summary, Appendices, References etc.	14

Learning Outcomes :

On successful completion of the course, students should be able to

- Understand some basic concepts of research and its methodologies
- Identify appropriate research topics
- Select and define appropriate research problem and parameters
- Prepare a project proposal (to undertake a project)
- Organize and conduct research (advanced project) in a more appropriate manner



- Write a research report and thesis

Teaching & Learning Methodology :

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

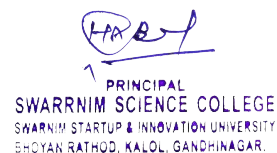
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. How to write and publish a scientific paper by Day, R. A
2. Guide to write scientific papers by Garson, G. D.
3. Developing Bioinformatics computer skill, Gibas.
4. Instrumental methods of analysis, D. A Skoog.

E-Resources

- ims.nyu.edu/~cfgranda/pages/OBDA_fall17/notes...
- www.sxccal.edu/mathematics-lecture-notes
- <https://users.math.msu.edu/users/gnagy/teaching/la.pdf>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Integral Transforms

Subject Code: 256050403

M.Sc. Semester - 4

Teaching & Evaluation Scheme

This program leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding of the fundamental and advanced content in Mathematics which will be determined by his /her particular choice of courses, according to his/her particular needs and interests.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives :

When one has completed this degree he / she will be able to demonstrate the following skills:

☐ Fourier and Laplace Transforms and indicate their applications in fields such as digital signal processing and differential equations.

Prerequisites :

A Candidate for admission to the Master of Science (Mathematics) must have a 10+2 Science and Bachelor degree with mathematics Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline: The objective of this course is to provide knowledge of Laplace transform, Fourier transform, Mellin transform, Henkel Transform .




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Sr. No.	Course Contents	Teaching hours
1	Unit 1 Laplace transform: Definition and its properties, Rules of shifting, Laplace transforms of derivatives and integrals, Properties of inverse Laplace transform, Convolution theorem, Complex inversion formula.	12
2	Unit 2 Fourier transform: Definition and properties of Fourier sine, cosine and complex transforms, Convolution theorem, Inversion theorems, Fourier transform of derivatives, Application of Fourier transform.	12
3	Unit 3 Mellin transform: Definition and elementary properties, Mellin transforms of derivative and integrals, Inversion theorem, Convolution theorem.	10
4	Unit 4 Henkel Transform: Definition and elementary properties, Henkel transforms of derivative and integrals, Inversion theorem, Convolution theorem.	12

Learning Outcomes :

On successful completion of the course, students will be able to :

- Understand the idea of a principal value integral and the significance of absolute integrability.
- Define the Fourier transform and how to compute it for standard examples.
- Understand Inversion Theorem and its uses in computing transforms and inverse transforms.
- Know applications of Fourier transforms to partial differential equations.
- Define Laplace transform and how to compute it for standard examples.
- Know applications of Laplace transforms to differential equations.

Teaching & Learning Methodology :

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:




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- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. “Integral Transforms and Their Applications”, Brian Davies 3rd edition Springer Publication
2. “Integral Transforms for Engineers” Larry c Andrews, Bhimsen KShivamoggi, published By SPIER – The international society for optical engineering.
3. “Applied Integral Transforms” M. Ya. Antimirov, A. A. Kolyshkin, Remi Vaillancourt.
Published by American mathematical Society.
4. Integral Transforms”, A. R. Vasishtha, R. K. Gupta, Krishna Prakashan

E-Resources

- ims.nyu.edu/~cfgranda/pages/OBDA_fall17/notes...
- www.sxccal.edu/mathematics-lecture-notes
- <https://users.math.msu.edu/users/gnagy/teaching/la.pdf>



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DEPARTMENT OF MATHEMATICS

TOPOLOGY – II

Subject Code: 256050404

M.Sc. Semester -4

Teaching & Evaluation Scheme

This program leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding of the fundamental and advanced content in Mathematics which will be determined by his /her particular choice of courses, according to his/her particular needs and interests.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives :

The objective of this course is

- Topological properties play an important role in most branches of mathematics. The purpose of the course is to develop further the concepts, which are introduced in Topology I, in more advanced settings.
- This course will provide a firm foundation in topology to enable the student to continue more advanced study in this area.

Prerequisites :

A Candidate for admission to the Master of Science (Mathematics) must have a 10+2 Science and Bachelor degree with mathematics Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility .

Course outline: The objective of the course is to introduce some Separable Axioms, Regular and Normal Spaces , Product and Quotient Topology , Net and Filters in Topological Spaces




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Sr. No.	Course Contents	Teaching hours
1	Unit 1 Separable Axioms: T ₀ -spaces, T ₁ -spaces, T ₂ -spaces, First countable Space, Second countable space, Lindel of space, Separable spaces.	12
2	Unit 2 Regular and Normal Spaces: Regular spaces, Normal spaces, Completely normal spaces, Completely regular spaces, One point compactificatoin.	12
3	Unit 3 Product and Quotient Topology: Weak topologies, Product spaces, Tychonoff topology, Tychonoff theorem, Quotient topology.	10
3	Unit 4 Sequence, Net and Filters in Topological Spaces: Sequences in topological spaces, Direct sets, Residual subset, Net, Convergence of a net in topological space, Ultranet, Subnet, Cluster points of a net, Filters, Filters generated by collection of sets, Filter base, Ultrafilter and its characterization, Convergence of filters, Cluster points of a filter.	12

Learning Outcome :

On successful completion of the course, students should be able to

- Recognize whether or not a topological space is a particular space or not (like First countable, Second Countable T₀ etc.) and be familiar with the basic properties of these spaces and their proofs;
- Understand the Tchonoff topology and quotient topology.
- Understand net and filters

Teaching & Learning Methodology :

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs




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- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. R. Munkers, Topology, Prentice Hall of India, 2011.
2. Simmons G. F., Introduction to Topology and Modern Analysis, McGraw-Hill Co., Tokyo, 1963.
3. J.N. Sharma, J.P. Chauhan, Topology, Krishna Prakashan Media (P) Ltd. 43rd edition, 2013

E-Resources

- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics.
<https://swayam.gov.in/> and <https://nptel.ac.in/>
- cims.nyu.edu/~cfgranda/pages/OBDA_fall17/notes...
- www.sxccal.edu/mathematics-lecture-notes.
- <https://users.math.msu.edu/users/gnagy/teaching/la.pdf>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

OPERATIONAL RESEARCH– II

Subject Code: 256050404

M.Sc. Semester -4

Teaching & Evaluation Scheme

This program leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding of the fundamental and advanced content in Mathematics which will be determined by his /her particular choice of courses, according to his/her particular needs and interests.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives :

The objectives of this course is to

- Explain the physical properties of a fluid and the consequence of such properties on fluid flow.
- Identify the fundamental kinematics of a fluid element.
- State the conservation principles of mass, linear momentum, and energy for fluid flow.
- Apply the basic applied-mathematical tools that support fluid dynamics.
- Create models of inviscid, steady fluid flow over simple profiles and shapes.

Prerequisites :

A Candidate for admission to the Master of Science (Mathematics) must have a 10+2 Science and Bachelor degree with mathematics Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility .

Course outline: The objective of the course is to Fundamental of Fluid Dynamics, Conservation of Momentum, Irrotational Motion, Motion in Two Dimensions .




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Sr. No.	Course Contents	Teaching hours
1	Unit – 1 Fundamental of Fluid Dynamics: Basic Concepts, Types of fluid, Fluid properties, Density, Specific weight, Specific volume, Specific gravity, Pressure, Viscosity, Temperature, Thermal conductivity, Specific heat, Surface tension, Vapor pressure, Bulk modulus of Elasticity, Kinematics of the Flow Field, Lagrangian method, Eulerian method, Relationship between the Lagrangian and Eulerian method, Velocity of a fluid particle at a point, Local, convective and material derivatives, Equation of continuity, Equation of continuity (stream tube concept, Equation of continuity (Cartesian coordinates), Equation of continuity (spherical polar coordinates), Equation of continuity (cylindrical polar coordinates), Equation of continuity (Lagrangian method), Equivalence of the two forms of the equation of continuity, Velocity potential, Irrotational flow, Rotational flow, Vorticity, Vorticity vector, Vortex lines, Vortex tube, Vortex filament, Boundary Surface.	10
2	Unit – 2 Conservation of Momentum: Euler's equation of motion along a stream line, Equation of motion of an inviscid fluid, Equation of motion of an inviscid fluid (Cartesian coordinates), Cauchy's integral, Bernoulli's equation (Stream tube method), Conservative field of force, Integration of Euler's equation, Helmholtz equations, Symmetrical forms of the equation of continuity, Spherical symmetry, Cylindrical symmetry, Impulsive motion of a fluid, Impulsive motion of a fluid (Cartesian coordinates), Energy equation, Applications of Bernoulli's Theorem, Flow over a protuberance in a closed channel, Pitot tube, Venturi tube, Orifice plate, Weirs.	12



3	Unit – 3 Irrotational Motion: General motion of a fluid element, Motion of a fluid element (Cartesian coordinates), Vorticity, Body forces and surface forces, Flow and circulation, Stoke’s theorem, Kelvin’s circulation theorem, Connectivity, Cyclic constants, Irrotational motion in multiplyconnected space, Acyclic and Cyclic motion, Green’s theorem, Deductions from Green’s theorem, Mean value of the velocity potential over a spherical surface, Motion regarded as due to Sources and Sinks, Liquid extending to infinity Kelvin’s minimum energy theorem.	12
3	Unit – 4 Motion in Two Dimensions: Stream function (Plane polar coordinates), Physical interpretation of Stream function, Complex potential and complex velocity, Uniform flows, Two dimensional Source and Sink, Strength, Complex potential of a source, Two-dimensional doublet, Complex potential of a doublet, Images in two-dimension, Image of a source with regard to a plane, Image of a doublet with regard to a plane, The circle theorem, Image of a Source with regard to a circle, Image of a doublet with regard to a circle, Conformal representation, Application to Fluid Dynamics.	12

Learning Outcome :

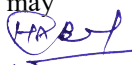
On successful completion of the course, students should be able to

- Classify and exploit fluids based on the physical properties of a fluid.
- Compute correctly the kinematical properties of a fluid element.
- Apply correctly the conservation principles of mass, linear momentum, and energy to fluid flow systems with emphasis on aerodynamics.

Teaching & Learning Methodology :

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:




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- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Shanti Swarup, Fluid Dynamics, Krishna Prakashan
2. F. Chorlton, Text Book of fluid dynamics, CBS Publication, Delhi 1985.
3. R.W. Fox and A.T. Mc Donald, Introduction to fluid mechanics, Wiley, 1985.
4. E.Krause, Fluid Mechanics with problems and solutions, Springer, 2005.
5. B.S. Massey, J.W. Smith and A.J.W. Smith, Mechanics of fluids, Taylor and Francis, New York, 2005.
6. P.Orlandi, Fluid Flow Phenomena, Kluwer, New York, 2002.
7. T.Petrila, Basics of Fluid Mechanics and Introduction to Computational Fluids Dynamics,
Springer, Berlin, 2004.

E-Resources

- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics.
<https://swayam.gov.in/> and <https://nptel.ac.in/>
- cims.nyu.edu/~cfgranda/pages/OBDA_fall17/notes...
- www.sxccal.edu/mathematics-lecture-notes.
- <https://users.math.msu.edu/users/gnagy/teaching/la.pdf>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

MATHEMATICAL PRACTICALS

Subject Code: 256050305

M.Sc. Semester -3

Learning Objectives:

- To understand basic concepts of complex analysis
- To understand the concept of Variational problems with fixed and moving boundaries.
- Give introductory idea of integral equation
- To understand Fredholm integral equation and its solution.
- To develop basic concepts of research methodology
- To understand basic concepts of topology
- Give idea of basic inventory control models
- Develop the knowledge of queuing theory
- Formulate and solve different replacement and maintenance models
- Study sequencing techniques.

Outline of the Course:

This course contains only problem solving sessions

Sr. No	Topics	Practical (Hours)
	Compulsory Subjects	12
1.	Examples on topological spaces.	12
2.	Examples on Mathematical modeling	12
3.	Examples on hypothesis testing.	12
4.	Examples on continuous functions.	12
5.	Examples on connectedness.	12
6.	Examples on compactness.	12
7.	Examples on deterministic inventory control models	12
8.	Examples on queuing theory	12
9.	Examples on replacement and maintenance models	12
10.	Examples on sequencing problems	12

Learning Outcome :




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On successful completion of the course, students should be able to

- Understand the meaning of inventory control as well as various forms and functional role of inventory.
- Calculate EOQ for minimizing for minimizing total inventory cost.
- Identify and examine situations that generate queuing problems
- Understand various components of a queuing system and description of each of them
- Make distinction between several queuing models and derive performance measure for each of them.

Teaching & Learning Methodology :

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

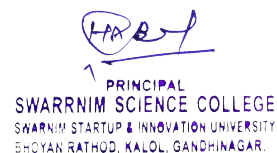
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. John Duncan, The Elements of Complex Analysis, John Wiley and Sons Ltd. London (1968).
2. J B Conway, Functions of one complex variables, 2nd edition, Springer Verlag, New York (1967) [Indian edition: Narosa Publication House, New Delhi (1982)].
3. Dr. Shailesh S. Patel, Dr. Narendra B. Desai, Complex Analysis and Numerical Techniques, Volume IV, Atul Prakashan
4. J. N. Kapur, Mathematical Modeling, Wiley Eastern Ltd., 1988.
5. J. N. Kapur, Mathematical Models in Biology and Medicine, East West press Pvt Ltd., 1992
6. Braum, Coleman & Drew. Differential Equation Models, Springer Verlag, 1983.
7. Martin Braun, Differential Equation and their application, Springer Verlag, 1977.
8. Dym & Lvey, Principles of Mathematics Modeling, Academic Press- 1980.
9. Haberman, Mathematical Model, Prentice- Hall Inc., 1977.
10. Bhupendra Sinh and Neenu Agrwal, Bio Mathematics, Krishna Prakashan.
11. How to write and publish a scientific paper by Day, R. A
12. Guide to write scientific papers by Garson, G. D.
13. Developing Bioinformatics computer skill by Gibas.
14. Instrumental methods of analysis by D. A Skoog.
15. J. R. Munkres, Topology, Prentice Hall of India, 2nd edition, 2011.
16. J. N. Sharma, J. P. Chauhan, Topology, Krishna Prakashan Media (P) Ltd., 43rd edition, 2013.
17. J. K. Sharma, "Operation Research- Theory and Application", 4th Edition, Macmillan Publishers India Ltd.

E-Resources

- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics.
<https://swayam.gov.in/> and <https://nptel.ac.in/>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

M.Sc. Semester -4

Advance Quantum Mechanics-II & Nuclear Physics-II

Subject Code: 256040401

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- To provide basics of nuclear physics that involves the nuclear forces and formation of universe.
- The purpose of the course is to introduce students to understand the various quantum mechanical phenomena and to develop skills for solving problems in the same.
- To provide an understanding the various transducers and related instruments that are used in research as well as in the industry level.

Prerequisites

Student Must have studied B.Sc. with physics as a major subject and knowledge of basic mathematics.




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Course outline

Sr. No.	Course Contents	Teaching hours
1	Scattering theory: Kinematics of the scattering process: differential and total cross sections elastic and inelastic scattering, wave mechanical picture of scattering: the scattering amplitude, Green's functions: formal expression for scattering amplitude. The Born approximation, validity of the Born approximation, The Born series, The Eikonal approximation, Asymptotic behavior of partial waves: phase shifts, the scattering amplitude in terms of phase shift, the differential and total cross sections: optical theorem, Phase shifts: Relation to the potential, Potentials of finite range, Low energy scattering, scattering by a square well potential, scattering by a hard sphere, scattering by a coulomb potential, Complex potential and absorption.	14
2	Nuclear Properties Nuclear spin, electric moments, magnetic moments, a brief description of hyperfine structure of atomic spectra, effect of an external magnetic field on the hyperfine structure, determination of I from molecular band spectra, molecular beam resonance method – experiments on hydrogen and deuteron.	14
3	Two-body forces Deuteron: Excited states of the deuteron, neutron proton scattering at low energies, scattering length, spin dependence of neutron proton scattering, singlet state in n-p system, effective range theory in np scattering, tensor forces, magnetic moment and electric quadrupole moment of the deuteron, proton proton scattering at low energy, exchange forces, meson theory of nuclear forces.	14
4	Transducers, Measurement and control Transducers: Desired characteristics of transducer, Different transducers: Temperature, Capacitive, Magnetic field, LVDT, Optical, Piezoelectric, Pyrometer. Measurement and control: Types of noises in electrical systems, Signal to noise ratio, Enhancement of signal to noise ratio, Signal conditioning and recovery, Impedance matching, filtering and noise reduction, shielding and grounding, Phase sensitive detector and lock-in amplifier.	14



Learning Outcomes

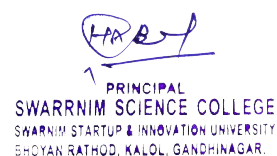
- The students will be able to understand the aspects of the quantum mechanical phenomena in apply the mathematical skills to solve quantitative problems in the study of physics and enable to apply integral transform to solve mathematical problems of interest in physics.
- Student should be able to understand basic concepts of Quantum Mechanics, Postulates of Quantum Mechanics, Mathematical foundations of Quantum Mechanics, Schrödinger equation, Symmetries in Quantum Mechanics, Approximation methods and students should be able to Solve one dimensional Schrödinger equations, Solve Schrödinger equations for central potentials. Use time-independent perturbation theory, Use time-dependent perturbation theory.
- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs



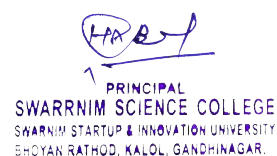
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Enge H. A., Introduction to Nuclear Physics
2. Roy R. R. and B. P. Nigam, Nuclear Physics theory and experiment
3. Tayal D. C., Nuclear Physics
4. Patel S. B., Nuclear Physics - an introduction
5. Khanna M. P., Introduction to particle physics, PHI 6
6. Leon M., Particle Physics - an introduction
7. Perkins D. H., Introduction to High Energy Physics
8. David C. Cheng and Gerard K. O. Neill, Elementary Particle Physics - an introduction
9. Gasiorowicz S., Particle Physics
10. T. P. Holmann., Experimental systems, Applications and Design : TMH publication.
11. M. Sayer & A Mansingh., Measurement, Instrumentation and experimental design for physicists and engineers: Prentice Hall of India
12. Mathews & Venketesan, A Text Book of Quantum Mechanics, TMH, 1976

E-Resources

- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics and nuclear physics. <https://swayam.gov.in/> and <https://nptel.ac.in/>
- https://www.grc.nasa.gov/www/k-12/Numbers/Math/documents/Scatteringtheory_TM2002211716.pdf
- <https://web.stanford.edu/~boyd/ee102/scatteringtheory.pdf>
- https://link.springer.com/chapter/10.1007/instrumentsandapplication/978-981-15-2225-3_5



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

M.Sc. Semester-4

Numerical Techniques & Sophisticated Experimental and Characterization Techniques

Subject Code: 256040402

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The course aims to develop an understanding of Numerical methods which are for simplified treatments of many complex problems in physics and provides the foundation for the modern understanding of subject.
- To have an appreciation for the modern aspects of electronics; Digital electronics and related topics like conversion of analog to digital.

Prerequisites

Student must have studied B.Sc. with physics as a major subject and knowledge of basic mathematics and electronics.




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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Numerical Solution of Ordinary Differential Equations Introduction, Picard's method, Taylor's series method, Euler's method, Modified Euler's method, Runge's method, Runge-Kutta method, Predictor-corrector method, Milne's method, Adams-Bashforth method	14
2	Numerical Solution of Partial Differential Equations Introduction, Classification of second order equations, Elliptical equations, Solution of Laplace equation, Solution of Poisson's equation, Parabolic equations, Solution of one-dimensional heat equation, Solution of two-dimensional heat equation, Hyperbolic equations, Solution of wave equation.	14
3	Digital Electronics Parity generators and checkers, read only memory, programmable array logic. Clocks & Timers: Clock waveform, TTL clock, 555 Timer (internal block diagram) as Monostable Multivibrator and as Astable Multivibrator. Shift Registers: Types of registers, serial in - serial out, serial in - parallel out, parallel in - serial out, parallel in - parallel out, ring counter. Counters: Concept of asynchronous counters (IC 7493 Binary counter, IC 7490 Decade counter), Concept of synchronous counters (IC 74193-4-bit updown counter) Digital clock.	14
4	D/A and A/D Conversion Variable register network, Binary ladder, D/A converter, D/A accuracy and resolution, A/D converter - simultaneous conversion, counter method, continuous A/D conversion, A/D techniques, Dual slope A/D conversion, A/D accuracy and resolution, application of DAC & ADC, Displays: LED (seven segment), dot matrix, plasma, LCD.	14

Learning Outcomes

- The students will be able to apply the Variational principles to real physical problems. The students will be able to model mechanical systems, both in inertial and rotating frames, using Lagrange and Hamilton equations.
- The students will be able to work out equations of state and thermodynamic potentials for elementary systems of particles; and use and develop mean field theory for first and second order phase transitions.




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- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Numerical Methods in Engineering and Science, B.S. Grewal and J. S. Grewal, Khanna Publishers.
2. Numerical Methods, Balgurusamy, Tata McGraw-Hill Pub. Co. Ltd, New Delhi (2000)
3. Numerical Methods with Computer Programs in C++, Pallab Ghosh, Prentice-Hall of India
4. Private Limited, New Delhi (2006)
5. Digital Principles and Applications, Albert Paul Malvino , Donald P. Leach and Saha, Tata
6. McGraw-Hill Publishing Company Limited, New Delhi
7. Fundamentals of Digital Circuits, Anand Kumar, PHI Private Limited, New Delhi (2006)
8. Digital Logic and Computer Design, Morris Mano, PHI Private Limited, New Delhi (2006)



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

M.Sc. Semester-4

Microwaves and Microprocessor-II

Subject Code: 256040403

Teaching & Evaluation Scheme: -

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

Objectives

- Various techniques of modulation and different aspects of digital communication are included in this paper.
- Radio wave propagation is an important aspect of long-distance communication; different modes of radio wave propagation are covered in this paper. Satellite communication and optical fiber communication which revolutionized the communication systems are also covered this paper.
- Microprocessor is considered as the building block of modern computers. Microprocessor - I course covers an architecture, instruction sets including classification, buses, machine cycles, writing and executing of simple programs as well as pin and functional block diagrams of 8-bit 8085 Microprocessor.
- This course also includes some details of Microcomputer systems along with logic devices, and memory interfacing. Students can get some information about ASCII, and BCD codes.

Prerequisites

Student must have studied B.Sc. with physics as a major subject and knowledge of basic mathematics.




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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Radio Wave Propagation and Satellite communication Radio Wave Propagation: Propagation in free space - mode of propagation, microwave systems. Tropospheric Propagation - mode of propagation, radio horizon, super and sub refractions, attenuation in atmosphere, VHF/UHF radio system. Ionospheric propagation - ionospheric layers, effect of ionosphere on wave propagation, plasma frequency and critical frequency, secant law skip distance and MUF, optimum working frequency, virtual height, effect of earth's magnetic field, service range, ionospheric irregularities and disturbances, HF radio systems. Surface wave – mode of propagation, ground wave. Satellite communication: Kepler's laws, orbits, geostationary orbit, power systems, attitude control, station keeping, antenna look angles, limits of visibility, frequency plan and polarization, satellite antenna radiation pattern, transponders, uplink and downlink power budget calculations, overall budget calculations, multiple access methods, applications of satellite communication, satellite radio navigation, Indian communication satellites.	14
2	Fiber optic Communication Principle of light transmission in a fiber - propagation with in a fiber, fiber index profiles, Modes of propagation - overview of modes, key modal concepts, Maxwell's equations, waveguide equations for cylindrical fiber, wave equations for step index fiber, modal equation, modes in step index fiber, single mode fiber. Losses in fibers - absorption losses, leaky modes, mode coupling losses, bending losses, combined fiber losses. Dispersion - effect of dispersion on pulse transmission, intermodal dispersion, material (chromatic) dispersion, total dispersion and maximum transmission rates. Light sources and detectors for fiber optics. optical receiver circuit. Connectors and splices - losses in connectors and splices, connectors, fiber splices. Fiber optic communication link.	14
3	Microprocessor- based systems: Hardware and interfacing A programmable machine: device, Memory, Input/output, CPU. Block diagram of a Microcontroller, Advances in semiconductor Technology, Organization of Microprocessor-Based system. Microprocessor Instruction set and computer languages: Machine Language: 8085 Machine language, 8085 Assembly language. ASCII code, writing and Executing Assembly language program, High level languages, Block diagram of Translation High level language into Machine code, operating system. From large computer to Single chip Microcontrollers	14



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	Large Computers, Medium size computers, Microcomputers, personal computers, workstations, single board Microcomputers, Single chip Microcomputers (Microcontrollers) Application: Microprocessor controlled Temperature system (MCTS): System hardware, Microprocessor-controlled Temperature system (MCTS) block diagram, Microprocessor, Memory, input (A/D converter) Temperature sensor, output including Fan, Header, LCDs, system software (Programs). Introduction to 8085 Assembly Language Programming: The 8085 Programming Model Hardware Model, Programming model: Registers, Accumulator, Flags, Program Counter (PC) and Stack Pointer (SP); Instruction classification: The 8085 instruction set, Data transfer operations, Arithmetic operations, logical operations, Branching Operations, Machine control operations and Review. Instruction, Data format and Storage: Instruction Work size: one byte, two byte, Three byte, Opcode format, Data format: ASCII Code, BCD code, Signed integer, Unsigned integers, Instruction and data storage: Memory. How to write Assemble and execute a simple program: Illustrative program: Addition of two hexadecimal numbers, including Flow chart, Manual assembly process and executing a program. Writing and hand assembling a program: Illustrative program: Subtracting two hexadecimal numbers and storing the result in Memory, writing Mnemonics, and Assembling Hex code, common errors.	
4	Microprocessor Architecture and Microcomputer Systems Microprocessor Architecture and Its Operations, Memory: Flip-Flop or Latch as a storage Element, Memory Map and Addresses, Examples, Memory Address Range of a 1K Memory chip, Memory Address Lines, Memory work size, Memory and Instruction Fetch, Memory classification: From static Memory to Flash Memory, Advances in Memory technology. Input and output (I/O) devices: I/Os with 8-bit Addresses (Peripheral-Mapped I/O), I/O with 16-bit Addresses (Memory-Mapped I/O) Logic devices for interfacing: Tri-state devices, Buffer, Examples of Tri-state buffer. Bidirectional buffer, octal buffer, Logic diagram and Function Table, Decoder, (2 to 4), (3 to 8), Examples of Decoders, Encoder (8 to 3), D-Flip-Flops: Latch and clocked; Examples of Latches (Registers), Logic diagram and Function Table. 8085 Microprocessor, Architecture and Memory interfacing: The 8085 MPU : The 8085 Microprocessor, Address bus, The 8085 Microprocessor pin out and signals, Multiplexed Address/data bus, Control and status signals, power supply and clock frequency, Externally initiated signals, Microprocessor communication and Bus timings, Examples of Data flow from Memory to MPU, Timing diagram, De-multiplexing the bus AD7-AD0, Generating control signals, A detail look at the 8085 MPU and its Architecture, The 8085A Microprocessor: Functional block diagram Example of Instruction decoding and execution, Example of an 8085-based Microcomputer: 8085 single-Board Microcomputer system, The 8085 Machine cycles and Bus timing, Op-code Fetch Machine cycle, Memory read Machine cycle with example and Timing diagram, How to recognize machine cycle.	14



(Signature)

Learning Outcomes

- Predict propagation effects of electromagnetic waves in the terrestrial, atmosphere, space, and urban environments
- Compute link budgets and select antennas, frequencies, and paths for radio communication and radar systems
- Describe statistical characteristics of propagating signals
- Identify factors that hamper and enhance radio propagation in a variety of scenarios.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended:

1. Roddy D. and Cooln J., Electronic communications, PHI, 2006
2. Kennedy G and Davis B. Electronic Communication systems, TMH 1999.
3. Tosmasi W., Advanced Electronic Communication system, PHI.
4. Keiser G, Optical fiber communications, MGH, 2000
5. Senior J.M., Optical Fiber Communications – Principles and practice, Pearson, 2007
6. Roddy D., Satellite communications
7. M.L. Gupta, Electronic and Radio engineering Dhanpat Rai & Sons, 1991
8. Microprocessor Architecture, Programming and Applications with 8085 Ramesh S. Gaonkar, Penram International Publishing India Private LTD. (Fifth edition)
9. Microprocessor, Microcomputer & their Applications, A.K Mukhopadhaya, NAROSA Publisher. Fundamentals of Microprocessors & Microcomputers B. Ram, Dhanpat Rai & Sons.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

M.Sc. Semester-4

Remote Sensing & Electronic Communication-II

Subject Code: 256040404

Teaching & Evaluation Scheme: -

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

Objectives

- The transmission line theory bridges the gap between field analysis and basic circuit theory.
- The phenomenon of wave propagation on transmission lines is approached from an extension of circuit theory as well as from a specialization of Maxwell's equation.
- It covers lossy, lossless, short circuit, open circuit and quarter wave lines. Another important course on various antenna parameters and the basic operating principles of antennas is introduced.
- They will also learn about the different types of the antennas that are commonly used. Elements of analogue and digital communication systems are covered here in detail. Electronic communication is a very important area of electronics.
- Various techniques of modulation and different aspects of digital communication are included in this paper.

Prerequisites

Student must have studied B.Sc. with physics as a major subject and knowledge of basic mathematics and electronics.




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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Transmission Line Theory Lumped element circuit model for a transmission line, Field analysis of transmission lines, The terminated lossless transmission line, Smith chart. The quarter wave transformer, Generator and load mismatches, Lossy transmission lines.	14
2	Antenna Basic antenna parameters (radiation pattern, radiation resistance, directivity and gain), Half-wave dipole antenna, effect of ground on the radiation pattern of ungrounded antenna, antenna arrays, Yagi antenna, antenna system employing parabolic reflectors, frequency independent log-parabolic antenna.	14
3	Analog Modulation Amplitude modulation: Theory of amplitude modulation, Frequency spectrum of AM wave, AM modulator and detector. Single side band modulation: Single sideband principle, FET balanced modulator, SSB generation: Filter method, Phasing method and Third method. Angle Modulation: Theory of frequency and phase modulation, frequency spectrum of FM wave. Reactance FM Modulator, Armstrong method of frequency modulation. Slope detector, Stagger tuned detector, Foster-Seeley discriminator, Ratio detector.	14
4	Pulse Modulation and Digital Communication Pulse Modulation: Pulse amplitude modulation, Pulse code modulation, PCM Receiver, Pulse time modulation, Pulse position modulation, Pulse width modulation. Synchronization, Probability of bit error in baseband transmission, matched filter, Bit-timing recovery, carrier recovery systems. Digital carrier systems: Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), Continuous Phase Frequency Shift Keying (CPFSK), Minimum Shift Keying (MSK), Phase Shift Keying (PSK).	14

Learning Outcomes

- Understand and identify the fundamental concepts and various components of analog communication.
- Explain signal to noise ratio, noise figure and noise temperature for single and cascaded stages in a communication system.
- Describe analog pulse modulation techniques and digital modulation technique.



Develop the ability to compare and contrast the strengths and weaknesses of various communication systems.

- Describe basic components of communication system and concept of modulation, its needs.
- Classify different types of AM (Analog Modulation) techniques, their principles.
- Demonstrate different AM systems (generation and detection).
- Explain different types of angle modulation schemes (FM & PM), their generation and detection.
- Demonstrate the different types of multiplexing in communication system.
- Analyze the noise characteristics of a communication system using different modulation scheme.

Teaching & Learning Methodology: -

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

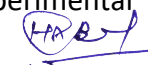
Books Recommended:

1. David M. Pozar, Microwave Engineering (Third Edition), Wiley- India.
2. J. D. Ryder, Networks, Lines and Fields, PHI Pvt. Ltd. New Delhi, 1991
3. G. P. Srivastava, V. L. Gupta, Microwave Devices and Circuit Design, PHI.
4. G. S. Raghuvanshi, Microwave Engineering, CENGAGE Learning.
5. E. C. Jordan and K. G. Balman, Electromagnetic waves and radiating systems, PHI
6. Roddy D. and Coolen J., Electronic communications, PHI, 2006
7. Kennedy G and Davis B. Electronic Communication systems, TMH 1999.

E-Resources

- SWAYAM / NPTEL portal online courses available of solid stste physics and experimental techniques. <https://swayam.gov.in/> and <https://nptel.ac.in/>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

ENVIRONMENTAL MICROBIOLOGY

CODE: 256030401

M.Sc. 4th SEM

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

Objectives:-

- To provide basic knowledge of Environmental Microbiology. It covers up scope of global warming, environmental problems, biodegradation, bioleaching.
- To provide basic knowledge of microbes in environment.
- The main goal is to know and understand the role of microbes in biogeochemical processes in different ecosystems. The students will learn the basic microbiological principles, the methods in microbial ecology and their theoretical and practical use.
- The knowledge can give the base for understanding processes and changes in the environment.
- The students can get some skills to recognise the ecological problems and critical evaluation of the human impacts on pollution, climate changes and as well as environmental protection.
- The lectures will be implemented with individual practical work in the laboratory and presentations of the seminars.
- The students can get general competences in microbial ecology.




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Prerequisites:-

- Student Must have studied B.Sc. with microbiology/biotechnology as a major subject and knowledge of basic biology

Course outline:-

Unit	Description in Detail	Weightage
1	Global environmental problems: Global warming, Ozone depletion, Acid rain. Global warming and infectious diseases. Water pollution: sources and types, physical, chemical and biological pollution. Eutrophication and its control Microbial indicators of water pollution Biodeterioration of wood and metals. Role of microorganism, mechanism and control.	08
2	Biogeochemical cycles: Carbon, Nitrogen, Sulphur, iron and phosphorous cycles. Detrimental effects of diverted biogeochemical cycles. Acid mine drainage, nitrous oxide emission, nitrate pollution of ground water. Biological nitrogen fixation in detail: Asymbiotic, Symbiotic and associative nitrogen fixation. Structure, function and genetic regulation of nitrogenase.	08
3	Biodegradation of organic pollutants: Mechanisms and factors affecting biodegradation. Pollution problems and biodegradation of simple aliphatic, aromatic, polycyclic aromatic hydrocarbons, halogenated hydrocarbons, azo dyes, lignin and pesticides. Bioremediation: Intrinsic bioremediation, Biostimulation and Bioaugmentation. In situ and ex situ bioremediation technologies. Bioremediation of oil spills. Bioremediation of heavy metal pollution, Phytoremediation. Use of GMO in bioremediation. Biological treatment of waste gas (polluted air): biofilters, bioscrubbers, membrane bioreactors, biotrickling filters.	10
4	Bioleaching of metals: Characteristics of commercially important microbes, mechanisms of bioleaching,	



	factors affecting bioleaching and current biomining processes. Biobeneficiation of gold ores. Microbially enhanced oil recovery. Biodesulfurization of coal: Removal of organic and inorganic sulphur from coal. Microbial Insecticides: Bacterial, fungal and viral insecticides in pest management. Biofertilizers: Nitrogen fixing and phosphate solubilizing biofertilizers.	10

Learning Outcomes:

- At the end of the course the student would have basic knowledge of microbiology techniques and bacteria.
- Students will get the basic knowledge how to prepare and perform sampling and microbial analyses to determine the abundance, growth rate and microbial community composition together with the basic environmental parameters.
- The knowledge can be used to prevent infections and to protect human and environmental health.
- Students will get basic knowledge to determine the role of microbes:
 - in different habitats,
 - in different biogeochemical cycles,
 - to determine their role in nutrient cycling
 - to determine water quality,
 - in degradation of natural organic compounds and selected pollutants in the environment.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs



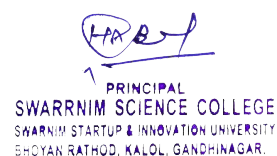
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Environmental Microbiology –RM Maier, IL Pepper & GP Gerba
- Comprehensive Biotechnology- Vol 4, Murray Moo Young
- Biotechnology – Rehm and Reid
- Environmental Science O BJ Nebel and RT Wright
- Environmental Biotechnology –HJ Jordening & Josef Winter

E-Resources

- <https://www.slideshare.net/nischayn1/acid-rain-ppt>
- <https://www.slideshare.net/AbinoDavid/global-warming-14620613>
- <https://www.slideshare.net/PanthoSarker/eutrophication-it>
- <https://www.slideshare.net/VarugheseGeorge/infectious-diseases-174252970>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

r-DNA Technology

Subject Code: 256030402

M.SC. Semester -4

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- To provide students the basic knowledge of R-DNA technology (Recombinant DNA technology).
- The purpose of the course is to give student to introduction of Recombinant DNA technology and its cover up scope of genetic engineering, Cloning, Recombinant, and PCR.
- To provide an understanding of Scope of genetic engineering, concept & important of genetic engineering, chemical synthesis of gene cloning & expression vectors, and PCR techniques.

Prerequisites

Student must have studied M.Sc. with microbiology as a major subject and knowledge of basic microbiology/Life science.




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Course outline

Sr. No.	Course Contents	Teaching hours
1.	Scope of Genetic Engineering, Concept and importance of Genetic Engineering; General strategies and Steps involved in gene cloning; Extraction and purification of DNA from bacteria, plant and animal cells; Restriction enzymes, DNA lipase and other enzymes involved in gene cloning; mRNA and cDNA preparation.	06
2.	Chemical synthesis of gene/DNA Cloning and expression vectors- Plasmids, λ -bacteriophages, M-13 based vectors, Phagemids, Cosmids, YAC, BAC, HAC/MAC, etc. Expression of cloned gene in heterologous host Introduction of DNA into different host systems.	06
3.	Recombinant selection and screening Southern blotting & hybridization, Northern analysis, Western blot analysis, Agarose gel electrophoresis, Pulse Field Gel Electrophoresis, Rotating Gel. Electrophoresis (RGE), Mapping Regulatory Sequences by in vivo expression assay Mapping of Protein Binding Site by DNase I Protection, Mobility Gel Shift Assay Protein Activity Assay – Yeast-one hybrid, Yeast-two hybrid and Yeast-three hybrid system. Phage display, Subtractive hybridization and cloning, HRT/HART, Chromosomal Walk. Characterization of Cloned genes .Restriction map, S1 mapping ,Denaturation mapping ,Heterogonous mapping DNA sequencing, Nucleic Acid Microarray, Metagenomics, Metabolism, gene therapy.	10
4	Polymerase chain reaction Molecular markers Linkage mapping using meiotic recombination frequencies Genomic mapping using radiation induced Chromosome rearrangement Genomic mapping using DNA sequence polymorphism as genetic marker In vitro Mutagenesis Metagenomics Metabolic engineering Gene therapy Recombinant products- recombinant hormones ,recombinant DNA vaccines, Transgenic plants, Transgenic animals, Genetic Engineering Guidelines, Levels of Physical containment, Levels of Biological Containment, The Indian Guidelines.	10




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Learning Outcomes

- The students will be able to understand the Knowledge of r-DNA technology to understand concept of various fields like research, gene manipulation, genetic engineering, gene cloning, fermentation industries, etc.
- Student should be able to understand basic concepts of recombination, methods of genetic engineering, screening methods, enzymes involved in r-DNA technology, DNA sequencing, vectors, gene markers, transgenic plants and animals as well as gene therapy.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically and/or in writing the theoretical data clearly and concisely that incorporates the stylistic conventions used by microbiologists, biotechnologists, researchers and scientist worldwide.

Teaching & Learning Methodology

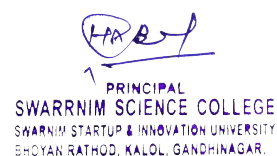
We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

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- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Genomes TA Brown 3rd Edition
- Principles of Genetic Manipulation- Old & Primrose
- Genetic Engineering – Rastogi & Pathak
- Recombinant DNA technology by keya chaudhari



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

Plant Biotechnology

Subject Code: 256010401

M.Sc. Semester-4

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70		100

Objectives

- To provide basic knowledge of plant biotechnology, secondary metabolites and about genetic engineering technology.
- To provide basic knowledge of Plant Biotechnology. It covers up about cell & tissue culture, methods of propagation, plant tissue culture.
- The present course opens the door to all of the abundant careers in and out of the area of biological sciences including health/ medical / Environmental Sciences.

Prerequisites

Student must have studied B.Sc with microbiology/Biotechnology as a major subject and knowledge of basic microbiology.




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Course outline

Sr. No.	Course Contents	Teaching hours
1	Cell & tissue culture in plants; callus cultures; in-vitro morphogenesis organogenesis and embryogenesis; Artificial Seeds, Micropropagation (Clonal propagation); Haploidy; anther and ovule cultures, Embryo cultures; Protoplast isolation, culture and protoplast fusion and somatic hybridization, Cybrids, Somaclonal Variation; in-vitro mutation methods; Virus elimination, pathogen indexing; Cryopreservation	08
2	Production of secondary metabolites; Sources of plant secondary metabolites; criteria for cell selection, factors affecting the culture of cells; different bioreactors and their use in secondary metabolite production; biochemical pathways for the production of different secondary metabolites; and biotransformation.	06
3	Principles and methods of genetic engineering, and its applications in Agriculture. Methods for genetic transformation and transgenic plants production through Agro bacterim tumefaciens and A. rhizogenes; Gene transfer methods in plants; PEG mediated, microinjection, particle bombardment, electroporation, Molecular markers and their importance in plant breeding, Marker Assisted Selection (MAS).	10
4	Molecular plant pathology: Mechanisms of disease resistance in plants against pathogens; Signalling pathways and molecular events during pathogen – plant interaction. Biotechnology and intellectual property rights (IPR); Plant genetic resources GATT & TRIPS; Patent for higher plant genes and DNA sequence	08

Learning Outcomes

- The aim of this course is to provide a thorough understanding of theoretical and practical aspects of plant cell and tissue culture. Topics include: plant regeneration/genetic modification, cellular & physiological aspects of differentiation and hormonal regulation of differentiation.



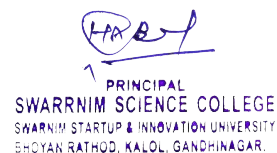
- Student should be able to understand Explain basic metabolic pathways of plants and formation of different secondary metabolites through various biosynthetic pathways in plants
- The course is designed to give students an understanding of the students will have knowledge of tools and strategies used in genetic engineering. Understanding of applications of recombinant DNA technology and genetic engineering. from academic and industrial perspective
- The students will learn how to select and apply the methodologies to be used in molecular plant pathology

Teaching & Learning Methodology

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Elements of Biotechnology – P K Gupta
- Principles of plant biotechnology: An introduction to genetic engineering in plants – S H Mantel, et. al.
- Advances in Biochemical engineering / Biotechnology – Anderson, et. al.
- Plant cell culture technology – M M Yeoman



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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY ENVIRONMENTAL BIOTECHNOLOGY

CODE: 256010402

M.Sc 4th SEM

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70		100

Objectives:-

- To provide knowledge about environment monitoring, its assessment using bio-indicators, biomarkers, biosensors and toxicity testing. Various environmental laws.
- Student will get an idea about bioremediation techniques, strategies involved in bioremediation. Phytoremediation, GMO and impact on bioremediation.
- To provide an idea about principles of biodegradation and mechanism of detoxification, biodegradation of various compounds like detergents, pesticide, lignin, hydrocarbon and dyes.
- Provide knowledge about Principles and mechanisms of biodeterioration, Methodology to assess biodeterioration, Prevention and control of biodeterioration, Biodeterioration of selected material.

Prerequisites

Student must have studied B.Sc with microbiology/Biotechnology as a major subject and knowledge of basic microbiology.




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COURSE OUTLINE:

Unit	Description in Detail	Weightage
1	Environmental problems and monitoring: Environmental monitoring: environmental impacts and their assessments using bio-indicators, biomarkers, biosensors and toxicity testing , rDNA technology, Conservation strategies , Environmental laws and policies in India	06
2	Bioremediation: Bioremediation principles, Strategies and techniques of bioremediation: <i>in situ</i> and <i>ex situ</i> , Bioremediation of metals , Phytoremediation, GMOs and their impact on bioremediations	06
3	Biodegradation: Principles of biodegradation and mechanism of detoxification , Biodegradation of detergent , pesticide, lignin, hydrocarbon and dyes	10
4	Biodeterioration: Principles and mechanisms of biodeterioration , Methodology to assess biodeterioration , Prevention and control of biodeterioration , Biodeterioration of selected materials	10

Learning Outcomes

- To provide knowledge about environment monitoring, its assessment using bio-indicators, biomarkers, biosensors and toxicity testing. Various environmental laws.
- Student will get an idea about bioremediation techniques, strategies involved in bioremediation. Phytoremediation, GMO and impact on bioremediation.



- To provide an idea about principles of biodegradation and mechanism of detoxification, biodegradation of various compounds like detergents, pesticide, lignin, hydrocarbon and dyes.
- Provide knowledge about Principles and mechanisms of biodeterioration, Methodology to assess biodeterioration, Prevention and control of biodeterioration, Biodeterioration of selected material.
-

Teaching & Learning Methodology

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
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- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Biotechnology- U. Satyanarayana
2. Environmental engineering and management- S. K. Dhameja, Publ: Kataria & Sons
3. Textbook of Biotechnology- H.K.Das
4. Methods in Biotechnology- Hans-peter-schmauder
5. Environmental Biotechnology- B.C. Bhattacharyya and R. Banerjee
6. Environmental biotechnology- G. M. Evans and J. C. Furlong
7. Environmental biotechnology- A. Scragg, Oxford

E-Resources

1. <https://www.slideshare.net/Omodhu/bioremediation-71688629>
2. <https://www.slideshare.net/vanithagopal/bioremediation-41934065>
3. <https://www.slideshare.net/halalarahman/phytoremediationppt>
4. https://www.slideshare.net/Christa_belle/phytoremediation-43828173
5. <https://www.slideshare.net/tanujanautiyal/environmental-biotechnology-50099488>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

Department of Chemistry
Advanced Organic Chemistry
Subject Code: 256020401
M.Sc. Semester- IV

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-		4	4	30		70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental Organic Chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Pericyclic Reactions Introduction, classification of pericyclic reactions, stereochemistry, molecular orbital symmetry, frontier orbitals of ethylene, 1,3 – butadiene, 1,3,5-hexatriene and allyl system, F.M.O. and PMO approach to cycloaddition and electrocyclic reactions: Generalisation of wood-ward Hoffmann rule, sigmatropic rearrangement-suprafacial and antarafacial shifts of H.Stereoselectivity in sigmatropic rearrangement, enantioselectivity in pericyclic reactions.	14
	Conformational Analysis	14



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	Confirmation at cyclic systems: Confirmation of cyclohexane, mono and disubstituted cyclohexane, heterocyclic compounds, five and six membered heterocycles, stereoelectronic effects, fused bicyclic system, decalin, dodecalin, polycyclic system, perhydrophenanthrene, bridged systems-conformation of sugars, steric strains due to unavoidable crowding, stereochemistry of the compounds containing nitrogen, sulphur and phosphorous.	
3	Oxidation Introduction, different oxidation processes, hydrocarbons-alkenes, aromatic rings, saturated C-H group (activated and unactivated), alcohols, diols, aldehydes, ketones, amines, hydrazine and sulphides.	14
4	Reduction Introduction, different reductive processes, hydrocarbons-alkanes, alkenes, alkynes and aromatic rings, Carbonyl compounds- aldehydes, ketones, acids and their derivatives, epoxides, nitro, nitroso, azo and oxime groups, Preparation and properties and application of Pd and Ti compounds as organometallic agents	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Organic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Advanced Organic Synthesis

Subject Code: 256020402

M.Sc. Semester- IV

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-		4	4	30		70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental Organic Chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Protection of groups Principle of protection of hydroxyl, amino, carbonyl, carboxylic acid with different reagents and their deprotection, synthetic equivalent groups, synthetic analysis and planning, control of stereochemistry.	14
2		



14
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	Disconnection approach An introduction to synthesis, and synthetic equivalents, disconnection approach, functional group inter-conversions, the importance of the order of events in organic synthesis one group C-X and two group C-X disconnections, chemo-selectivity, reversal and polarity.	
3	One group C-C disconnections Alcohols and carbonyl compounds, region-selectivity, alkene synthesis, use of acetylenes and aliphatic nitro compounds in organic synthesis.	14
4	Ring synthesis Saturated heterocycles, synthesis of 3, 4, 5, and 6-membered rings, aromatic heterocycles in organic synthesis.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Organic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology

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- Include group work, with groups representing diverse cultures.



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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Bio-organic Chemistry
Subject Code: 256020403
M.Sc. Semester- IV

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-		4	4	30		70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental organic chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Water and vitamins Water –interaction among biomolecules in aqueous systems, buffering against pH changes, in biological systems, participation of water in biological reactions. Vitamins-classification, introduction, chemistry, absorption transport, mobilization and biochemical functions of Vitamins A, D, E, K, C, B, B2, B6, H and folic acid	14
2	Proteins and enzymes	



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	Proteins: properties and conventions of common amino acids, stereoisomerism in α-amino acid, Peptides: formation, compositions and sizes of protein separation, purification and characterization, sequencing of peptides, sanger's method, edman degradation, outline of other methods, protein sequences and evolution. Oxygen binding proteins, haemoglobin and myoglobin in oxygen transport and storage. Enzymes: classification, nomenclature and extraction factors affecting catalytic activity and specificity in action, regulation of enzyme activity, enzyme inhibition, illustrative enzymatic reactions using chymotrypsin, hexokinase, enolase and lysozyme	
3	Carbohydrates and nucleic acid Carbohydrates: classification and stereochemistry, biologically important hexose derivatives, nomenclature of disaccharides, structure and role of some homo and hetero polysaccharides, glucoconjugates : proteoglycans, glycoproteins and glycolipids Nucleic acid: compounds of nucleic acids, nomenclature of nucleotides, nucleosides, structure of DNA and structure of RNA	14
4	Lipids Nomenclature, structure and physical properties of some naturally occurring fatty acids, triacylglycerol and waxes as sources of stored energy, insulation of water repellants, types of membrane lipids, introduction to glycerophospho lipids, galactolipids, sphingo lipids, phospholipids and sterols, bile acids.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Organic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology:-

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- Include group work, with groups representing diverse cultures.

Books Recommended:

1. Principles of biochemistry –Donald J.Voet, Judith G.Voet, charlotte w. pratt (John willey and sons)
2. Lehninger principles of biochemistry- David L.Nelson and Michael M.wx (Palgrave Macmillan / w.h. freeman company new york)
3. 3. Biochemistry – U.Satyanarayana Baro and allied P.Ltd., kolkata

E-Resources

- <https://kidshealth.org/en/teens/vitaminsminerals.html#:~:text=The%20water%2Dsoluble%20vitamins%20%E2%80%94can't%20store%20these%20vitamins.>
- <https://www.healthline.com/nutrition/water-soluble-vitamins>
- https://www.who.int/water_sanitation_health/dwq/nutrientschap13.pdf
- <https://www.freedrinkingwater.com/water-education3/34-water-vitamins.htm>
- https://www.medicinenet.com/water_soluble_vitamins_vs_fat_soluble_vitamins/ask.htm
- <https://extension.colostate.edu/topic-areas/nutrition-food-safety-health/water-soluble-vitamins-b-complex-and-vitamin-c-9-312/>
- <https://www.nature.com/scitable/topicpage/protein-function-14123348/#:~:text=Enzymes%20are%20proteins%2C%20and%20they,highly%20specific%20to%20their%20substrates.>
- <https://www.britannica.com/science/protein/Enzymes>
- [https://chem.libretexts.org/Bookshelves/Biological_Chemistry/Supplemental_Modules_\(Biological_Chemistry\)/Enzymes/3. Proteins as Enzymes](https://chem.libretexts.org/Bookshelves/Biological_Chemistry/Supplemental_Modules_(Biological_Chemistry)/Enzymes/3._Proteins_as_Enzymes)
- <https://www.ncbi.nlm.nih.gov/books/NBK9921/>
- <https://www.ncbi.nlm.nih.gov/books/NBK554481/>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF Chemistry

Selected topics in Medicinal Chemistry

Subject Code: 256020404

M.Sc. Semester - IV

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-		4	4	30		70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

- Chemistry majors must have a basic understanding of fundamental Organic Chemistry.

Course outline

Sr. No.	Course Contents	Teaching hours
1	Drug design Introduction, naming of organic medicinal compounds, literature of medicinal chemistry, development of new drugs, procedure followed in drug design, concept of lead compound and lead modification, pro drugs, soft drugs, phase I, II and III clinical trials, structure activity relationship, theories of drug activity : occupational theory, rate theory, induced fit theory, quantitative	14  PRINCIPAL SWARNIM SCIENCE COLLEGE SWARNIM STARTUP & INNOVATION UNIVERSITY BHOYAN RATHOD, KALOL, GANDHINAGAR.



	structure activity relationship, history and development of QSAR. Concept of drug receptors, elementary treatment of drug receptor interactions, physio chemical parameters lipophilicity, partition coefficient, electronic ionization constant, concept of 3-D QSAR.	
2	Pharmacokinetic and pharmacodynamics Pharmacokinetics: introduction to drug absorption, distribution, metabolism, elimination. important pharmacokinetic parameters in defining drug deposition and in therapeutics, uses of pharmaceuticals in drug development process Pharmacodynamics: Introduction, elementary treatment of enzyme stimulation, enzyme inhibition, drug metabolism, biotransformation, significance of drug metabolism in medicinal chemistry.	14
3	Dosage forms, Quality control and application of computers in chemistry Dosage forms, types of dosages, different routes of administration, quality control of drugs pharmacopias, modern methods of pharmaceutical analysis. Computer in chemistry Use of computer in chemistry and industry Important websites for data search chemistry Information about online journals for chemistry	14
4	Medicine Overview, Medicinal use of nanomaterials-Drug delivery Protein and peptide delivery –cancer, surgery, visualization, nanoparticle targeting Medical application of molecular nanotechnology-nanorobots, cell repair machines, nanonephrology.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Organic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:



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- Work with students at an early stage of the programmer/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs.
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programmer/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures.

Books Recommended

1. Burger's Medicinal Chemistry and Drug Discovery (5/e), 1997, Vol. 1, 2, 3, 4,5, Edited by Manfred E. Wolff (John Wiley & Sons, inc., New York).
2. Wilson and Gisvold's Text-book of Organic Medicinal and Pharmaceutical Chemistry (5/e, 1982) by Robert F. Doerge (J. B. Lippincott Company, Philadelphia/Toppan Co. Ltd., Tokyo).
3. Principles of Medicinal Chemistry, Vol. I & II (5/e), by S. S. Kadam, K. R. Mahadik, K. G. Bothra (Nirali Prakashan).
4. QSAR: quantitative structure-activity relationships in drug design by Jean-Luc Fauchère. ISBN:084515141X, 9780845151419
5. QSAR : Hansch analysis and related approaches By Hugo Kubinyi

E-Resources

- https://en.wikipedia.org/wiki/Drug_design#:~:text=Drug%20design%2C%20often%20referred%20to,knowledge%20of%20a%20biological%20target.
- <https://www.dovepress.com/journal-editor-drug-design-development-and-therapy-eic19>
- <https://www.pharmatutor.org/articles/drug-designing-review>
- <https://newdrugapprovals.org/drug-design/>
- <https://www.bioagilityix.com/blog/2020/10/05/the-difference-between-pharmacokinetics-and-pharmacodynamics/#:~:text=Pharmacokinetics%20is%20the%20study%20of,drug%20does%20t%20the%20body.&text=When%20referring%20to%20pharmaceuticals%2C%20pharmacokinetics,how%20your%20body%20excretes%20it.>
- <https://www.ashp.org/-/media/store%20files/p2418-sample-chapter-1.pdf>



<https://www.ausmed.com/cpd/articles/pharmacokinetics-and-pharmacodynamics>

<https://en.wikipedia.org/wiki/Medicine>

SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

IMMUNOLOGY-I

Subject Code: 253010401

B.SC. Semester -4

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- To provide students the basic knowledge of immunology, immune system, immunity, antigen, Antibody, and its Interaction. Also detection technique of Ag-Ab.
- The purpose of the course is to introduce students to Introduction of immune system , types of the immunity, and antigen antibody interaction.
- To provide an understanding of the blood grouping technique, Ag-ab detection technique and various cells and organ of immune systems.

Prerequisites

Student Must have studied B.Sc. with Biotechnology as a major subject and knowledge of basic Principle of Immunology.

Course outline




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Unit No.	Course Contents	Teaching hours
1.	Immune System: • Introduction to immune system. • Immune system: Hematopoiesis, Cells and organs of immune system (T cell, B cell, NK cells, APC)	10
2.	Immunity and its types: • Types of immunity: a) innate and acquired, b) active and passive, c) humoral and cell-mediated). • Immune response- primary and secondary.	10
3.	Antigens and Antibodies: • Antigen- Definition, properties and classification, epitopes and hapten. • Antibody- Definition, structure, type and function, blood group types, ABO and Rh system,	10
4.	Antigen –Antibody Interaction: • Introduction to antigen-antibody interaction. • Precipitation, Agglutination, Cross-reactivity. • Ag-Ab detection techniques: ELISA, RIA, Western blotting	10
		40



Learning Outcomes

- The students will be able to understand and apply antigen antibody techniques and easily understand the immune system in our body.
- Student should be able to understand basic concepts of Immune system, Types of Immunity, Ag-Ab detection techniques.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical and laboratory experiments in a clear and concise manner that incorporates the conventions used by biotechnologists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Prescott, Harley, and Klein's Microbiology, J. M. Willey, L. M. Sherwood, C. J. Woolverton, 7 th Edition (2008), McGraw Hill Higher Education- USA .
- Principles of Microbiology, R. M. Atlas, 2nd Edition (Indian Edition) (2015), McGraw Hill Education (India) Private Limited –New Delhi .



Baker and Silverton's Introduction to Medical Laboratory Technology, Baker F J, Silverton R E, Pallister C J, 7th edition (1998), Butterworths-Heinemann, Oxford, UK

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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

BIOINSTRUMENTATION

Subject Code: 253010402

B.Sc. 4th Semester

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- To provide students basic knowledge of Bio-analytical techniques. This course begins with a review of basic bio analytical technique and an introduction to general terminologies
- The purpose of the course is to introduce students to methods of Bioanalysis and to develop required microbiological skills which will be helpful in their future.
- This course contains bio analytical techniques along with their theory, working principal, common instrumentation and possible applications. This course will be equally beneficial to various scientific areas including, life science, chemical science, material science and environmental science.

Prerequisites

Student Must have studied 2years B.Sc. with microbiology/Biotechnology as a major subject and knowledge of basic microbiology.




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Unit. No.	Course Contents	Teaching hours
1	COLORIMETRY AND SPECTROPHOTOMETRY - Principle, Instrumentation Method and Application of UV-Visible Spectroscopy, - Atomic Absorption Spectroscopy - Flame Photometry - Nephelometry, Infra-Red Spectroscopy - Mass Spectroscopy for Protein Characterization & Identification.	10
2	ELECTROPHORESIS AND CENTRIFUGATION Electrophoresis - Principle, Support Media - Types and application. Separation of protein and nucleic acids (PAGE, SDS-PAGE, Agarose and IEF) Centrifugation - Basic Principles of Sedimentation, types and Applications of (Rate Zonal and Isopycnic), Ultracentrifugation (Introduction and Applications)	10
3	CHROMATOGRAPHY - Introduction, Definition and Types of Chromatography, - General Principles Underlying Chromatographic techniques, - Paper chromatography and Thin Layer Chromatography, - Adsorption, chromatography, Ion Exchange Chromatography, - Gas Liquid Chromatography - HPLC, Affinity CHROMATOGRAPHY	10
4	Bioinformatics - Definition. Branches of Bioinformatics. - Aim of Bioinformatics. - Scope of Bioinformatics. Databases - Types of Databases Primary, secondary, tertiary and composite databases. - Database retrieval system. Bioinformatics basic tools - Blast, sequence alignment, protein structure analysis. NCBI, EBI	10
		40



Learning Outcomes

- The students will be able to use selected analytical techniques. Familiarity with working principals, tools and techniques of analytical techniques. student should be able to understand basic concepts of the present day scope and applications of Bioanalytical techniques.
- The course is designed to understand the strengths, limitations and creative use of techniques for problem-solving.
- The students will be able to select analytical technique for case study. able to design experiments and understand the instrumentation. Students can use their knowledge in Academic and industrial research organization ,Industries based on biotechnology, pharmacy, agriculture, and chemical

Teaching & Learning Methodology

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.



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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

BACTERIAL DIVERSITY

Subject Code: 253040401

B.Sc. Semester -4

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- To provide students basic knowledge of Microbial diversity of Archea bacteria and Eubacteria.
- The purpose of the course is to give students to introduction and basic knowledge of bacterial and archaeal diversity.
- To provide an understanding of different genera of eubacteria.

Prerequisites

Student must have studied First year (FY) of B.Sc. with Microbiology as a major subject and knowledge of basic biology.




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Course outline

Unit No.	Course Contents	Teaching hours
1	Archea bacteria • Introduction and phylogeny • General properties ➤ Cell wall and cell membrane ➤ Chromosome ➤ Ribosome • Salient features of: ➤ Methanogens ➤ Halophiles ➤ Thermophilic S^0 metabolizers	10
2	Eubacteria-I • Photosynthetic bacteria: General properties ➤ Oxygenic photosynthetic bacteria ➤ An-oxygenic photosynthetic bacteria • Chemolithotrophic bacteria ➤ Nitrifying bacteria ➤ Colorless Sulphur bacteria ➤ Iron, Hydrogen and Magnetotactic bacteria	10
3	Eubacteria II • Gram negative spiral and curved rods: ➤ Spirocheatales ➤ Spiral bacteria ➤ Curved rods • Gram negative aerobic rods and cocci: ➤ Pseudomonadaceae ➤ Neisseriaceae • Gram-negative anaerobic and facultative rods and cocci: ➤ Enterobacteriaceae ➤ Vibrionaceae ➤ Veillonellaceae • Obligatory Parasites: ➤ Rickettsiaceae ➤ Chlamydiaceae ➤ Mollicutes	10
4	Eubacteria III • Gram positive rods and cocci ➤ Micrococcaceae ➤ Deinococcaceae ➤ Other genera: Streptococcus, Leuconostoc, Peptococcus ➤ Endospore formers ➤ Non spore forming Rods • Gram positive irregular rods	10




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	➤ Nonfilamentous rods ➤ Aerobic curved rods ➤ Nocardioforms • Filamentous bacteria with complex morphology • Bacteria with unusual morphology ➤ Prosthecate budding/nonbudding bacteria ➤ Nonprosthecate budding/nonbudding bacteria ➤ Sheathed bacteria ➤ Gliding fruiting/nonfruiting bacteria	
TOTAL		40

Learning Outcomes

- The students will be able to apply the knowledge of bacterial diversity to understand concepts of various fields like research fields, fermentation industries, food industries, culture collection centers etc. to identification of organism or strains.
- Student should be able to understand basic concepts of Archea bacteria, phylogeny, general features of methanogens; halophiles; Thermophiles. Students also should be able to get knowledge of morphological, cellular, physiological, metabolic and ecological diversity of selected genera of eubacteria.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the theoretical data clearly and concisely that incorporates the stylistic conventions used by microbiologists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups



- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc.) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Atlas R M, (2015), *Principles of Microbiology* 2nd Edition, McGraw Hill education, Mumbai
2. Garrity George M, Noel R Krieg et al (2011) *Bergey's Manual of Systematic Bacteriology* (Vol. I to IV) 2nd edition, Editors James T Staley and Aidan C Parte Springer
3. Pelczar Jr, M J, Chan E C S, Krieg N R, (1986) *Microbiology*, 5th edn, McGraw-Hill Book company, NY




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SWARNIM SCIENCE COLLEGE
DEPARTMENT OF MICROBIOLOGY

Food & Dairy Microbiology

CODE:253040402

B.Sc. 4th Sem

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70		100

Objectives: -

- This study will provide the information about the microflora present in food, food and milk borne infections. It will also describe about the food poisoning and also will study about the role of *Staphylococcus aureus*, *Clostridium botulinum* and *Salmonella* etc.
- Students will learn about the various sources of microbial spoilage of food and milk product, how to preserve the food & milk and methods of preservation.
- It will provide the information about how to use microbe as food and food products like various Indian fermented food, mushrooms, spirulina and yeasts.
- Students will get an idea how to grade the quality of food and milk samples using different methods like SPC, CFU, MPN, Acid-fast staining etc.

Prerequisites:-

- Student Must have studied F.Y Year B.Sc. with microbiology as a major subject and knowledge of basic biology.

• **Course outline:-**




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Sr. No.	Course Contents	Number of Hours
1	Microbes in food infection and poisoning: - Food as a substrate for microorganism - Microbial flora of foods: fruits, vegetables, meat, eggs, biochemical, temperature and pathogenic types of milk - Factors affecting kinds and number of microorganisms: intrinsic and extrinsic - Food and Milk borne infections: Microorganism involved, source of infection, Incubation period and characteristics in brief: (A) Bacterial infection: <i>Salmonella sp.</i>, <i>Shigella sp.</i>, <i>E.coli.</i>, <i>Vibrio sp.</i>, <i>Campylobacter jejuni</i>, <i>Listeria monocytogenes</i>(B) Viral Infections: <i>Rotavirus</i>, Hepatitis A, Polio virus (C) Protozoal infections: <i>Entamoeba</i> Food poisoning: (A) Role of <i>Staphylococcus aureus</i>, <i>Clostridium botulinum</i>, <i>Salmonella spp.</i> (B) Molds as poisoning agents: Role of Mushroom, <i>Aspergillus</i>, <i>Claviceps purpurea</i>, <i>Fusarium moniliformis</i>	10



2	Microbial food spoilage and preservation: • Microbial spoilage of food (A) Spoilage of milk and milk product, fruits, vegetables, eggs, meat (B) Spoilage of canned foods • Preservation of food and milk: (A) General principles (B) Preservation of food and Milk : (i) Use of aseptic handling (ii) High temperature: Pasteurization, Sterilization, canning (iii) Low temperature : Refrigeration and freezing (iv) Dehydration (v) Osmotic pressure (vi) Preservatives (vii) Radiations: Ionizing and non-ionizing radiation	10
3	Microbes as food and food products: • Fermented dairy products (A) Cheese: Types, curdling, processing, ripening (C) Other fermented dairy products: Yogurt, cultured buttermilk, acidophilus milk, Kefir and cultured sour milk (D) Introduction to probiotics, prebiotics and synbiotics • Indian fermented food products: Pickles, sauerkraut and bread • Microbes as food: Mushrooms, spirulina and yeasts.	10
4	Methods in food microbiology: • Biological methods: Generalized scheme for microbiological examination (A) Direct microscopic examination, colony forming units (CFU) (B) Most probable number (MPN) (C) Identification of specific group or species of microorganisms • Bacteriological analysis of milk (03) (A) Grading of milk: Methylene Blue Reduction test and Resazurin test (B) Determination of efficiency of pasteurization: Phosphatase test (C) Determination of MPN (D) Acid-fast staining • Microbiological analysis of milk (A) Microbial standards for food (B) FDA, BIS, Food safety and Standard Act of India (C) Food certification marks in India: ISI, Agmark,	10




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	FPO, BIS, FSSAI	
		40




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Learning Outcomes:-

- At the end of the course student will know about the microflora present in foods, different infections caused by food and milk. They will have an idea about the different sources of contamination and also diseases caused by different micro-organisms.
- Students will get an idea about how the food and milk are spoiled and methods for preservation and storage will be learned by them.
- This course will help in knowing the use of microbes as food and food products like Indian fermented foods, using of other sources as energy and food.
- Lastly students will have an idea about the different technology that can be used for monitoring the quality of food and milk.

Teaching & Learning Methodology:-

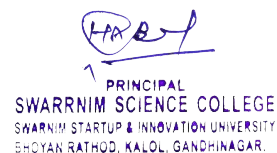
We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Basic Text & Reference Books:

1. Pelczar Jr, M J, Chan E C S, Krieg N R, (1986), *Microbiology: An Application Based Approach*, 5th edn. McGraw-Hill Book Company, NY
2. Frazier W C and Westhoff D C (1988), *Food Microbiology*, 4th edn. McGraw-Hill Book Company, NY
3. Prescott L, Harley J P, and Klein D A, (2008), *Microbiology*, 7th edn. Wm C. Brown - McGraw Hill, Dubuque, IA.
4. Indian Standards: Food Hygiene-Microbiological Criteria-Principles for Establishment and Application
5. Fssai: Manual of methods of analysis of foods- food safety and standards authority of India, Ministry of health and family welfare, Government of India, New Delhi, 2015



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Fundamentals of Inorganic Chemistry

CODE : 253020401

B.Sc. 4th Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives:- To provide basic knowledge Chemistry

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Wave –Mechanics: Basic postulates of quantum mechanics (Postulates 1,2,3 and 4); Operators: their addition, subtraction and multiplication; Commutators; Particle in a box (One dimensional); Zero potential energy; Characteristics of the wave functions; Electron in a ring.	14
2	Coordination Compounds: Application of valence bond theory to some complexes; Shortcoming of valence bond theory; Crystal Field Theory; Orientation of d-orbitals and Crystal Field Splitting of Energy levels; Crystal Field Splitting in Octahedral complexes; Crystal Field Stabilization Energy (CFSE); Crystal Field Splitting in Tetrahedral Complexes; Crystal Field Splitting in Tetragonal and square Planar Complexes; Magnetic Properties of Metal Complexes and Crystal Field Theory; Factors	14



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	influences the magnitude of Crystal Field Splitting; Color of Transition Metal Complexes; Crystal Field Effects on Ionic Radii; Crystal Field Effects on Lattice Energies; Jahn- Teller Effect.	
3	Chemical Bonding : Molecular orbital Theory; LCAO Molecular Orbital Theory; Energy Level Diagram for Molecular Orbitals; Mixing of Orbitals; Filling up of Molecular Orbitals; Electronic Configuration of Heteronuclear Diatomic molecules (CO, NO, HF, HCl); Molecular orbitals of Polyatomic Species (BeH ₂ , CO ₂ , NH ₃) (Excluding Walsh diagram); M.O. Theory of [Co (NH ₃) ₆] ³⁺ and [CoF ₆] ³⁻ ; Molecular orbital or Band Theory for metals.	14
4	Non Aqueous Solvents: Introduction; Classification of Solvents; General Properties of Ionising Solvents (a) Liquid Ammonia (NH ₃): Physical Properties, Auto-ionization, Acid-Base reactions, Ammonia as a proton – acceptor, Precipitation reactions, Complex formation reaction, Ammonolysis reactions, Reactions of Metal-Ammonia solution, Reduction –Oxidation (Redox) reactions; Advantages and disadvantages of using liquid Ammonia as a solvent. (b) Liquid SO ₂ : Physical Properties, solubility of Inorganic materials and Organic Compounds, Electrolytic conductance behavior of solutions, Acid-Base reactions, Solvolysis, Precipitation reactions, Complex formation reactions, Reduction –Oxidation (Redox) reactions (c) Liquid HF: Physical Properties, Solvent effect, Amphoteric behavior, Precipitation reactions, Reduction –Oxidation (Redox) reactions, Solutions of Compounds of Biological Interest	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

1. Gurdeep Raj, “Advanced Inorganic Chemistry”, Goel Publishing House, Meerut, Volume –I, 24th Revised Edition, 1998.
2. R.D. Madan, “Modern Inorganic Chemistry”, S. Chand & Co. Ltd., New Delhi, 2nd Edition, 2006.
3. J.D. Lee, “Concise Inorganic Chemistry”, Wiley India Publication, 5th Edition, 1996, Reprint 2011.
4. W.V. Malik, G.D. Tuli, R.D. Madan, “Selected Topics in Inorganic Chemistry”, S.Chand & Co. Ltd., New Delhi, 7th Edition, 2007.



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	reaction rates; Derivation of Arrhenius equation.	
2	(A) Electrochemistry Transport number; Determination of transport numbers by moving boundary method; Conductometric titrations: Principle and advantages; Titration of Strong acid against strong base (HCl vs NaOH); Titration of Weak acid against strong base (CH₃COOH vs NaOH); Titration of Strong acid against weak base (HCl vs NH₄OH); Titration of very weak acid against strong base (H₃BO₃ vs NaOH); Titration of mixture of acids against strong base (HCl + CH₃COOH vs NaOH); Activity and activity coefficient; Ionic strength. (B) Phase Rule Theoretical derivation of phase rule; One component system : water system and sulphur system; Condensed phase rule; Silver – lead (Ag-Pb) system;	14
3	(A) Adsorption Definition of terms, Types of adsorption (physical, chemical and their difference), Types of adsorption isotherms (5 types), Derivation of Freundlich adsorption isotherm, Derivation of Langmuir adsorption isotherm, Applications of adsorption (B) Catalysis Characteristic of catalysis, Homogenous and heterogeneous catalysis, Enzyme catalysed reaction and derivation mechanism, Marten reaction.	8 6
4	Polymer Chemistry Definition: Monomer, Polymer, Polymerization, Classification of Polymers; Chain polymerization: Free radical and Ionic polymerization [cationic and anionic], Coordination polymerization, Step polymerization: Polycondensation and Polyaddition and Ring Opening Polymerization. (B) Colloids Colloidal Systems; Preparation of Colloidal Solutions; General Properties of Colloidal Systems; Properties of hydrophobic Colloidal Systems	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:



Robert Thornot Morrison and Robert Neilson Boyd, "*Organic Chemistry*", Prentice Hall

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SWARNIM SCIENCE COLLEGE

SEMESTER-IV

DEPARTMENT OF CHEMISTRY

CHEMISTRY PRACTICAL

(CODE : 253020403)

[A] Inorganic Mixture:

- Semi micro method of analysis of inorganic mixture containing four radicals (excluding phosphate, arsenite, arsenate and borate) Minimum eight mixtures should be performed. Mixture may be partly soluble in water and soluble in acid.

[B] Physical Experiment

1. Determination of Viscosity by Ostwald Viscometer of different liquid.
2. To Measure the Concentration of Water:Methanol by Measuring the Viscosity
3. To find out the order of Reaction of hydrolysis of Methyl Acetate(First Order Kinetics)
4. To Determine order of Reaction of Alkaline Hydrolysis of Ethyl Acetate(Second Order)
5. To Determine Adsorption Isotherm of Acetic Acid Solution by Activated Charcoal.
6. Conductometric titration.
 - a. Strong acid - Strong base (HCl - NaOH)
 - b. Weak acid - Strong base (CH₃COOH - NaOH)
 - c. Mixture of acids- Strong base (HCl+CH₃COOH - NaOH)
7. To Determine Refractive Index of Different Liquids.




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PHYSICS -401

Subject Code: 253050401

B.Sc. Semester 4

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	-	4	30	-	70	-	100

Objectives: -

Physics students will:

- Develop a solid grasp of core concepts and applications of solid state physics, Heat & Thermodynamics, transistor circuits and atomic spectroscopy. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites

Knowledge of basics of Solid State Physics, thermodynamics and spectroscopy.

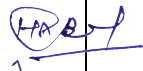



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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Solid State Physics: A. Lattice Vibrations : Harmonic crystals : the “Ball & strings” model; Normal modes of one dimensional monoatomic lattice, periodic boundary condition, concept of the first Brioullin zone, salient features of the dispersion curve; Normal modes of one dimensional diatomic lattice, salient features of the dispersion curves, optical and acoustical mode; Quantization of lattice vibrations-phonons; Measurement of phonon dispersion by inelastic neutron scattering. B. Thermal properties: Classical lattice heat capacity Quantum theory of lattice heat capacity, Einstein model, phonon density of states; Debye continuum model; Anharmonic effects, Thermal expansion, Gruneisen parameter; Phonon collision processes, Phonon thermal conductivity.	12
2	Heat and Thermodynamics: Entropy: Reversible part of the second law (clausius theorem), Entropy, Entropy of the ideal gas, TS diagram, Application of the Entropy principle. Pure substances: Volume expansivity: Cubic Expansion coefficient, Compressibility. Mathematical methods in thermodynamics: Characteristics functions, Enthalpy, Helmholtz & Gibb’s functions, two mathematical theorems, Maxwell’s relations, Tds equations, Internal energy equations, Heat Energy equations, Heat capacity equations. Open Systems: Joule-Thomson expansion, Liquefaction of gases by the Joule-Thomson expansion	12
3	Transistor Circuits: Transistor Biasing: Factors contributing to thermal stability, effect of temperature increase, stability factor S, common base stability, collector to base bias, disadvantage of collector to base bias, emitter bias, voltage divider bias with emitter bias, emitter bypass capacitor, summary of stabilization circuit, additional stability factors, bias compensation Hybrid equivalent circuit for a transistor: conversion of a transistor to a standard form, general Black box theory, Hybrid ‘h’ parameters, obtaining the hybrid h parameters, typical h parameter value, Amplifier equation, voltage and current gains taking into account R_g of source, dependence of amplifier characteristics on R and R_L, comparison of CB, CC and CE Number system: Binary number system, Binary to decimal conversion, decimal to binary conversion, Hexadecimal numbers, ASCII codes, The Excess 3 code, Gray code	12
4	Atomic Spectroscopy: Hydrogen atom spectrum, Orbital magnetic moment of hydrogen,	12




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	Larmor precession, Stern-Garlach experiment, Electron spin, The vector atom model , Spin-orbit interaction and fine structure, Pauli's exclusion principle and electronic configuration, Total angular momentum in many electron atoms, L-S coupling, j-j coupling, Hund rules, Energy levels and transitions of Helium, Alkali spectra, Shielding of core electrons, Spectral terms of equivalent electrons , Normal Zeeman effect, experimental arrangement and theory , Anomalous Zeeman effect, Paschen-Bach effect, Stark effect, Characteristics X-ray spectrum, Moseley's law, Width of spectral lines.	

Learning Outcomes

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on ones own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.



Books Recommende

- Elements of Solid State Physics (2nd Edition) by J. P. Srivastava, PHI Learning
- Introduction to Solid State Physics (7th Edition) by C. Kittel, Wiley (India)
- Heat & Thermodynamics by Mark W. Zemansky and R.H. Dittman, McGraw Hill, Int. Edition (7th edition)
- Thermal Physics by A. B. Gupta, H. P. Roy (New central Publication)
- Electronics Devices and Circuits By Allen Mottershed , PHI
- Digital principle and Application By Malvino, Leach and Saha (6th edition)
- Fundamentals of Digital Circuits by A. Anandkumar, PHI (2nd Edition)
- Modern Physics by G. Aruldas and P. Rajagopal, PHI Learning Pvt. Ltd
- Principles of Modern Physics by A.K. Saxena, Narosa Publishing House

E-Resources

- The Flying Circus of Physics 2nd edition by Jearl Walker, Wiley India
- Six Ideas that shaped physics by Thomas A Moore, McGraw Hill education
- <http://www.howstuffworks.com/> -- Tech stuff
- How things works by Louis A Bloomfeild, Wiley Publications
- Physics of Everyday Phenomena by W. Thomas Griffith, Juliet Brosing, McGraw Hill Education
- Latest journals like BBC Knowledge, How things work-everyday technology explained by National Geographics.
- <http://www.sciencefairadventure.com/>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PHYSICS -402

Subject Code: 253050402

B.Sc. Semester 4

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- Develop a solid grasp of core concepts and applications of sound & optics, statistical mechanics, theory of relativity and quantum mechanics. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites

Basic Mathematics and fundamentals of relativity, quantum mechanics and quantum mechanics .

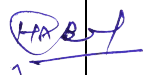



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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Sound and Optics: Sound: Architectural Acoustics, Sabine's formula, Reverberation time-theoretical treatment, Reverberation time of a live room, Reverberation time of a dead room, optimum reverberation time. A. Polarization of light & double refraction : Plane polarized light, pictorial representation of light vibrations, method to produce plane polarized light (only names), double refraction or birefringence, geometry of calcite crystal, Optical axis principal section & principal plane, Nicol prism, Parallel & Crossed Nicol prism, Huygen's theory of double refraction in uniaxial crystals, refractive indices for o-rays & e-rays, Polaroids. B. Production & Analysis of Polarized light : Introduction, superposition of two plane polarized waves having perpendicular vibrations, The elliptically & circularly polarized light, quarter wave plate, half wave plate, production of plane elliptically & circularly polarized light, detection of plane elliptically & circularly polarized light, systematic analysis of polarized light	12
2	Statistical Mechanics: Macroscopic and microscopic states: Macroscopic states, Microscopic states, Phase spaces, μ-space, Γ-space, Postulate of equal a priori probabilities, Ergodic hypothesis, Density distribution in phase space, Liouville's theorem, Principle of conservation of density in phase and principle of conservation of extension in phase, Condition for statistical equilibrium, Statistical ensemble: Microcanonical ensemble, Canonical ensemble, Mean value and fluctuations, Grand canonical ensemble, Fluctuations in the number of particles of a system in a grand canonical ensemble. Some applications of Statistical mechanics: Thermodynamics, Statistical interpretation of basic thermodynamic variables, Ideal gas, Gibbs paradox, the equipartition theorem	12
3	Special theory of Relativity & Quantum Mechanics: Special Theory of Relativity: The Michelson- Morley experiment, The special theory of relativity, The Galilean Transformation, The Lorentz transformation, The Lorentz Fitzgerald Contraction, Time dilation, Relativity of mass, mass & energy, some relativistic formulas, velocity addition, Doppler Effect in light Expectation values: Ehrenfest's Theorem, Admissibility conditions on the wave functions, stationary states : The time dependent schrodinger equation, A particle in a square well potential, bound states in a square well ($E < 0$) (a,b,c,d), The square well : Nonlocalized states ($E > 0$), square potential Barrier	12




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4	Quantum Mechanics: General Formalism of wave mechanics : The schrodinger equation & the probability interpretation for an N- particle system, the fundamental postulates of wave mechanics. The adjoint of an operator & self adjointness. The Eigen value problem, Degeneracy, Eigen values & Eigen functions of self- adjoint operators, The Dirac delta function, observables: Completeness & normalization of Eigen functions, closure, physical interpretation of Eigen values, Eigen functions & Expansion coefficients, Momentum Eigen functions : Wave functions in momentum space. The uncertainty principle, states with minimum value for uncertainty product, Commuting observables, Removal of Degeneracy, Evolution of system with time, constants of the motion, Non- interacting & interacting systems, systems of identical particles.	12

Learning Outcomes

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

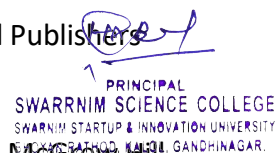
Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

Books Recommended:

- A textbook on oscillations, waves & acoustics by M. Ghosh, D. Bhattacharya, S. Chand Publishers
- Optics & atomic physics by Singh, Agrawal (Pragati Prakashan, Meerat)
- Optics by Ajoy Ghatak, Tata McGraw Hill Ltd
- Fundamentals of Statistical Mechanics by B.B. Laud, New Age International Publishers
- Statistical Mechanics An Introduction by Evelyn Guha, Narosa Publications
- Concepts of Modern Physics by Arthur Beiser, McGraw Hill Pub. Co.
- A Textbook of Quantum mechanics by PM Mathews & K. Venkatesan, Tata McGraw Hill



SWARNIM STARTUP & INNOVATION UNIVERSITY (SSIU)

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PHYSICS

B.Sc. Semester 4

Practical List

Sr. No.	Practical Name
1	Searl's goniometer
2	Study of Resolving power of telescope.
3	Flatness of plate by Newton's ring.
4	Diffraction by single slit.
5	Wavelength of light by Biprism.
6	Phonon dispersion relation of monoatomic lattice.
7	FET Characteristics.
8	C by ballistic galvanometer
9	Gray to binary code conversion
10	High Resistance by leakage method.
11	To study the variation of I_c & V_{ce} with temperature in fixed bias circuit & collector to base bias circuit for CE configuration
12	To study the variation of I_c & V_{ce} with temperature in fixed bias circuit & potential divider circuit for CE configuration Group.
13	Identification of elements in line spectra
14	Thevenin's maximum power theorem
15	Analysis of elliptical polarized light using photocell
16	Wavelength of light by Adser's A pattern
17	L by Anderson's bridge
18	Least Square Method



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

ADVANCED CALCULUS

Subject Code: 253030401

B.Sc. Semester -4

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Student are evaluated on the basis of Mid term examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- To provide students the Concept of vector valued function, determinant and its properties of higher order, Linear transformation, Gauss elementary and matrix inversion concept.
- The aim of this subject is to present the important ideas in advanced calculus using multiple method to student whose principal interest lie outside the field of mathematics.
- It is a subject which provide a vital arena where students can see the interaction of mathematics and machine computation.

Prerequisites

A Candidate for admission to the bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.




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Course outline: This Course designed for undergraduate and graduate students working on Line integral and vector space. This course serves as an introduction to Line integral and vector used to applied mathematics problems. .

Sr. No.	Course Contents		Teaching hours
1	Unit I Line integral, Evaluation of line integrals, Double integral: Definition and Examples, Change of variables in double integral, Application of Double integral, triple integral ,polar coordinate, cylindrical coordinate ,spherical coordinate.		10
2	Unit: II Beta and Gamma Functions, Symmetrical properties of Beta gamma function ,Other form of Beta and Gamma Function, Relation between Beta and Gamma Function.		10
3	Unit: III Laplace Transform of Elementary Functions, Differentiation of Laplace Transform, Integration of Laplace Transform, Laplace Transform of Derivatives, Laplace Transform of Integration, Laplace Transform of Periodic Function, Inverse Laplace Transform, Convolution Theorem, Solution of Linear Ordinary Differential Equation.		12
4	Unit: IV Vector differentiation and Integral calculus: Vector point function and scalar point functions, vector differentiation, Laplace operator, Laplace equation, Gradient, divergence and curl. Line integral, Surface integral, Green's theorem, Stoke's theorem Divergence theorem of Gauss and its applications with Examples		12

Learning Outcomes

After Successfully Completion of the Course the student will be




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- Student can learn to solve the Line integral, Double integral and triple integral.
- Solve multiple integrals, including area, centre of mass and inertial multiple integrals.
- Derive different type of function like Beta function, Gamma function and different properties Beta and Gamma function.
- In this maths student understand partial differential equation and its application and related theorems.
- Student will understand line integral, surface integral and its application.
- Students learn the concept of Fourier series and Laplace Transforms

Teaching & Learning Methodology

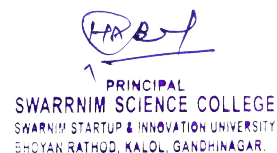
The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. S.S.Sastry, Introductory methods of Numerical analysis, Prentice hall of India, 1990.
2. Numerical Analysis by G. Shankar Rao.
3. Numerical Analysis, B.S.Gawal.
4. Numerical methods by Dr. P. kandasamy.
5. Introduction of Numerical analysis by Josef Stoer and Roland Bulirsch.
6. Analysis of Numerical Methods by Isaacson and Herbert Keller.

E-Resources



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Algebra and Statistical mathematics

Subject Code: 253030401

B.Sc. Semester -4

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Student are evaluated on the basis of Mid term examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

Objectives

- To provide students the Concept of vector valued function, determinant and its properties of higher order, Linear transformation, Gauss elementary and matrix inversion concept.
- The aim of this subject is to present the important ideas in advanced calculus using multiple method to student whose principal interest lie outside the field of mathematics.
- It is a subject which provide a vital arena where students can see the interaction of mathematics and machine computation.

Prerequisites

A Candidate for admission to the bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.




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Course outline: This Course designed for undergraduate and graduate students working on Line integral and vector space. This course serves as an introduction to Line integral and vector used to applied mathematics problems. .

Sr. No.	Course Contents	Teaching hours
1	Unit I Inner product spaces, Cauchy-Schwartz inequality, Triangular inequality, Orthogonal vectors, Orthonormal vectors, Orthogonal sets and bases, Orthonormal bases , Gram- Schmidt process, Orthogonal Compliments, Orthogonal Projection, Least Squares Approximation.	10
2	Unit: II The space of linear transformations, composition of linear transformations, The Matrix of a Linear Transformation, Eigen basis and diagonalization of L.T., Effect of Change of Bases on Linear Operators, Similarity of Matrices.	10
3	Unit: III Measure of central tendency: introduction and theory of Mean, Median, Mode. Problems based on Mean, Median, Mode. Other measures of central tendency: Geometric Mean and Harmonic Mean. Problems based on Harmonic Mean and Geometric Mean. Measures of Dispersion, Characteristics of measures of dispersion, classification of measures of dispersion. Introduction and Problems Based on Range, Quartile deviation, and Mean Deviation.	12
4	Unit: IV Introduction to Probability, Relative frequency and axiomatic. Definitions of probability, Addition Rule and Conditional Probability, Multiplication Rule, total probability, Baye's Theorem and independence, probability mass, probability density and commutative distribution functions. Markov's inequality problems. Chebyshev's inequality problems, Discrete probability distribution, Binomial passion, Normal distribution.	12



Learning Outcomes

After Successfully Completion of the Course the student will be

- Student can learn to solve the Line integral, Double integral and triple integral.
- Solve multiple integrals, including area, centre of mass and inertial multiple integrals.
- Derive different type of function like Beta function, Gamma function and different properties Beta and Gamma function.
- In this maths student understand partial differential equation and its application and related theorems.
- Student will understand line integral, surface integral and its application.
- Students learn the concept of Fourier series and Laplace Transforms

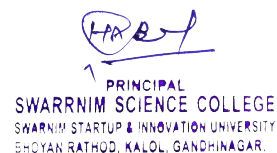
Teaching & Learning Methodology

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. E.Kreyszing, Advanced Engineering Mathematics, Fifth edition, New Age International (P) Ltd., New Delhi, 1997.
2. B.S.Grewal, Higher Engineering Mathematics.



SWARNIM STARTUP & INNOVATION UNIVERSITY

Communication Skills -2

CODE: 253000402

B.sc sem 4

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
2	-	-	2		30	-	70	-	100

Objectives: -

- To enhance students' communicative and linguistic approach in English
- To provide icebreaking approach through LSRW skills and soft skills
- To learn ways to enhance overall communication skills

Prerequisites:-

- Being able to communicate effectively is the most important of all life skills; hence, students are expected to have good spirit for learning English as second language.

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Introduction to Communication Skills : LSRW 1. Need for Effective communication 2. Importance of English as second language 3. Importance of Communication Basics of Communication 1. Definition & types of Communication, 2. Cycle of communication 3. Components of Verbal & Non-verbal communication	10




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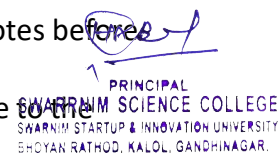
2	Listening Skill 1. Definition & Types of Listening 2. Barriers to effective listening 3. Techniques to be good listener Listening audio clips (practical exercise) Reading Skill 1. Reading techniques 2. Reading Strategies 3. Comprehensive reading Book review	12
3	Writing Skill 1. Effective Writing Skill 2. Paragraph writing 3. Precise writing 4. Business Letters 5. Technical Report Writing 6. Email writing	12
4	Non- Verbal Communication 1. Kinesics 2. Paralinguistic/ Paralanguage 3. Chronemics & Proxemics Short Stories • The Selfish Giant by Oscar Wilde • The Last Leaf by O’Henry	8
	Total hours:	42

Learning Outcomes: -

- * Students will become master of four communication skills.
- * They feel confident in speaking and writing English language.
- * Students will be able to improve the language skills i.e. Listening Skill, Speaking Skill, Reading Skill, and Writing Skill (LSRW).
- * To make them learn about life skills and soft skills.

Teaching & Learning Methodology:-

- Power point presentation
 - Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- It includes audio video clips that can provide ample number of exercise to the students



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Abstract Algebra - I

Subject Code: 256050101

M.Sc. Semester -1

Teaching & Evaluation Scheme

This program leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding of the fundamental and advanced content in Mathematics which will be determined by his /her particular choice of courses, according to his/her particular needs and interests.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives :

When one has completed this degree he / she will be able to demonstrate the following skills:

- The ability to advance your own knowledge and understanding through independent learning.
- Communicate clearly knowledge, ideas and conclusions about mathematics.
- Develop problem- solving skills and apply them dependently to problems in pure, applied and applicable mathematics
- Communicate effectively in writing about the subject
- Improve his/her own learning and performance.

Prerequisites :

A Candidate for admission to the Master of Science (Mathematics) must have a 10+2 Science and Bachelor degree with mathematics Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline: This Course is Designed to enable student to understand and apply the conceptual structure of group theory.




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Sr. No.	Course Contents	Teaching hours
1	Unit 1 Homomorphism and Isomorphism of Groups: Definition and basic examples of Group, Sub group, Normal subgroups, Quotient group and Cyclic group. Homomorphism of Group, Fundamental Theorem on homomorphism, Isomorphism of groups, Laws of Isomorphism	14
2	Unit 2 Automorphism of Groups: Conjugacy relation on a group and its applications, Class Equation, Automorphism of a group, Inner Automorphism, External direct product of groups, Inner direct products.	10
3	Unit 3 Sylow's Theorems: Cauchy's theorem for abelian groups, Cauchy's theorem for finite groups, Sylow's p-subgroup, Sylow's Theorems, Finite Abelian Group.	12
4	Unit: 4 Solvable Groups: Subnormal and normal series, Composition series, Nilpotent group, Solvable groups.	10

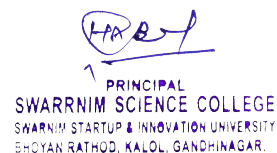
Learning Outcomes :

On successful completion of the course, students should be able to

- Differentiate between homomorphism, isomorphism and Automorphism.
- Recognize and apply Sylow's theorem to characterize certain finite groups.
- Determine whether a given set is solvable group or not.
- Use the skills of proof by contradiction, proof by contraposition, proof of set equality, and proof using both forms mathematical induction.

Teaching & Learning Methodology :

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:



- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Topics in Algebra by I. N. Herstein, John Wiley and Sons Inc., 2nd Edition.
2. “Advanced Abstract Algebra” by S.K. Pundir, Krishna Prakashan (P) Ltd., Meerut.
3. “A First Course in Abstract Algebra” by John B. Fraleigh, Pearson
4. “Basic Abstract Algebra” by Bhattacharya, Jain and Nagpal, 2nd Edition.
5. “Algebra” by S. Mcclane and G. Birkhoff, 2nd Edition.
6. “Basic Algebra” by N. Jacobson, Hind, Pub. Corp, 1984.
7. “A first course in Abstract Algebra” by John Fraleigh (3rd Edition), Narossa Publishing House, New Delhi.
8. “Contemporary Abstract Algebra” Joseph A. Gallian, Narossa Publishing House, New Delhi.

E-Resources

- cims.nyu.edu/~cfgranda/pages/OBDA_fall17/notes...
- www.sxccal.edu/mathematics-lecture-notes
- <https://users.math.msu.edu/users/gnagy/teaching/la.pdf>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Real Analysis

Subject Code: 256050102

M.Sc. Semester -1

Teaching & Evaluation Scheme

This program leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding of the fundamental and advanced content in Mathematics which will be determined by his /her particular choice of courses, according to his/her particular needs and interests.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives :

When one has completed this degree he / she will be able to demonstrate the following skills:

- The ability to advance your own knowledge and understanding through independent learning
- Communicate clearly knowledge, ideas and conclusions about mathematics
- Develop problem- solving skills and apply them dependently to problems in pure, applied and applicable mathematics \
- Communicate effectively in writing about the subject
- Improve his/her own learning and performance.

Prerequisites :

A Candidate for admission to the Master of Science (Mathematics) must have a 10+2 Science and Bachelor degree with mathematics Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.




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BHOYAN RATHOD, KALOL, GANDHINAGAR.

Course outline: To provide knowledge of the theory of measurable sets, integration and differentiation of measurable functions.

Sr. No.	Course Contents	Teaching hours
1	Unit 1 Lebesgue outer measure: Algebra and σ - algebra of sets, σ algebra of Borel sets, Lebesgue outer measure on $\mathbb{R}$, Measurable sets, Lebesgue measure	10
2	Unit 2 Measurable function: Measurable function, Littlewoods's three principles, Egoroff's theorem, Integral of a simple function, Lebesgue integral of bounded functions, Comparison of Reimann and Lebesgue integration, Bounded convergence theorem.	12
3	Unit 3 Integration of non-negative functions: Integral of nonnegative measurable functions, General Lebesgue (integral), Fatou's lemma, Monotone convergence theorem, Lebesgue's convergence theorem, Convergence in measure	12
4	Unit 4 Differentiation of measurable functions: Differentiation of monotone functions, Functions of bounded variation, Differentiation of an integral, Absolutely continuous functions and indefinite integrals	12

Learning Outcomes :

On successful completion of the course, students will be able to

- Identify and formulate the basic concepts and theorems of sigma algebras, measure and abstract measure spaces .
- Synthesize techniques that have been developed in the course to solve particular problems and explain the basic concepts and main theorems of Lebesgue and different types of convergence theorems.

Teaching & Learning Methodology :

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:




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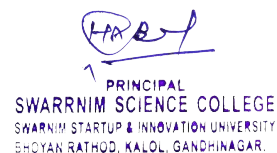
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs.
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. “Real Analysis” by H. L. Royden, Macmillan Pub. Co 3rd Ed.
2. “Theory of Functions of a Real Variable”- by I. N. Natansen, Fredrik Pub Co., 1964.
3. “Measure Theory”- by P. R. Halmos, East and West Press.
4. “Introduction to Real Variable Theory”- by S.C. Saxena and S. N Shah Prentice Hall of India 1980.
5. “Real and Complex Analysis”, Rudin, W., 2nd Edition, Tata McGraw- Hill Publishing Co., Ltd 1974.

E-Resources

- cims.nyu.edu/~cfgranda/pages/OBDA_fall17/notes...
- www.sxccal.edu/mathematics-lecture-notes
- <https://users.math.msu.edu/users/gnagy/teaching/la.pdf>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Statistical Methods

Subject Code: 256050103

M.Sc. Semester -1

Teaching & Evaluation Scheme

This program leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding of the fundamental and advanced content in Mathematics which will be determined by his /her particular choice of courses, according to his/her particular needs and interests.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives :

The objective of this course is

- To provide an understanding of statistical concepts like measurements of location and dispersion, probability, probability distributions, sampling, estimation, hypothesis testing, regression, correlation analysis, multiple regression and business/economic forecasting.

Prerequisites :




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A Candidate for admission to the Master of Science (Mathematics) must have a 10+2 Science and Bachelor degree with mathematics Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline: To provide knowledge of the Descriptive Statistics and Correlation , Probability & Probability Distribution , Statistical Inference , Regression Analysis .

Sr. No.	Course Contents	Teaching hours
1	Unit 1 Descriptive Statistics and Correlation: Introduction to Statistics, Applications in Business & Economics, Data Summarizing Qualitative & Quantitative Data, Exploratory Data Analysis, The Stem and leaf Display, Cross tabulation & Scatter Diagrams, Measures of location, Mean, Median, Mode, Percentiles, Quartiles, Measures of variability, Range, Inter quartile range, Variance, Standard deviation, Coefficient variation, Measures of distribution shape, Relative location and detecting outliers, Measures of association between two variables, Covariance, Correlation.	12
2	Unit 2 Probability & Probability Distribution: Basic probability concepts, Experiment, Sample space, Events, Exclusive events, Exhaustive events, Independent events, Dependent events, Methods for assigning probability: Classical method, Relative frequency method, Subjective method, Events and their Probability, Addition rule (not to be proved or derived), Conditional probability, Multiplication rule (not to be proved or derived), Baye's theorem (statement only not to be proved or derived), Random variable, Discrete and continuous random variable, Expected value and variance of random variable, Probability distribution: Binomial distribution, Poisson distribution, Normal distribution.	12




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3	Unit 3 Statistical Inference: Sampling methods, Sampling distribution, Central limit theorem (statement only), Point and interval estimation, Sampling distribution of sample mean, Sampling distribution of sample proportion, Hypothesis tests: Null and alternative hypothesis, Type I & II errors, One and two tails test, Rejection rule using p- value and critical value approach, Test of hypothesis about population mean (known), Test of hypothesis about population and proportion, Sampling distribution and test of hypothesis about difference between two population means(known and unknown), Sampling distribution and test of hypothesis about difference between two population and proportions analysis of variance.	12
4	Unit 4 Regression: Introduction to Regression, Simple linear Regression Model, Least Square Method, Coefficient of Determination, Correlation Coefficient, Model Assumptions, Residual Analysis, Validating Model Assumptions, Outliers and Influential Observations, Using the Estimated Regression Equation for Estimation and Prediction.	10

Learning Outcomes :

On successful completion of the course, students will be able to

- How to calculate and apply measures of location and measures of dispersion to grouped and ungrouped data cases.
- How to apply discrete and continuous probability distributions to various business problems.
- Perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases.
- Learn non-parametric test such as the Chi-Square test for Independence as well as Goodness of Fit.
- Compute and interpret the results of Bivariate and Multivariate Regression and Correlation Analysis, for forecasting and also perform ANOVA and F-test

Teaching & Learning Methodology :



The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Anderson, Sweeney, Williams, “Statistics for Business and Economics”, 9th edition, Cengage Publication.
2. S.P. Gupta, “Statistical Method”, Sultan Chand and Sons, 37th edition (2008).

E-Resources

- cims.nyu.edu/~cfgranda/pages/OBDA_fall17/notes...
- www.sxccal.edu/mathematics-lecture-notes
- <https://users.math.msu.edu/users/gnagy/teaching/la.pdf>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Advanced Linear Algebra

Subject Code: 256050104

M.Sc. Semester -1

Teaching & Evaluation Scheme

This program leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding of the fundamental and advanced content in Mathematics which will be determined by his /her particular choice of courses, according to his/her particular needs and interests.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives :

When one has completed this degree he / she will be able to demonstrate the following skills:

- To connect linear algebra to other fields both within and without mathematics.
- To develop abstract and critical reasoning by studying logical proofs and the axiomatic method as applied to linear algebra

Prerequisites :

A Candidate for admission to the Master of Science (Mathematics) must have a 10+2 Science and Bachelor degree with mathematics Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline: · To provide knowledge of the theory of Vector Space, Linear Transformation and Rational Conical Form .




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Sr. No.	Course Contents	Teaching hours
1	Unit 1 Characteristic roots & Matrices: The Algebra of Linear Transformation, Characteristic roots, Characteristic vectors, Diagonalization of Matrices.	10
2	Unit 2 Triangular canonical forms: Triangular canonical form and its theorems, Nilpotent linear transformations and its theorems.	10
3	Unit 3 Decomposition theorem & Jordan canonical forms: Trace and transpose, Decomposition theorem, Jordan canonical forms.	10
4	Unit 4 Rational canonical forms & Determinants: Rational canonical forms, Determinants	10

Learning Outcomes :

On successful completion of the course, students will be able to

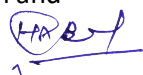
- Analyze and evaluate the accuracy of common numerical methods
- Demonstrate understanding of common numerical methods and how they are used to obtain approximate solutions to otherwise intractable mathematical problems.

Teaching & Learning Methodology :

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.




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Books Recommended

1. Topics in Algebra", 2nd edition, by I N Herstein, John Wiley and Sons, Student Edition, New York (2004).
2. Lenneth Hoffman, Ray Kunze, Linear Algebra, 2nd edition Prentice Hall of India, New Delhi (1971).
3. S. K. Pundir, Advanced Abstract Algebra, Krishna Prakashan Media (P) Ltd. Meerut
4. P B Bhattacharya, Phani Bhusan Bhattacharya, S K Jain and S R Nagpaul, Advanced linear algebra, New Age International Ltd Publishers, New Delhi (2008).
5. Steven Roman, Advanced Linear Algebra, 3rd Edition, Springer (2008).

E-Resources

- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics.
<https://swayam.gov.in/> and <https://nptel.ac.in/>
- cims.nyu.edu/~cfgranda/pages/OBDA_fall17/notes...
- www.sxccal.edu/mathematics-lecture-notes
- <https://users.math.msu.edu/users/gnagy/teaching/la.pdf>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

Mathematical Physics-I & Quantum Mechanics-I

Subject Code: 256040101

M.Sc. Semester -1

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

Objectives

- To provide students the ability to hone the mathematical skills necessary to approach problems in advanced physics courses.
- The purpose of the course is to introduce students to methods of mathematical physics and to develop required mathematical skills to solve problems in quantum mechanics, electrodynamics and other fields of theoretical physics.
- To provide an understanding of the formalism and language of non-relativistic quantum mechanics. To understand the concepts of time-independent perturbation theory and their applications to physical situations.

Prerequisites

Student Must have studied B.Sc. with physics as a major subject and knowledge of basic mathematics.




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Course outline

Sr. No.	Course Contents	Teaching hours
1	Integral Transform Introduction, Laplace transforms, Solution of differential equations by Laplace transform, Convolution, Inverse Laplace transforms, Applications of Laplace Transform for different physical problems.	14
2	Group Theory & Tensor Group theory: Group, subgroups and classes, Invariant sub groups, factor groups, Homomorphism and Isomorphism, Group representation, Reducible and irreducible representation, Schur's Lemmas, orthogonality theorem, Character of a representation, Character tables, Decomposing a reducible representations into irreducible ones, Construction of representation, Representations of groups and quantum mechanics. Tensor: Introduction, n - dimensional space, superscripts and subscripts, Coordinate transformations, Indicial summation conventions, Dummy and Real indices, Kronekar delta symbol, Scalars, Contravariant vectors and covariant vectors, Tensors of higher ranks, Algebraic operations, Symmetric and Antisymmetric tensors, Invariant tensors, Conjugate and reciprocal tensors, Relative and absolute tensors, Line element and matrix tensor, Fundamental tensors.	14
3	Approximation Methods for Stationary States Perturbation theory for discrete levels, Equations in various orders of perturbation theory, Non - degenerate case, Degenerate case - removal of degeneracy, Effect of an electric field on the energy levels of an atom (Stark- effect), Two – electron atoms. Illustrative examples The variation method: Upper bound on ground state energy, Applications to excited states, Trial function linear in variational parameters, The Hydrogen molecule, Exchange interaction. Illustrative examples	14
4	WKB Approximation & Evolution with time WKB Approximation: One - dimensional Schrodinger equation, Bohr-Somerfield quantum condition, WKB solution of the radial wave equation. Evolution with time: Exact formal solutions: Propagators, Schrodinger equation: general solution, Propagators, Alteration of Hamiltonian, transitions and sudden approximation. Illustrative examples.	14




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Learning Outcomes

- The students will be able to understand and apply the mathematical skills to solve quantitative problems in the study of physics and enable to apply integral transform to solve mathematical problems of interest in physics.
- Student should be able to understand basic concepts of Quantum Mechanics, Postulates of Quantum Mechanics, Mathematical foundations of Quantum Mechanics, Schrödinger equation, Symmetries in Quantum Mechanics, Approximation methods and students should be able to Solve one dimensional Schrödinger equations, Solve Schrödinger equations for central potentials. Use time-independent perturbation theory, Use time-dependent perturbation theory.
- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.




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Books Recommended

1. M.L. Boas, Mathematical methods in the physical sciences, JW, 1966
2. P.K. Chattopadhyaya, Mathematical Physics, Wiley Eastern Ltd.
3. G. Arfken, Mathematical methods for Physicists, Academic Press, 1970
4. P.M. Mathews and K Venkatesan, A text book of Quantum Mechanic, Tata MC Graw - Hill publishing company Limited.
5. L. I. Schiff, Quantum mechanics, Tata McGraw - Hill publishing company Limited.
6. G. Aruldas, Quantum mechanics, Prentice - Hall of India

E-Resources

- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics.
<https://swayam.gov.in/> and <https://nptel.ac.in/>
- https://www.grc.nasa.gov/www/k-12/Numbers/Math/documents/Tensors_TM2002211716.pdf
- <https://web.stanford.edu/~boyd/ee102/laplace.pdf>
- https://link.springer.com/chapter/10.1007/978-981-15-2225-3_5
- <https://www.cambridge.org/core/books/physics-of-semiconductors/approximation-methods-in-quantum-mechanics/7B2AAC194639D63A5DCF280C6E3FD56C>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PAPER-2 Classical Mechanics-I & Statistical Mechanics

Subject Code: 256050102

M.Sc. Semester-1

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

Objectives

- The course aims to develop an understanding of Lagrangian and Hamiltonian formulation which allow for simplified treatments of many complex problems in classical mechanics and provides the foundation for the modern understanding of dynamics.
- To have an appreciation for the modern aspects of phase transitions and fluctuations in statistical physics.
- The students will be able to work out equations of state and thermodynamic potentials for elementary systems of particles; and use and develop mean field theory for first and second order phase transitions.

Prerequisites

Student must have studied B.Sc. with physics as a major subject and knowledge of basic mathematics.



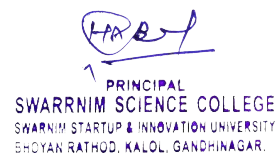

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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Theory of small oscillations General case of coupled oscillations, Eigen vectors and Eigen frequencies, orthogonality of Eigen vectors, normal coordinates, small oscillations of particles on string.	14
2	Canonical Transformation Canonical transformation and Hamilton Jacobi theory: Gauge transformation, Canonical transformation, condition for transformations to be Canonical. Poisson bracket, canonical equations in terms of Poisson bracket notation, Relation between infinitesimal transformation and Poisson brackets, The Hamilton Jacobi equations, Separation of variables, Action angle variables, Properties of action angle.	14
3	Critical Phenomena and Phase Transitions Phase transitions, Condition for phase equilibrium, First order phase transition, Clausius – Clayperon equation, Second order phase transition, The Critical exponent, Co - operative processes, Curie - Weiss theory of Magnetic transition, Ising Model, Ising Model in zeroth approximation, Exact solution of one dimensional Ising Model, Order parameters.	14
4	Fluctuations Brownian motion, Langevin theory of random motion, Time dependence of fluctuations, Power spectrum of fluctuation, Persistence and correlation of fluctuation, Wiener - Khinching theorem, Johnson noise - Nyquist theorem, Shot noise	14

Learning Outcomes

- The students will be able to apply the Variational principles to real physical problems. The students will be able to model mechanical systems, both in inertial and rotating frames, using Lagrange and Hamilton equations.



- The students will be able to work out equations of state and thermodynamic potentials for elementary systems of particles; and use and develop mean field theory for first and second order phase transitions.
- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. R.G. Takwale and P. S. Puranik, Introduction to Classical Mechanics, TMH, 1979
2. H. Goldstein, Classical Mechanics, Addison Wesley
3. A. B. Bhatia, Classical Mechanics, Narosa Pub. House, New Delhi
4. J.C. Upadhyay, Classical Mechanics
5. S.K. Sinha, Statistical Mechanics - Theory and Applications Narosa Pub House
- E.S. Raja Gopal, Statistical Mechanics and Properties of Matter, McMillan Co. Limited.
- Arvelyn Guha, Statistical Mechanics - An Introduction, Narosa Publishing House




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8. R.K. Patharia Statistical Mechanics, Pergamon Press
9. F. Reif, Fundamentals of Statistical Mechanics, McGraw Hill Companies
10. R.K. Srivastava & J. Ashokan, Statistical Mechanics, Printice Hall of India
11. John D. Walecka, Fundamentals of Statistical Mechanics, World Scientific.

E-Resources

- SWAYAM PORTEL/ NPTEL- online courses on special topics on mechanics for classical mechanics and thermodynamics and statistical mechanics for statistical mechanics.
<https://swayam.gov.in/> and <https://nptel.ac.in/>
- <https://oxford.universitypressscholarship.com/view/10.1093/acprof:oso/9780198567264.001.0001/acprof-9780198567264-chapter-17>
- http://www.physik.uni-leipzig.de/~schiller/tp3_2014/Small%20Oscillations.pdf
- <https://www.icts.res.in/program/fnsta20>
- <http://www.phys.ens.fr/~monasson/Articles/a34.pdf>




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SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PAPER-3 Electrodynamics and Plasma Physics

Subject Code: 256050103

M.Sc. Semester-1

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

Objectives

- To evaluate fields and forces in Electrodynamics and Magneto-dynamics using basic scientific method.
- To provide concepts of relativistic electrodynamics and its applications in branches of Physical Sciences.
- To give advance picture of plasma physics and recent advancement in field of plasma physics.

Prerequisites

Student must have studied B.Sc. with physics as a major subject and knowledge of basic mathematics.




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SWARNIM STARTUP & INNOVATION UNIVERSITY
BHOYAN RATHOD, KALOL, GANDHINAGAR.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Electromagnetic waves in Matter Propagation in linear media, Reflection and transmission of plane waves at normal incidence, Reflection and transmission at oblique incidence, Total internal reflection, reflection from the surface of a metal, The frequency dependence of permittivity, Illustrative examples.	14
2	Waveguides Propagation of waves between conducting planes, Waves in guides of arbitrary cross- section, waveguide of rectangular cross section, co-axial waveguides, resonant cavities, dielectric waveguides, Illustrative examples.	14
3	Scattering and Dispersion Scattering of radiation by a free charge, Scattering of radiation by a bound charge, Radiation damping, Dispersion in dilute gases, Dispersion in liquids and solids. Frequency dependence ϵ , μ , σ . Dispersion in non conductors, Free electrons in conductors and Plasma, Illustrative Examples.	14
4	Plasma Physics The moment equations, Derivation of the moment equations, Magnetohydrodynamic OR MHD, One fluid model, Two fluid model, Illustrative Examples. Collisions, Liouville equation, The system of B.B.G.K.Y. Equations, The B-V equation with self consistent field, Illustrative Examples. Controlled thermonuclear reaction, Lawson criterion, The Coulomb barrier, Heating and confinement of the plasma, Radiation loss of energy, Instability problem, Magnetohydrodynamic conversion of energy, Plasma propulsion, Other plasma devices, Illustrative Examples.	14



Learning Outcomes

- Using fundamental plasma parameters, under what conditions an ionized gas consisting of charged particles (electrons and ions) can be treated as a plasma.
- distinguish the single particle approach, fluid approach and kinetic statistical approach to describe different plasma phenomena.
- determine the velocities, both fast and slow (drift velocities), of charged particles moving in electric and magnetic fields that are either uniform or vary slowly in space and time
- classify the electrostatic and electromagnetic waves that can propagate in magnetized and non-magnetized plasmas, and describe the physical mechanisms generating these waves
- define and determine the basic transport phenomena such as plasma resistivity, diffusion (classical and anomalous) and mobility as a function of collision frequency and of the fundamental parameters for both magnetized and non-magnetized plasmas
- formulate the conditions for a plasma to be in a state of thermodynamic equilibrium, or non-equilibrium, and analyze the stability of this equilibrium and account for the most important plasma instabilities
- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

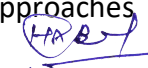
Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs




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- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended:

1. J. Griffiths, Introduction to electrodynamics, Prentice Hall India Ltd. (2nd ed.)
2. B.B. Laud, Electromagnetics, Wiley Eastern, (2nd ed.)
3. E. C. Jordan and K. G. Balmain, Electromagnetic waves and radiating systems, Prentice Hall of India, New Delhi, 1976
4. B. B. Laud, Electromagnetics (2nd Edition), Wiley Eastern,
5. S. N. Goswami, Elements of Plasma Physics, New Central book Agency Pvt. Ltd, Calcutta
6. F.F. Chen, Introduction to Plasma Physics, Plenum Press

E-Resources

- SWAYAM / NPTEL portal online courses available of electromagnetic and plasma physics.
<https://swayam.gov.in/> and <https://nptel.ac.in/>
- <http://indico.ictp.it/event/a14229/session/0/contribution/4/material/slides/0.pdf>
- <https://physics.info/em-waves/>
- https://www.feynmanlectures.caltech.edu/II_24.html
- <http://mypages.iit.edu/~johnsonpo/plasmaweb.pdf>
- <https://ocw.mit.edu/courses/nuclear-engineering/22-611j-introduction-to-plasma-physics-i-fall-2003/lecture-notes/>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PAPER-4 Solid State Physics & Elements of Experimental Physics

Subject Code: 256050104

M.Sc. Semester-1

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

Objectives

- To develop a solid grasp of core concepts and applications of Condensed matter physics and methods of characterization. They learn how physics and other disciplines have impacted and continue to impact each other and society.
- To provide extended knowledge of principles and techniques of solid state physics.
- To provide an understanding of structure, thermal and electrical properties of matter.

Prerequisites

Student must have studied B.Sc. with physics as a major subject and knowledge of basic mathematics.




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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Energy Bands Introduction, Nearly Free Electron Model, Origin of energy gap, Magnitude of the energy gap. Bloch Functions, Kronig-Penney Model, Wave Equation of Electron in a Periodic Potential, Restatement of the Bloch theorem, crystal momentum of an electron, solution of the central equation, empty lattice approximation, Approximate solution Near Zone Boundary, Number of orbital in a band, Metals and Insulators.	14
2	Fermi Surfaces and Metals Introduction, Reduced zone scheme, Periodic zone scheme, construction of Fermi surfaces, electron orbits, hole orbits and open orbits, Calculations of energy bands, Tight binding method for energy bands, Wigner -Seitz method, cohesive energy, Pseudo potential method, Experimental methods in Fermi Surface studies, Quantization of orbits in a magnetic field, de-Haas-Van Alphen Effect, Extremel orbits, Magnetic breakdown.	14
3	Vacuum Techniques & Gauges Classification of vacuum pumps, Rotary pump, Diffusion pump, Molecular drag pump, ion pumping, Sputter ion pump, measurement of pumping speed: constant pressure method, constant volume method. Classification of gauges, McLeod gauge, Thermal conductivity gauge, Thermocouple gauge, Hot cathode ionization gauge, Bayard-Alpert gauge, Cold cathode ionization gauge, Penning gauge, Magnetron gauge.	14
4	Experimental Techniques X-ray Diffraction: X-ray sources, Production of X-rays, continuous X-rays, characteristics Xrays, X-ray filters, X-ray absorbers, Scattering by electrons, atom and unit cell, Electron Diffraction: Introduction to electron diffraction, Transmission Electron microscopes, Neutron Scattering: Slow neutron scattering in solid, Elastic Scattering, Cross – section, Coherent Scattering.	14



Learning Outcomes

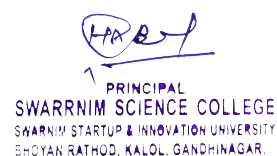
- The students will be able to formulate basic models for electrons and lattice vibrations for describing the physics of crystalline materials; and develop an understanding of relation between band structure and the electrical/optical properties of a material.
- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology:-

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.



Books Recommended:

1. C. Kittel, Introduction to Solid State Physics, 7th Ed., Wiley Eastern Limited, New Delhi
2. J.P. Srivastava: Elements of solid state physics, PHI, India.
3. Vacuum Science and Technology V.V. Rao, T.B. Ghosh and K.L. Chopra Allied Publishers Limited (India)
4. Elements of X-ray diffraction Cullity and Stock.
5. Ashcroft, W. N., and Mermin, D.N., (1976), Solid State Physics, Cengage Learning .

E-Resources

- SWAYAM / NPTEL portal online courses available of solid state physics and experimental techniques. <https://swayam.gov.in/> and <https://nptel.ac.in/>
- <https://inst.eecs.berkeley.edu/~ee130/fa13/lectures/Lecture2marked.ppt>
- <https://physicstoday.scitation.org/doi/pdf/10.1063/1.3057384#:~:text=The%20Fermi%20surface%20is%20therefore,ronic%20states%20in%20momentum%20space.&text=Since%20the%20electrical%20properties%20of,to%20our%20knowledge%20of%20metals.>
- http://www-personal.umich.edu/~sunkai/teaching/Winter_2015/chapter08.pdf
- <https://www.sciencedirect.com/science/article/pii/B9780080444796500029>
- <http://web.physics.ucsb.edu/~phys128/experiments/vacuum/VacuumRev07.pdf>
- https://link.springer.com/chapter/10.1007/978-0-387-37880-0_3



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

GENE STRUCTURE AND FUNCTION

Subject Code: 256010101

M.Sc. Semester -1

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

Objectives

- To provide students basic knowledge of Molecular biology of prokaryotes as well as eukaryotes.
- The purpose of the course is to give students to introduction of replication, transcription, translation and post-translation protein processing in prokaryotes and eukaryotes.
- To provide an understanding of Gene regulation and expression system and also get idea about transposons and topology of DNA.

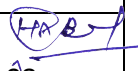
Prerequisites

Student Must have studied B.Sc. with Biotechnology or Microbiology as a major subject and knowledge of basic biology.




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Course outline

Sr. No.	Course Contents	Teaching hours
1	DNA structure Chemistry of DNA, Forces stabilizing DNA structure, Helix parameters, Forms of DNA, Watson –Crick and Hoogsteen base pairing, Physical properties of ds DNA (UV-Absorption spectra, Denaturation and Renaturation, Cot curves, DNA hybridization), Chemicals that react with DNA. DNA topology: DNA supercoiling, Supercoiled forms of DNA, Superhelical density, energetics of supercoiled DNA, Biology of supercoiled DNA (Topological domains of DNA, DNA topoisomerases, Mechanisms of supercoiling in cells, Mechanism of action of Topoisomerase I and II, effect of supercoiling on structure of DNA and role of supercoiling in gene expression and DNA replication) DNA-protein Interactions: General features, Interaction of Helix-turn Helix motif, B-sheet, Zn- DNA binding domains, etc with DNA.	08
2	Organization of DNA into chromosomes Packaging of DNA and organization of chromosome in bacterial cells; Packaging of DNA in eukaryotic nucleosome and chromatin condensation, assembly of nucleosomes upon replication, Chromatin modification and genome expression. DNA replication: Mechanism of DNA polymerase catalyzed synthesis of DNA, Types of DNA polymerases in bacteria and their role. Initiation of chromosomal DNA replication and its regulation in prokaryotes, assembly of replisome and progress of replication fork, termination of replication. Types and function of eukaryotic DNA polymerases, initiation of replication in eukaryotes, role of telomerases in replication of eukaryotic chromosomes. Inhibitors of DNA replication (blocking precursor synthesis, nucleotide polymerization, altering DNA structure).	08
3	Transcription RNA polymerases, features of prokaryotic and eukaryotic promoters, assembly of transcription initiation complex in prokaryotes and eukaryotes and its regulation; synthesis and processing of prokaryotic and eukaryotic transcripts. Transport of RNA within eukaryotic cell. Translation Structure and role of t-RNA in protein synthesis, ribosome structure, basic features of genetic code and its deciphering, translation (initiation, elongation and termination in detail in prokaryotes as well as eukaryotes).	08
	Processing of proteome Posttranslational processing of proteins (protein folding, processing by proteolytic cleavage, processing by chemical modification),	 08-PRINCIPAL SWARNIM SCIENCE COLLEGE SWARNIM STARTUP & INNOVATION UNIVERSITY BHOYAN RATHOD, KATOI, GANDHINAGAR.



	Protein degradation. Regulation of gene expression in prokaryotes: Operon concept, positive and negative regulation. Examples of lac-, Ara-, His- and Trp-operon regulation; antitermination, global regulatory responses; Regulation of gene expression in eukaryotes: Transcriptional, translational and processing level control mechanisms.	

Learning Outcomes

- The students will be able to apply the knowledge of the Molecular biology to understand concepts of various fields like research fields, Gene manipulation, Genetic engineering, Genetics, etc.
- Student should be able to understand basic concepts of Replication, transcription and translation in prokaryotes as well as eukaryotes, gene regulations, protein targeting, transposons, retrotransposons, application of transposons, protein degradation, gene expression, operon systems.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the theoretical data clearly and concisely that incorporates the stylistic conventions used by biotechnologist worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc.) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.




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Books Recommended

1. Lewin's GENES X, Volume 10 Benjamin Lewin, Jocelyn Krebs, Stephen Kilpatrick, Elliott Goldstein-Jones & Bartlett Learning, 2011
2. Molecular Biology of the gene – Watson, Hopkins, Roberts 4TH edition
3. Molecular biology of the cell (third edition): By B Alberts, D Bray, J Lewis, M Raff, K Roberts and J D Watson.
4. iGenetics: A Molecular Approach (3rd Edition). by Peter J. Russell




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SWARRNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

Bioinstrumentation

CODE:256010102

M.Sc. 1st semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	--	100

Objectives:-

- To provide students basic knowledge of Bio-analytical techniques. This course begins with a review of basic bio analytical technique and an introduction to general terminologies
- The purpose of the course is to introduce students to methods of Bioanalysis and to develop required microbiological skills which will be helpful in their future.
- This course contains bio analytical techniques along with their theory, working principal, common instrumentation and possible applications. This course will be equally beneficial to various scientific areas including, life science, chemical science, material science and environmental science.

Prerequisites:-

Student must have passed B.Sc in Microbiology as major subject and have knowledge about biology field.




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Course outline:-

Sr. No.	Course Contents	Number of Hours
1.	Electrochemistry: pH and buffers, potentiometric and conductometric titration. Principle and application of light, phase contrast, fluorescence, scanning and transmission electron microscopy, scanning tunneling microscopy, atomic force microscopy, confocal microscopy, cytophotometry and flow cytometry. Preparation of microbial, animal and plant samples for microscopy.	10
2.	Principle methodology and applications of gel – filtration, ion –exchange and affinity chromatography; Thin layer and gas chromatography; High performance liquid chromatography, FPLC. Electrophoresis: Principle and applications of Native and SDS PAGE; Agarose and 2D gel electrophoresis.	10
3.	Spectroscopy: UV, Visible, IR, NMR and ESR spectroscopy. Atomic absorption and plasma emission spectroscopy; MS and MALDI-TOF.	10
4.	Centrifugation: Basic principle and application; Differential, density and Ultracentrifugation. Principle of biophysical method and used for analysis of biopolymer structure; X ray diffraction, fluorescence, Principle and applications of tracer technique in biology: Radioactive Isotopes and half life of isotopes; Effect of radiation on biological system; autoradiography; cerenkov radiation; radiation dosimetry; scintillation counting. Biosensors: Principle and application	10

Learning Outcomes:

- The students will be able to use selected analytical techniques. Familiarity with working principals, tools and techniques of analytical techniques. student should be able to understand basic concepts of the present day scope and applications of Bioanalytical techniques.
- The course is designed to understand the strengths, limitations and creative use of techniques for problem-solving.



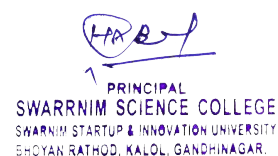
- The students will be able to select analytical technique for case study. able to design experiments and understand the instrumentation. Students can use their knowledge in Academic and industrial research organization ,Industries based on biotechnology, pharmacy, agriculture, and chemical

Teaching & Learning Methodology

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- K. Wilson, J. M. Walker, Eds., Principles and techniques of biochemistry and molecular biology (Cambridge University Press, Cambridge, UK : New York, 7th ed., 2009).
- R. F. Boyer, Biochemistry laboratory: modern theory and techniques (Prentice Hall, Boston, 2nd ed., 2012).
- R. Katoch, Analytical techniques in biochemistry and molecular biology (Springer, New York, 2011).
- D. L. Spector, R. D. Goldman, Eds., Basic methods in microscopy: protocols and concepts from cells: a laboratory manual (Cold Spring Harbor Laboratory Press, Cold Spring Harbor, N.Y, 2006).
- R. L. Switzer, Experimental biochemistry (W. H. Freeman and Co, New York, 3rd ed., 1999).



- R. F. Boyer, Modern experimental biochemistry (Benjamin Cummings, San Francisco, 3rd ed., 2000).
- J. R. Lakowicz, Principles of fluorescence

E-Resources

- <https://www.slideshare.net/drmohsin3/colorimetry-spectrophotometry>
- <https://www.tandfonline.com/doi/abs/10.1081/SPM-100100006?journalCode>
- <https://www.fishersci.se/se/en/scientific-products/centrifuge-guide/centrifugation-theory.html>
- <https://en.wikipedia.org/wiki/Chromatography#:~:text=Chromatography>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1122955/#:~:text=Bi>




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SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

Microbial Diversity

Subject Code: 256010103

M.SC. Semester -1

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

Objectives

- To provide students the basic knowledge cell, cell structure & its function and role of various biomolecules.
- The purpose of the course is to give student to introduction of Evolution of the cell, Chemical and physical foundations of biomolecules, Nucleotides, Biological membranes.
- To provide an understanding of various cell organelles, amino acids, Lipids, vitamins, and membrane structure and transport mechanisms.

Prerequisites

Student must have studied M.Sc. with microbiology as a major subject and knowledge of basic Microbial diversity.




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Course outline

Sr. No.	Course Contents	Teaching hours
1.	Principles of microbial diversity - Principles and concepts of microbial diversity - Culturable and non-culturable diversity - Methods of studying diversity - Principles and concepts of metagenomics - Conservation of microbial diversity - Metabolic diversity in bacteria	10
2.	Bacterial systematics - Conventional and molecular systematics and general discussion on the occurrence, diversity, characteristic features, significance and potential applications of various groups of bacteria, comparison of Bergey's Manual of Systematic Bacteriology (Edition 1 and 2) - Diversity of actinomycetes - Diversity of cyanobacteria	10
3.	Diversity of yeast and moulds - Systematics and classification of fungi - Properties, structure and reproduction of economically important fungi - Mycorrhizal fungi - Biology of yeast and its role in industry - Ecological importance and significance of fungi	10
4.	Diversity of Archaea - Systematics occurrence, diversity, characteristics features, of different groups of archaea bacteria - Survival, adaptation and potential applications: Halophiles, Thermophiles, Alkalophiles and Acidophile	10

Learning Outcomes

- The students will be able to understand the Knowledge of Diversity.
- Student should be able to understand basic concepts of Microbial diversity ,Diversity of Yeast and moulds ,Diversity of Archaea.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.




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Teaching & Learning Methodology

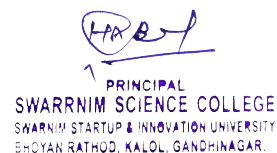
We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

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- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Oladele Ogunseitan(2004), Microbial Diversity. Form and Function in Prokaryotes.
- _Mikel A. Becerro, Maria J. Uriz, Manuel Maldonado and Xavier Turon (Eds.)(2012), Advances in Sponge Science: Physiology, Chemical and Microbial Diversity, Biotechnology.
- Christine E. Salomon; Nathan A. Magarvey; David H. Sherman(2004), Merging the Potential of Microbial Genetics with Biological and Chemical Diversity: An Even Brighter Future for Marine Natural Product Drug Discovery
- Burnet et.al(1980), A guide to identifying and classifying yeast.
- Colwd. D, Microbial diversity.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

Diversity of Prokaryotic and Eukaryotic Microorganisms-103

Subject Code: 56010103

M.SC. Semester -1

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	50	70	-	150

Objectives

- To provide students the basic knowledge cell, cell structure & its function and role of various biomolecules.
- The purpose of the course is to give student to introduction of Evolution of the cell, Chemical and physical foundations of biomolecules, Nucleotides, Biological membranes.
- To provide an understanding of various cell organelles, amino acids, Lipids, vitamins, and membrane structure and transport mechanisms.

Prerequisites

Student must have studied M.Sc. with microbiology as a major subject and knowledge of basic Microbial diversity.




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Course outline

Sr. No.	Course Contents	Teaching hours
1.	Principles of microbial diversity - Principles and concepts of microbial diversity - Culturable and non-culturable diversity - Methods of studying diversity - Principles and concepts of metagenomics - Conservation of microbial diversity - Metabolic diversity in bacteria	10
2.	Bacterial systematics - Conventional and molecular systematics and general discussion on the occurrence, diversity, characteristic features, significance and potential applications of various groups of bacteria, comparison of Bergey's Manual of Systematic Bacteriology (Edition 1 and 2) - Diversity of actinomycetes - Diversity of cyanobacteria	10
3.	Diversity of yeast and moulds - Systematics and classification of fungi - Properties, structure and reproduction of economically important fungi - Mycorrhizal fungi - Biology of yeast and its role in industry - Ecological importance and significance of fungi	10
4.	Diversity of Archaea - Systematics occurrence, diversity, characteristics features, of different groups of archaea bacteria - Survival, adaptation and potential applications: Halophiles, Thermophiles, Alkalophiles and Acidophile	10

Learning Outcomes

- The students will be able to understand the Knowledge of Diversity.
- Student should be able to understand basic concepts of Microbial diversity ,Diversity of Yeast and moulds ,Diversity of Archaea.



Access information on a topic from a variety of sources, and be able to learn new things on one's own.


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Teaching & Learning Methodology

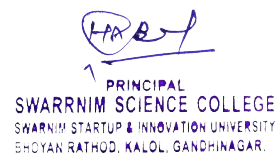
We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Oladele Ogunseitan(2004), Microbial Diversity. Form and Function in Prokaryotes.
- Mikel A. Becerro, Maria J. Uriz, Manuel Maldonado and Xavier Turon (Eds.)(2012), Advances in Sponge Science: Physiology, Chemical and Microbial Diversity, Biotechnology.
- Christine E. Salomon; Nathan A. Magarvey; David H. Sherman(2004), Merging the Potential of Microbial Genetics with Biological and Chemical Diversity: An Even Brighter Future for Marine Natural Product Drug Discovery
- Burnet et.al(1980), A guide to identifying and classifying yeast.
- Colwd. D, Microbial diversity.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

Biogeohydrotechnology and Biofuels

Subject Code: 256010104

M.Sc. Semester-1

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	8	30	50	70	50	200

Objectives

- To provide applied knowledge of waste management with different biological methods, marine biotechnology, microbiology of minerals and fuel biology.
- Learn about the Methodology of waste treatment, marine bacterial diversity, bioleaching methods & bio-oxidation.
- Get awareness on the conservation of energy and migration towards bioenergy such as biogas, bio-hydrogen, bioethanol, etc.

Prerequisites

Student must have basic knowledge about waste treatment, bacterial diversity as well as energy resources.




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Course outline

Unit. No.	Course Contents	Teaching hours
1	Waste treatment: - Classification and characterization of waste - Principles and mechanisms of waste treatment - Biological methods of liquid waste treatment - Biological methods for solid waste management	10
2	Marine Biotechnology: - Marine environment and bacterial diversity - Cultivation and enumeration of marine bacteria - Application of indicators of marine microbial enzymes, polysaccharide, antimicrobial peptides and carotenoids	10
3	Microbiology of Minerals: - Bioleaching and Bio-oxidation - Biogeohydrotechnology of sulphidic minerals - Biobeneficiation - Acid mine drainage formation and control - Bioleaching methods and factors affecting bioleaching	10
4	Fuel Biotechnology: - Types of energy resources and their uses - Biotechnology for biogas, bioethanol, biodiesel and bio-hydrogen production - Desirable and undesirable features of biofuels - Energy crops - MEOR - Mode of utilization of biomass	10
		40

Learning Outcomes

- The students will be able to apply the knowledge of the biological methods for solid and liquid waste treatment, also get knowledge about classification and characterization of waste.
- Student should be able to understand marine bacterial diversity and also learn techniques for cultivation and enumeration of marine bacteria and get knowledge about indicators of marine microbial enzymes and its applications.
- The course is designed to give students understanding different methods of bioleaching, bio-oxidation, bio-beneficiation as well as biogeohydrotechnology of sulphidic minerals. The study fuel biotechnology also helps students to understand importance of energy resources with knowledge of biogas, bioethanol, biodiesel, bio-hydrogen technology.



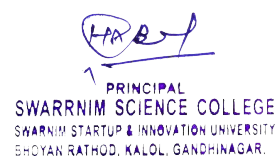
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the theoretical data and laboratory experiments clearly and concisely that incorporates the stylistic conventions used by microbiologists worldwide.

Teaching & Learning Methodology

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
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Books Recommended

- Bimal C Bhattacharyya., & Rintu Banerjee (2007). *Environmental biotechnology*.
- Ronald M. Atlas., & Richard Bartha (1998). *Microbial Ecology: Fundamentals and Applications*, 4th Edition
- Brierley, C. L., Ehrlich, H. Lutz. (1990). *Microbial mineral recovery*.
- T. Scheper (1983). *Advances in biochemical engineering/biotechnology*.
- Garg, Sudhi. (2011). *Environmental Security: Human and Animal Health*.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

GENE STRUCTURE AND FUNCTION

Subject Code: 256030101

M.Sc. Semester -1

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

Objectives

- To provide students basic knowledge of Molecular biology of prokaryotes as well as eukaryotes.
- The purpose of the course is to give students to introduction of replication, transcription, translation and post-translation protein processing in prokaryotes and eukaryotes.
- To provide an understanding of Gene regulation and expression system and also get idea about transposons and topology of DNA.

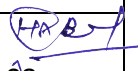
Prerequisites

Student Must have studied B.Sc. with Biotechnology or Microbiology as a major subject and knowledge of basic biology.




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Course outline

Sr. No.	Course Contents	Teaching hours
1	DNA structure Chemistry of DNA, Forces stabilizing DNA structure, Helix parameters, Forms of DNA, Watson –Crick and Hoogsteen base pairing, Physical properties of ds DNA (UV-Absorption spectra, Denaturation and Renaturation, Cot curves, DNA hybridization), Chemicals that react with DNA. DNA topology: DNA supercoiling, Supercoiled forms of DNA, Superhelical density, energetics of supercoiled DNA, Biology of supercoiled DNA (Topological domains of DNA, DNA topoisomerases, Mechanisms of supercoiling in cells, Mechanism of action of Topoisomerase I and II, effect of supercoiling on structure of DNA and role of supercoiling in gene expression and DNA replication) DNA-protein Interactions: General features, Interaction of Helix-turn Helix motif, B-sheet, Zn- DNA binding domains, etc with DNA.	08
2	Organization of DNA into chromosomes Packaging of DNA and organization of chromosome in bacterial cells; Packaging of DNA in eukaryotic nucleosome and chromatin condensation, assembly of nucleosomes upon replication, Chromatin modification and genome expression. DNA replication: Mechanism of DNA polymerase catalyzed synthesis of DNA, Types of DNA polymerases in bacteria and their role. Initiation of chromosomal DNA replication and its regulation in prokaryotes, assembly of replisome and progress of replication fork, termination of replication. Types and function of eukaryotic DNA polymerases, initiation of replication in eukaryotes, role of telomerases in replication of eukaryotic chromosomes. Inhibitors of DNA replication (blocking precursor synthesis, nucleotide polymerization, altering DNA structure).	08
3	Transcription RNA polymerases, features of prokaryotic and eukaryotic promoters, assembly of transcription initiation complex in prokaryotes and eukaryotes and its regulation; synthesis and processing of prokaryotic and eukaryotic transcripts. Transport of RNA within eukaryotic cell. Translation Structure and role of t-RNA in protein synthesis, ribosome structure, basic features of genetic code and its deciphering, translation (initiation, elongation and termination in detail in prokaryotes as well as eukaryotes).	08
	Processing of proteome Posttranslational processing of proteins (protein folding, processing by proteolytic cleavage, processing by chemical modification),	 08-PRINCIPAL SWARNIM SCIENCE COLLEGE SWARNIM STARTUP & INNOVATION UNIVERSITY BHOYAN RATHOD, KATOL, GANDHINAGAR.



	Protein degradation. Regulation of gene expression in prokaryotes: Operon concept, positive and negative regulation. Examples of lac-, Ara-, His- and Trp-operon regulation; antitermination, global regulatory responses; Regulation of gene expression in eukaryotes: Transcriptional, translational and processing level control mechanisms.	

Learning Outcomes

- The students will be able to apply the knowledge of the Molecular biology to understand concepts of various fields like research fields, Gene manipulation, Genetic engineering, Genetics, etc.
- Student should be able to understand basic concepts of Replication, transcription and translation in prokaryotes as well as eukaryotes, gene regulations, protein targeting, transposons, retrotransposons, application of transposons, protein degradation, gene expression, operon systems.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the theoretical data clearly and concisely that incorporates the stylistic conventions used by biotechnologist worldwide.

Teaching & Learning Methodology

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Books Recommended

1. Lewin's GENES X, Volume 10 Benjamin Lewin, Jocelyn Krebs, Stephen Kilpatrick, Elliott Goldstein-Jones & Bartlett Learning, 2011
2. Molecular Biology of the gene – Watson, Hopkins, Roberts 4TH edition
3. Molecular biology of the cell (third edition): By B Alberts, D Bray, J Lewis, M Raff, K Roberts and J D Watson.
4. iGenetics: A Molecular Approach (3rd Edition). by Peter J. Russell




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SWARRNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

Bioinstrumentation

CODE:256030102

M.Sc. 1st Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	4	4	4	30	-	70		100

Objectives:-

- To provide students basic knowledge of Bio-analytical techniques. This course begins with a review of basic bio analytical technique and an introduction to general terminologies
- The purpose of the course is to introduce students to methods of Bioanalysis and to develop required microbiological skills which will be helpful in their future.
- This course contains bio analytical techniques along with their theory, working principal, common instrumentation and possible applications. This course will be equally beneficial to various scientific areas including, life science, chemical science, material science and environmental science.

Prerequisites:-

Student must have passed B.Sc in Microbiology as major subject and have knowledge about biology field.




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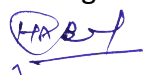
Course outline:-

Sr. No.	Course Contents	Number of Hours
1.	Electrochemistry: pH and buffers, potentiometric and conductometric titration. Principle and application of light, phase contrast, fluorescence, scanning and transmission electron microscopy, scanning tunneling microscopy, atomic force microscopy, confocal microscopy, cytophotometry and flow cytometry. Preparation of microbial, animal and plant samples for microscopy.	10
2.	Principle methodology and applications of gel – filtration, ion –exchange and affinity chromatography; Thin layer and gas chromatography; High performance liquid chromatography, FPLC. Electrophoresis: Principle and applications of Native and SDS PAGE; Agarose and 2D gel electrophoresis.	10
3.	Spectroscopy: UV, Visible, IR, NMR and ESR spectroscopy. Atomic absorption and plasma emission spectroscopy; MS and MALDI-TOF.	10
4.	Centrifugation: Basic principle and application; Differential, density and Ultracentrifugation. Principle of biophysical method and used for analysis of biopolymer structure; X ray diffraction, fluorescence, Principle and applications of tracer technique in biology: Radioactive Isotopes and half life of isotopes; Effect of radiation on biological system; autoradiography; cerenkov radiation; radiation dosimetry; scintillation counting. Biosensors: Principle and application	10

Learning Outcomes:

- The students will be able to use selected analytical techniques. Familiarity with working principals, tools and techniques of analytical techniques. student should be able to understand basic concepts of the present day scope and applications of Bioanalytical techniques.
- The course is designed to understand the strengths, limitations and creative use of techniques for problem-solving.
- The students will be able to select analytical technique for case study. able to design




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experiments and understand the instrumentation. Students can use their knowledge in Academic and industrial research organization ,Industries based on biotechnology, pharmacy, agriculture, and chemical

Teaching & Learning Methodology

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
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Books Recommended

- K. Wilson, J. M. Walker, Eds., Principles and techniques of biochemistry and molecular biology (Cambridge University Press, Cambridge, UK : New York, 7th ed., 2009).
- R. F. Boyer, Biochemistry laboratory: modern theory and techniques (Prentice Hall, Boston, 2nd ed., 2012).
- R. Katoch, Analytical techniques in biochemistry and molecular biology (Springer, New York, 2011).
- D. L. Spector, R. D. Goldman, Eds., Basic methods in microscopy: protocols and concepts from cells: a laboratory manual (Cold Spring Harbor Laboratory Press, Cold Spring Harbor, N.Y, 2006).
- R. L. Switzer, Experimental biochemistry (W. H. Freeman and Co, New York, 3rd ed., 1999).



- R. F. Boyer, Modern experimental biochemistry (Benjamin Cummings, San Francisco, 3rd ed., 2000).
- J. R. Lakowicz, Principles of fluorescence

E-Resources

- <https://www.slideshare.net/drmohsin3/colorimetry-spectrophotometry>
- <https://www.tandfonline.com/doi/abs/10.1081/SPM-100100006?journalCode>
- <https://www.fishersci.se/se/en/scientific-products/centrifuge-guide/centrifugation-theory.html>
- <https://en.wikipedia.org/wiki/Chromatography#:~:text=Chromatography>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1122955/#:~:text=Bi>




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SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

Microbial Diversity

Subject Code: 256030103

M.SC. Semester -1

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	4	4	4	30	-	70	-	100

Objectives

- To provide students the basic knowledge cell, cell structure & its function and role of various biomolecules.
- The purpose of the course is to give student to introduction of Evolution of the cell, Chemical and physical foundations of biomolecules, Nucleotides, Biological membranes.
- To provide an understanding of various cell organelles, amino acids, Lipids, vitamins, and membrane structure and transport mechanisms.

Prerequisites

Student must have studied M.Sc. with microbiology as a major subject and knowledge of basic Microbial diversity.




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Course outline

Sr. No.	Course Contents	Teaching hours
1.	Principles of microbial diversity - Principles and concepts of microbial diversity - Culturable and non-culturable diversity - Methods of studying diversity - Principles and concepts of metagenomics - Conservation of microbial diversity - Metabolic diversity in bacteria	10
2.	Bacterial systematics - Conventional and molecular systematics and general discussion on the occurrence, diversity, characteristic features, significance and potential applications of various groups of bacteria, comparison of Bergey's Manual of Systematic Bacteriology (Edition 1 and 2) - Diversity of actinomycetes - Diversity of cyanobacteria	10
3.	Diversity of yeast and moulds - Systematics and classification of fungi - Properties, structure and reproduction of economically important fungi - Mycorrhizal fungi - Biology of yeast and its role in industry - Ecological importance and significance of fungi	10
4.	Diversity of Archaea - Systematics occurrence, diversity, characteristics features, of different groups of archaea bacteria - Survival, adaptation and potential applications: Halophiles, Thermophiles, Alkalophiles and Acidophile	10

Learning Outcomes

- The students will be able to understand the Knowledge of Diversity.
- Student should be able to understand basic concepts of Microbial diversity ,Diversity of Yeast and moulds ,Diversity of Archaea.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.




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Teaching & Learning Methodology

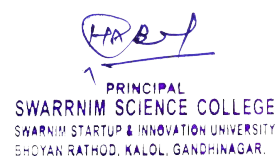
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- _Mikel A. Becerro, Maria J. Uriz, Manuel Maldonado and Xavier Turon (Eds.)(2012), Advances in Sponge Science: Physiology, Chemical and Microbial Diversity, Biotechnology.
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- Burnet et.al(1980), A guide to identifying and classifying yeast.
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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

Diversity of Prokaryotic and Eukaryotic Microorganisms-103

Subject Code: 56010103

M.SC. Semester -1

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	50	70	-	150

Objectives

- To provide students the basic knowledge cell, cell structure & its function and role of various biomolecules.
- The purpose of the course is to give student to introduction of Evolution of the cell, Chemical and physical foundations of biomolecules, Nucleotides, Biological membranes.
- To provide an understanding of various cell organelles, amino acids, Lipids, vitamins, and membrane structure and transport mechanisms.

Prerequisites

Student must have studied M.Sc. with microbiology as a major subject and knowledge of basic Microbial diversity.




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Course outline

Sr. No.	Course Contents	Teaching hours
1.	Principles of microbial diversity - Principles and concepts of microbial diversity - Culturable and non-culturable diversity - Methods of studying diversity - Principles and concepts of metagenomics - Conservation of microbial diversity - Metabolic diversity in bacteria	10
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Learning Outcomes

- The students will be able to understand the Knowledge of Diversity.
- Student should be able to understand basic concepts of Microbial diversity ,Diversity of Yeast and moulds ,Diversity of Archaea.



Access information on a topic from a variety of sources, and be able to learn new things on one's own.


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Teaching & Learning Methodology

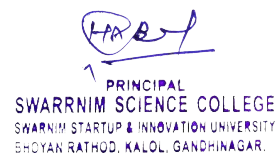
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SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

Biogeohydrotechnology and Biofuels

Subject Code: 256030104

M.Sc. Semester-1

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- To provide applied knowledge of waste management with different biological methods, marine biotechnology, microbiology of minerals and fuel biology.
- Learn about the Methodology of waste treatment, marine bacterial diversity, bioleaching methods & bio-oxidation.
- Get awareness on the conservation of energy and migration towards bioenergy such as biogas, bio-hydrogen, bioethanol, etc.

Prerequisites

Student must have basic knowledge about waste treatment, bacterial diversity as well as energy resources.




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SWARNIM STARTUP & INNOVATION UNIVERSITY
BHOYAN RATHOD, KALOL, GANDHINAGAR.

Course outline

Unit. No.	Course Contents	Teaching hours
1	Waste treatment: - Classification and characterization of waste - Principles and mechanisms of waste treatment - Biological methods of liquid waste treatment - Biological methods for solid waste management	10
2	Marine Biotechnology: - Marine environment and bacterial diversity - Cultivation and enumeration of marine bacteria - Application of indicators of marine microbial enzymes, polysaccharide, antimicrobial peptides and carotenoids	10
3	Microbiology of Minerals: - Bioleaching and Bio-oxidation - Biogeohydrotechnology of sulphidic minerals - Biobeneficiation - Acid mine drainage formation and control - Bioleaching methods and factors affecting bioleaching	10
4	Fuel Biotechnology: - Types of energy resources and their uses - Biotechnology for biogas, bioethanol, biodiesel and bio-hydrogen production - Desirable and undesirable features of biofuels - Energy crops - MEOR - Mode of utilization of biomass	10
		40

Learning Outcomes

- The students will be able to apply the knowledge of the biological methods for solid and liquid waste treatment, also get knowledge about classification and characterization of waste.
- Student should be able to understand marine bacterial diversity and also learn techniques for cultivation and enumeration of marine bacteria and get knowledge about indicators of marine microbial enzymes and its applications.
- The course is designed to give students understanding different methods of bioleaching, bio-oxidation, bio-beneficiation as well as biogeohydrotechnology of sulphidic minerals. The study fuel biotechnology also helps students to understand importance of energy resources with knowledge of biogas, bioethanol, biodiesel, bio-hydrogen technology.



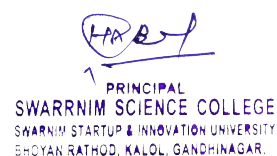
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- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Bimal C Bhattacharyya., & Rintu Banerjee (2007). *Environmental biotechnology*.
- Ronald M. Atlas., & Richard Bartha (1998). *Microbial Ecology: Fundamentals and Applications*, 4th Edition
- Brierley, C. L., Ehrlich, H. Lutz. (1990). *Microbial mineral recovery*.
- T. Scheper (1983). *Advances in biochemical engineering/biotechnology*.
- Garg, Sudhi. (2011). *Environmental Security: Human and Animal Health*.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Organic Chemistry - I

Subject Code: 256020101

M.Sc. Semester-1

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental organic chemistry.

Course outline

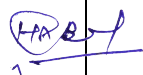
Sr. No.	Course Contents	Teaching Hours
1	(A) Elimination Reaction The E1, E2, E1CB mechanism, stereochemistry. Orientation of the double bond syn and anti-eliminations. Reactivity- effects of substrate structures, attacking base, leaving group and medium. Mechanism and orientation in pyrolytic syn eliminations – Chugaev and Cope eliminations.	14



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	(B) Nucleophilic Substitution Reaction Mixed SN1, SN2 and SET mechanism. Nucleophilic substitution at (a) Allylic carbon (Allylic rearrangements), (b) An Aliphatic trigonal carbon (the tetrahedral mechanism) and at (c) A Vinyl carbon. Participation of Neighboring groups in Nucleophilic substitution by (a) Carboxylate anion (b) Halogen atoms (c) Hydroxyl groups (d) Acetoxy group (e) Phenyl group (f) RS group (g) Participation by π-bond.	
2	(A) Aromaticity Aromaticity, aromatic character, Frost circle diagram for cyclobutadiene, benzene and others. Resonance and chemical stabilization-aromatic character based on NMR criteria, Huckels rule, energy level of π molecular orbitals, Huckels molecular orbital (HMO) method, MO of simple organic systems such as ethene, allyl and butadiene Aromaticity in benzenoid and non-benzenoid compounds and charged rings, annulenes, fulvenes, azulenes, antiaromaticity and homoaromaticity. (B) Acid base concept Concept, pKa, Hammett equation, Concept of hindered base, The effect of structure on the strength of acids and bases.	14
3	(A) Reactive intermediates (1) Carbocations (classical and non-classical) stability, structure, generation and fate (2) Carbanions- stability, structure, generation and fate of carbanions (3) Carbenes- stability and structure, the generation and fate of carbenes. (4) Free radicals: stability, structure, generation and fate of free radicals, NBS (5) Nitrene : stability, structure, generation, reaction (B) Rearrangements General mechanistic considerations, nature of migration, migratory aptitude, and memory effects in respect of following. (1) Carbon to Carbon migration of R, H and Ar (i) Pinacol- Pinacolone rearrangement (ii) Favorskii rearrangement (2) Carbon to Nitrogen migrations: (i) Curtius rearrangement (ii) Schmidt rearrangement (3) Carbon to oxygen migration of and Ar	14




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	(i) Baeyer- villiger rearrangement (ii) Rearrangement of hydroperoxide	
4	Stereo Chemistry Optical and geometrical isomerism, origin of chirality and chiral centre, axis and plane, helicity, Enantiotopic and diastereotopic atoms, groups and faces, prochiralcentre, biphenyl, allenes, spirans, compounds containing chiral nitrogen and sulfur, .stereospecific and stereoselective synthesis, dynamic resolution.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Organic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programmer/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs.
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programmer/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures.

Books Recommended:

1. Advanced Organic Chemistry, Reactions Mechanisms and Structure , J. March, 6th Edition, John Wiley.



2. Carbenes, nitrenes and arynes, T.L. Gilchrist and C.W. Rees.



3. Guidebook to Mechanism in Organic Chemistry by Peter Sykes, 6th Edition, Prentice Hall.
4. Advanced Organic Chemistry Part A: Structure and Mechanism and Part B: Reaction and synthesis, Francis A. Carey, Richard J. Sundberg, 5th Edition, Springer.
5. Organic Chemistry, Johnathan Clayden, Nick Greeves, Stuart Warren, 1st Edition, Oxford University Press.
6. Principles of Organic Synthesis, R.O.C. Norman and J.M. Coxon, 3rd Edition, Blackie Academic and Professional.
7. Stereo Chemistry, P.S. Kalsi, New Age Publications.
8. Reagents in Organic Synthesis- Fieser and Fieser, John Wiley.
9. Physical Organic Chemistry by Jack Hynes, (plenum publication)
10. Organic Chemistry, T.W. Graham Solomons and Graig B. Frymes, John Wiley and Sons.
11. Organic Chemistry, F. A. Carey, McGraw Hill Edition.
12. General Organic Chemistry Sachin Kumar Ghose, New Central book agency.
13. Organic Chemistry Vol 1-2 I.L. Finar 5th edition, ELBS.

E-Resources

- [https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_General_Chemistry_\(Petrucci_et_al.\)/27%3A_Reactions_of_Organic_Compounds/27.03%3A_Introduction to Elimination Reactions](https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_General_Chemistry_(Petrucci_et_al.)/27%3A_Reactions_of_Organic_Compounds/27.03%3A_Introduction_to_Elimination_Reactions)
- <http://www.chem.ucalgary.ca/courses/350/Carey5th/Ch08/ch8-0.html>
- <https://www.masterorganicchemistry.com/2017/02/23/rules-for-aromaticity/>
- <https://classnotes.org.in/class11/chemistry/ionic-equilibrium/concepts-acids-bases/>
- <http://burton.chem.ox.ac.uk/rearrangements-and-reactive.pdf>
- <https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/rearrang.htm>
- <https://www.masterorganicchemistry.com/2011/10/17/introduction-to-rearrangement-reactions/>
- <http://www.colby.edu/chemistry/CH241F/Chapter%204.pdf>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Inorganic Chemistry - I

Subject Code: 256020102

M.Sc. Semester-1

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental inorganic chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Quantum theory and Atomic Structure Postulates of quantum mechanics, setting up of different observables, Eigen value of angular momenta and commutation relations, step-up and step-down operators, and angular momenta	14



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	in many electron atoms. Schrodinger wave equation and applications: particle on a ring and the simple harmonic oscillator. H-atom wave functions, solutions of $R(r)$, $\theta(\theta)$ and $\phi(\phi)$ equations, quantum numbers, angular and radial wave function, shapes of the orbitals, angular momentum of inner quantum number j , physical interpretation of hydrogenic orbitals; space quantization of electronic orbits; electron spin. Approximation methods: Variation method and application to H atom. Perturbation theory (first order and non-degenerate, application to the Helium atom.	
2	Symmetry and Group Theory Representation of groups-some properties of matrices & vectors, representation of groups, the Great orthogonality theorem and its consequences, character table, wave functions as basis for irreducible representations, direct product, identifying nonzero matrix elements.	14
3	Magnetochemistry Magnetic susceptibility and basic derivation of diamagnetic susceptibility, pascal constant and its utility, Curie law and Curie-Weiss law, antiferromagnetism and ferromagnetism. Types of antiferromagnetism, antiferro magnetic exchange pathway : Direct – metal- metal interaction and Indirect-atom exchange i.e. super exchange mechanism.	14
4	Bio-inorganic Chemistry Metalloporphyrins (enzymes) definition, hemoglobin and myoglobin, cytochrome, vitamin B12 (cyanocobalamin), zincmetallo enzymes, nitrogen fixation, essential and trace elements in biological system, biochemistry of non-metals K, Na pump (action of bath ions), toxic metals and their toxicity. Co-ordination compounds in medicine Chelation therapy, gold compounds and rheumatoid arthritis, anticancer drugs –platinum complexes, gold complexes, metallocenesetc, antimicrobial agents, metal complexes as radiodiagnostic agents, magnetic resonance imaging.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of inorganic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.



Teaching & Learning Methodology


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We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

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- Work with students at an early stage of the programmer/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs.
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- Include group work, with groups representing diverse cultures.

Books Recommended

1. Introduction to Quantum Chemistry, A. K. Chandra, Tata MacGraw Hill
2. Quantum Chemistry, Ira N. Levine, Prentice Hall
3. Quantum Chemistry by R. K. Prasad, New Age International Publishers (1985)
4. Elementary Quantum Chemistry by D. L. Pilar, McGraw Hill Book Co, New York (1968)
5. D. A. McQuarrie Quantum Chemistry, OUP 1983
6. M. W. Hanna, Quantum Mechanics in Chemistry, The Benjamin Pub.
7. Molecular Quantum Mechanics, Third Edition, P. W. Atkins and R.S. Friedman
8. Group theory and symmetry in chemistry, L. H. Hall(McGraw Hill)
9. F. A. Cotton, Chemical Applications of Group theory, Wiley Eastern 2nd Edn.1992
10. V. Ramkrishnan& M. S. Gopinadhan, Group theory in Chemistry Vishal Pub.1996.
11. Inorganic Chemistry, Third Edition, Alan G. Sharpe
12. Theoretical Inorganic Chemistry, M. C. Day, J. Shellin
13. Chemistry, Fifth Edition, John E. McMurry, Robert C. Fay
14. Hermann Dugas, Bioorganic Chemistry, A Chemical Approach to Enzyme Action, Springer International Edition
15. An Introduction to Theoretical Chemistry, Jack Simons, Cambridge
16. Progress in inorganic Chemistry, Vols 18 and 38 ed. J. J. Lippard, Wiley
17. Inorganic Reaction Mechanisms, M. L. Tobe, Nelson Pub
18. Inorganic Chemistry, K. F. Purcell and J. C. Kotz.
19. Principles of Bioinorganic Chemistry, S. J. Lippard and J. M. Bers
20. Bioinorganic Chemistry, I. Bertini, H. B. Gray and S. J. Lippard
21. Principals of Bioorganic Chemistry, S. J. Lippard and J. M. Berg, University Science Books.
22. Bioinorganic Chemistry, I. Bertini, H. B. Gray, S. J. Lippard and J. S. Valentine, University Science Books.
23. Inorganic Biochemistry vols I and II ed. G. L. Eichhorn, Elsevier
24. Introduction to Magnetochemistry, Alan Earnshaw, 1968



25. Elements of Magnetochemistry, Dutta and Syamal, 1993

E-Resources

- https://mysite.science.uottawa.ca/sgambarotta/sites/default/files/CHM%201311F/slide%20show/Ch-6%20atom/7_lecture.pdf
- [https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_\(Physical_and_Theoretical_Chemistry\)/Group_Theory/Group_Theory%3A_Theory](https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Group_Theory/Group_Theory%3A_Theory)
- <http://www.ccl.net/cca/documents/dyoung/topics-orig/magnet.html>
- <https://www.mdpi.com/journal/magnetochemistry>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Physical Chemistry - I

Subject Code: 256020103

M.Sc. Semester-1

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental physical chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Chemical thermodynamics Nernst heat theorem and its applications to gaseous system, third law of thermodynamics and its applications to evaluate absolute entropies of solids, liquids and gases; partial molar quantities and their determination, Gibbs-Duhem equation, chemical potential,	14



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	chemical potential of ideal gases and solutions, Raoult's law, real solutions, free energy and solutions, activity and activity coefficients, methods of determination of activity and activity coefficients, fugacity of gases and liquids and methods of its determination. Non equilibrium thermodynamics-basic concepts.	
2	Chemical Kinetics Unimolecular reactions, chain reactions and branched chain reactions, explosion limits, chain reaction between hydrogen and bromine, theory of absolute reaction rates, kinetic isotope effect. Enzyme catalyzed reactions, mechanism, kinetics and some examples.	14
3	Solid state chemistry Bonding in solids and electronic structure in solids, bond theory- metals, semiconductors and insulators, defects in crystals, calculation of Schottky and Frenkel defects using statistical method, non stoichiometry, solid electrolytes, and diffusion in solids, electrical conductivity in solids, super conductivity, perovskites.	14
4	Surface chemistry Physical and chemical adsorption, BET and HJ equations, heat of adsorption, determination of surface area of adsorbents, surface tension, Gibb's equation, surface active agents, micellisation, critical micellar concentration (cmc), detergency.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Physical Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology:-

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs.




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- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures.

Books Recommended:

1. Textbook of physical chemistry – W.J.Moore.
2. Textbook of physical chemistry – Glasstone .
3. Textbook of physical chemistry – P.Atkins
4. Advanced physical chemistry – Surdeep Raj
5. Advanced physical chemistry – J.N.Gurtu, A.Gurtu
6. Thermodynamics for chemists –Glasstone
7. Physical chemistry – S. Castellan
8. Thermodynamics of non equilibrium processes- Karapitaneh
9. Chemical Kinetics- Laidler
10. Chemical Kinetics – Frost and Pearson
11. Solid state chemistry – H.Keer
12. Solid state chemistry- Hannay
13. Chemistry of solids – Azaroff
14. Surface chemistry – Adamson
15. Surface chemistry – Osipov

E-Resources

- [https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_Chemistry - The Central Science \(Brown et al.\)/19%3A_Chemical Thermodynamics](https://chem.libretexts.org/Bookshelves/General_Chemistry/Map%3A_Chemistry_-_The_Central_Science_(Brown_et_al.)/19%3A_Chemical_Thermodynamics)
- https://www.slideshare.net/shahzad_ali27/chemical-kinetics-32001888
- <https://www.youtube.com/watch?v=W8FhIGNnMkg>
- <https://byjus.com/jee/surface-chemistry/>
- <https://www.youtube.com/watch?v=w4yMyWa4-IQ>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Analytical Chemistry - I

Subject Code: 256020104

M.Sc. Semester-1

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental analytical chemistry.

Course outline

Sr. No.	Course Contents	Teaching hours
1	Analytical Objectives, Data Handling and Good Laboratory Practice (GLP) Scope of analytical science and its literature, qualitative and quantitative analysis, ways to express accuracy and precision, types	 PRINCIPAL SWARNIM SCIENCE COLLEGE SWARNIM STARTUP & INNOVATION UNIVERSITY BHOYAN RATHOD, KATOI, GANDHINAGAR.



	of errors and their causes; significant figures, control charts, confidence limit, test of significance, rejection of a result- the Q-test. GLP- standard operating procedures, quality assurance and quality control, validation of analytical methods.	
2	Sampling and Calibration Methods Sampling and sample preparation, general steps in chemical analysis, calibration of glass wares. Finding the best straight line- least square regression, correlation coefficient; Calibration curves, standard addition technique and internal standards. Chemical concentrations.	14
3	Fundamentals of Spectrophotometry Properties of light, absorption of light, interaction of light with matter and origin of spectra. The spectrophotometer- calibration, sources of light, monochromators and detectors. Beer's law in chemical analysis, photometric accuracy- Ringbom Plot, derivative spectrophotometry, optical rotatory dispersion and circular dichroism.	14
4	Applications of Spectrophotometry Analysis of mixture-resolved and unresolved spectra, measurement of equilibrium constant: Scatchard Plot; Stoichiometry-method of continuous variation- the Jobs plot. Photometric titrations.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Analytical Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

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- Include group work, with groups representing diverse cultures.

Books Recommended

1. "Quantitative Chemical Analysis" by Daniel C. Harris, 5th Edition, W.H. Freeman and Company, New York.
2. "Analytical Chemistry" by Gary D. Christian, 6th Edition, John Wiley and Sons Inc. New Jersey.
3. "Principles of Instrumental Analysis" by Douglas A. Skoog, 3rd Edition, HoltSaunders International Edition.
4. "Instrumental Methods of Chemical Analysis" by Galen W. Ewing, 4th Edition, International Student Edition.

E-Resources

- [http://c3162802.workcast.net/10211_Introduction, Objectives, and Key Requirements for GLP Regulations 2011106145213.pdf](http://c3162802.workcast.net/10211_Introduction,_Objectives,_and_Key_Requirements_for_GLP_Regulations_2011106145213.pdf)
- http://web.iyte.edu.tr/~serifeyalcin/lectures/chem201/cn_8.pdf
- <https://www.slideshare.net/MuhammadAsif564/fundamentals-of-spectrophotometer>
- <https://www.slideshare.net/rey216/spect>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Chemistry Practical

Subject Code: 256020105

M.Sc. Semester-1

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
-	-	12	12	8	-	200	-	-	200

M.Sc. Semester I

Organic Chemistry – I

Preparation of organic compounds:

- i) Nitration
- ii) Bromination
- iii) Acylation
- iv) Reduction
- v) Oxidation
- vi) Condensation reaction
- vii) Diazotization reaction
- viii) Friedl-Craft's reaction
- ix) Cannizzaro reaction




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- x) Aldol condensation

References books for practical:

1. A text book of practical organic chemistry – A. I. Vogel
2. Practical organic Chemistry – Mann and Saunders
3. A handbook of quantitative and qualitative analysis – H. T. Clarke
4. Comprehensive Practical Organic Chemistry : Qualitative Analysis V K Ahluwalia & S. Dhingra.
5. Comprehensive Practical Organic Chemistry : Preparations and Quantitative Analysis V K Ahluwalia & R. Aggarwal Universities Press.
6. An Advance Course in practical Chemistry, A K. Nad, B. Mahapatra and A. Ghoshal.

Inorganic Chemistry

1. **Semi-microqualitative analysis** of 15 mixtures, each having six radicals including less familiar elements (Mo, W, Li, Th, V, Zr, Ce, Be, Ti) and one insoluble compounds.

Books Recommended:

1. Vogel's Qualitative Inorganic Analysis, Revised by G Svehla, Sixth Edition, Longman, 1987

Physical Chemistry

• **Conductometry**

1. Titration of mixture of strong acid and weak acid with strong base (HCl + HAC against NaOH)
Titration of mixture of strong acid and weak acid with weak base (HCl + HAC against NH_4OH)
2. Solubility product of sparingly soluble salts – PbSO_4 & BaSO_4

• **Potentiometry**

1. Titration of mixture of strong (HCl) and weak (HAC) acid with NaOH / NH_4OH and find the strength of the acids in mixture.
2. Solubility product of silver halides.

• **pH metry**

1. Titration of mixture of strong (HCl) and weak (HAC) acid with NaOH / NH_4OH and find the strength of the acids.



2. Titration of mixture of bases (Na_2CO_3 & NaHCO_3) with standard HCl and find the concentration of bases.

- **Adsorption and kinetics**

1. Hydrolysis of esters
2. Reaction between $\text{K}_2\text{S}_2\text{O}_8$ and KI.

- **Distribution method (any 2)**

1. Distribution of acetic acid between H_2O and Butanol.
2. Distribution of HAC between H_2O and CHCl_3 / CCl_4 .
3. Distribution of I_2 between H_2O and CCl_4 .

Books Recommended:

1. Practical physical chemistry – J.B. Yadav
2. Practical in physical chemistry – P.S. Sindhur
3. Experimental physical chemistry – R.C. Das, B. Behera
4. Experiments in physical chemistry – P.H. Parsania, F. Karia

Analytical Chemistry Practicals

1. Calibration of glass wares and balance.
2. Calibration of pH meter, conductometer and potentiometer.
3. Determination of nicotine in tobacco (non-aqueous titration).
4. Determination of available chlorine in bleaching powder.
5. Determination of vitamin C in orange juice/ amla.
6. Determination of acetic acid in vinegar.
7. Determination of sodium carbonate and sodium bicarbonate in washing soda.
8. Determination of ascorbic acid in vitamin C tablets.
9. Determination of calcium and magnesium in water sample.
10. Determination of total dissolved solids in water samples.
11. Determination of sulphate in water sample.
12. Determination of chloride in water sample.

Books Recommended:

1. Analytical Chemistry Practice, John H. Kennedy, Saunders College Publishing, Second Edition 1990.
2. Vogels Textbook of Quantitative Chemical Analysis, 6th Edition, 2002.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Organic Chemistry - II

Subject Code: 256020201

M.Sc. Semester-2

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

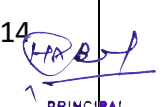
Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental organic chemistry.

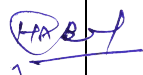
Course outline

Sr. No.	Course Contents	Teaching Hours
1	Spectroscopy 13 CNMR: General considerations, chemical shift (aliphatic, olefinic, alkyne, aromatic, heteroaromatic and carbonyl carbon), coupling constants. Mass spectroscopy: Introduction, ion production, EI, CI, FD and FAB, factors affecting fragmentation, ion analysis, ion abundance. Mass spectral fragmentation of organic compounds,	14  PRINCIPAL SWARNIM SCIENCE COLLEGE SWARNIM STARTUP & INNOVATION UNIVERSITY BHOYAN RATHOD, KALO, GANDHINAGAR.



	common functional groups, molecular ion peak, metastable peak, McLafferty rearrangement. Nitrogen rule. High resolution mass spectroscopy. Examples of mass spectral fragmentation of organic compounds, NMR, IR, UV with respect to their structure determination.	
2	(A) Photochemistry (1) Photochemical reactions: Principles of energy transfer, electronic excitation and molecular orbital view of excitation, excited states and fate of excited molecules (modified Jablonski diagram), Photosensitization. (2) Photochemistry of carbonyl compounds: Representation of excited states of ketones, photoreduction Norrish type I & II reactions, Reactions of cyclic Ketone, oxetane formation (Paterno- Buchi reaction) (3) Di-π methane rearrangement, Dienone photochemistry, cis-trans isomerisation and photochemistry of conjugated olefins. (B) Chemistry of Heterocycles (1) Nomenclature of heterocycles: Replacement and systematic nomenclature (Hantzsch-Widman system) for monocyclic, fused and bridged heterocycles. General chemical behavior of aromatic heterocycles. (2) Five-membered and benzo fused five member heterocycles: Oxazole, Isoxazole, Thiazole, Pyrazole, Imidazole, Benzothiazole and Benzimidazole. (3) Six membered and benzofused six membered heterocycles: Pyrazine, Pyridazine, Pyrimidine, Cinnoline, Quinazoline, Quinoxaline, Phenoxaline.	14
3	Name reactions General nature, method, mechanism and synthetic applications of the following reactions: (i) Vilsmeier-Haack reaction (ii) Mitsunobu reaction (iii) Suzuki reaction (iv) Buchwald Hartwig reaction (cross coupling) (v) Sonogashira coupling (vi) Stobbe condensation (vii) Jones oxidation (viii) Swern oxidation reaction (ix) Michael addition (x) Darzens' glycidic ester synthesis (xi) Mannich reaction (xii) Dieckmann reaction (xiii) Birch reduction (xiv) Wittig reaction (xv) Knoevenagel reaction	14




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4	Stereo Chemistry Mechanism selectivity and utility of following reagents: (i) Gilman's reagent-Lithium dimethylcuprate (ii) Lithium diisopropylamide (LDA) (iii) Dicyclohexylcarbodiimide (DCC) (iv) 1,3 – Dithiane (Umpolung reagent) (v) Dess- Martin periodinane (vi) Bakers yeast (vii) Diisobutylaluminium hydride(DIBAL –H) (viii) Sodium cyanoborohydride (NaBH ₃ (CN)) (ix) Grignard reagents (x) Sodium borohydride (xi) DDQ (xii) n-Butyl lithium (xiii) Phase transfer catalysis: Quaternary ammonium and phosphonium salts, crown ethers.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Organic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs.
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.



Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a

programmer/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Include group work, with groups representing diverse cultures.

Books Recommended:

1. Modern Synthetic Reactions, H.O.House, W.A. Benjamin.
2. Principles of Organic Synthesis, R.O.C. Norman and J.M. Coxon, 3rd Edition, Blackie Academic and Professional.
3. Spectrometric Identification of Organic Compounds by Robert M. Silverstein, 7th Edition, Wiley.
4. Mass Spectrometry – A Textbook Jurgen Gross, 1st Edition, 2002, Springer – Verlag Berlin Heidelberg.
5. Introductory Photochemistry, A.Cox and T.Camp, McGraw Hill.
6. Photochemistry, R.P. Kundall and A. Gilbert, Thomson Nelson.
7. Organic Photochemistry, J. Coxon and B. Halton, 2nd Edition, Cambridge University Press.
8. Strategic Applications of Named Reactions in Organic Synthesis, Laszlo Kurti and Barbara Czak, 1st Edition, Academic Press.
9. Name Reactions and Reagents in Organic Synthesis, Bradford P. Mundy, Michael G. Eller, Frank G. Favalaro, 2nd Edition, Wiley – Interscience.
10. Name Reactions. A Collection of Detailed Reaction Mechanisms, Jie Jack Li, 3rd Edition, Springer.
11. Heterocyclic Chemistry, volume 1-3, R.R. Gupta, M. Kumar and V. Gupta, Springer-Verlag.
12. Heterocyclic Chemistry, J.A. Joule, K.Mills, and G.F. Smith, 3rd Edition, Chapman and Hall.
13. Heterocyclic Chemistry, T.L. Gilchrist, Longman Scientific Technical.
14. Contemporary Heterocyclic Chemistry, G.R. Nikome and W.W. Poudler, Wiley.
15. Comprehensive Heterocyclic Chemistry, A.R. Kartizky, and C.W. Rees.
16. Encyclopedia of Reagents for Organic Synthesis, Leo A. Paquette, David Crich and Phillip L. Fuchs, John Wiley and Sons Inc.
17. Organic Chemistry, T.W. Graham Solomons and Graig B. Frymes, John Wiley and Sons.
18. Organic Chemistry, F. A. Carey, McGraw Hill Edition.
19. General Organic Chemistry Sachin Kumar Ghose, New Central book agency.
20. Guidebook to Mechanism in Organic Chemistry by Peter Sykes, 6th Edition, Prentice Hall.
21. Advanced Organic Chemistry Part A: Structure and Mechanism and Part B: Reaction and synthesis, Francis A. Carey, Richard J. Sundberg, 5th Edition, SPRINGER.
22. Organic chemistry vol 1-2 I.L Finar 5th edition, ELBS.

E-Resources

➤ <file:///C:/Users/admin/Downloads/spectroscopybasics-180519091436.pdf>

➤ https://www.youtube.com/watch?v=p_BMWraL62w

➤ [https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Book%3A_Basic Principles of Organic Chemistry \(Roberts and Caserio\)/28%3A Photochemistry/28.03%3A Organic Photochemistry](https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Book%3A_Basic_Principles_of_Organic_Chemistry_(Roberts_and_Caserio)/28%3A_Photochemistry/28.03%3A_Organic_Photochemistry)



- http://www.chem.gla.ac.uk/staff/stephenc/teaching/HeterocycleLectures2011_2C12.pdf
- <https://www.organic-chemistry.org/namedreactions/>
- <https://byjus.com/chemistry/named-reactions/>
- <https://nptel.ac.in/courses/104/103/104103111/>
- <https://byjus.com/jee/organic-chemistry/>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Inorganic Chemistry - II

Subject Code: 256020202

M.Sc. Semester-2

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental inorganic chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Chemical Bonding The method of linear combination VSEPR, Walsh diagrams(tri-and penta- atomic molecules), $d\pi - p\pi$ bonds, Bent rule and energetics of hybridization, some simple reactions of covalently bonded	14



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	molecules. Simple Huckel theory of linear conjugated systems, simple Huckel theory of the cyclic conjugated system and aromaticity, self-consistent field method, valence state ionization potentials, Pariser-Parr-Pople approximation. Band theory of solids, Fermi level, electrical properties, insulators, semiconductors and superconductors (properties).	
2	Application of symmetry Application of symmetry to hybrid orbital, molecular orbitals, hybridization schemes for σ orbitals, π bonding and molecular orbital for AB_n type of molecules. Application of symmetry to molecular vibrations, interpretation of IR and Raman spectral data.	14
3	Organometallic Compounds Organometallic compounds of transition elements, stability of metal carbon bond in complexes. Synthesis, uses and structure of organometallic compounds of π bonding organic ligands, 2-electron ligands, olefinic and acetylinic complexes, compound with 3 electron ligand – allylic complexes, compounds. With 4- electron ligands butadiene complexes, n_4 complexes of cyclopentadiene, compounds with 5 electron ligands – cyclopentadienyl, compounds with 6 electron ligands, n_6 complexes of benzene and its derivatives. Role of organometallic compounds in catalytic reaction.	14
4	Reaction Mechanism Mechanism of substitution reaction in square planar complexes. Kinetics of substitution reaction of platinum (II) complexes Effect of leaving group, effect of charge, steric effect, solvent effect, effect of nucleophile, effect of temperature and other effects. Oxidation-Reduction reaction, electron transfer, tunnelling effect, Marcus – Hush theory, one and two electron transfer inner sphere and outer sphere, effect of ions on rate, electron transfer through extended bridges, unstable oxidation states, hydrated electron.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of inorganic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.



Teaching & Learning Methodology


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We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs.
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures

Books Recommended

1. Introduction to Quantum Chemistry, A. K. Chandra, Tata MacGraw Hill
2. Quantum Chemistry, Ira N. Levine, Prentice Hall
3. Quantum Chemistry by R. K. Prasad, New Age International Publishers (1985)
4. D. A. McQuarrie Quantum Chemistry, OUP 1983
5. M. W. Hanna, Quantum Mechanics in Chemistry, The Benjamin Pub.
6. Lectures on Chemical Bonding and Quantum Chemistry, S. N. Datta, A Prism Book
7. Group theory and symmetry in chemistry, L. H. Hall (McGraw Hill)
8. Coulson's Valence, R. McWeeny, ELBS
9. F. A. Cotton, Chemical Applications of Group theory, Wiley Eastern 2nd Edn. 1992
10. V. Ramkrishnan & M. S. Gopinadhan, Group theory in Chemistry Vishal Pub. 1996.
11. Inorganic Chemistry, Third Edition, Alan G. Sharpe
12. Theoretical Inorganic Chemistry, M. C. Day, J. Shellin
13. Chemistry, Fifth Edition, John E. McMurry, Robert C. Fay
14. An Introduction to Theoretical Chemistry, Jack Simons, Cambridge
15. Progress in inorganic Chemistry, Vols 18 and 38 ed. J. J. Lippard, Wiley
16. Mechanism of Inorganic Reactions, F. Basolo and R. G. Persons, Wiley Pub
17. Reaction Mechanism of Coordination Compounds, C. H. Langford and H. B. Gray
18. Inorganic Reaction Mechanisms, M. L. Tobe, Nelson Pub
19. Inorganic Chemistry, K. F. Purcell and J. C. Kotz.
20. Principles of Bioinorganic Chemistry, S. J. Lippard and J. M. Bers
21. Mehrotra R. C. and Singh A. Organo Metallic Chemistry, Willey Eastern Ltd., New Delhi



22. Coates G. E. Green MIH Wade, K and Aylett B. J. Organo Metallic Comounds
Chapman and Hall, Londo

E-Resources

- <https://www.visionlearning.com/en/library/Chemistry/1/Chemical-Bonding/55>
- <https://www.britannica.com/science/chemical-bonding>
- [https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Modules_and_Websites_\(Inorganic_Chemistry\)/Chemical_Compounds/Introduction_to_Chemical_Bonding](https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Modules_and_Websites_(Inorganic_Chemistry)/Chemical_Compounds/Introduction_to_Chemical_Bonding)
- [https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Map%3A_Inorganic_Chemistry_\(Miessler_Fischer_Tarr\)/04%3A_Symmetry_and_Group_Theory/4.04%3A_Examples_and_Applications_of_Symmetry](https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Map%3A_Inorganic_Chemistry_(Miessler_Fischer_Tarr)/04%3A_Symmetry_and_Group_Theory/4.04%3A_Examples_and_Applications_of_Symmetry)
- https://sites.cns.utexas.edu/jones_ch431/section-1-symmetry
- <https://www.britannica.com/science/organometallic-compound>
- <https://www.youtube.com/watch?v=Efh5GkVbhEc>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Physical Chemistry - II

Subject Code: 256020203

M.Sc. Semester-2

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental physical chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Statistical thermodynamics Concepts of distribution of molecules, thermodynamic probability, permutations and combinations, Boltzmann's most probable distribution, partition function - translational, vibrational, rotational, electronic nuclear partition functions.	14



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2	Nuclear chemistry Nuclear properties-nuclear radius, coulombic and nuclear potential radius, nuclear spin and angular momentum, magnetic moment, nuclear binding energy, nuclear models-shell model, liquid drop model, Fermi gas model, collective model, radioactive decay, nuclear reactions, evaporation, spallation, fragmentation, fission and fusion reactions, accelerators, reaction cross section, use of radioisotopes as tracers.	14
3	Polymer chemistry Kinetics and mechanism of polymer processes, criteria of polymer solubility, thermodynamics of polymer solutions, polymer characterization, molecular weight of polymer (number average and weight average) , methods of molecular weight determination, properties of polymers and applications.	14
4	Electrochemistry Sign convention-American, European and IUPAC; Determination of dissociation constant of monobasic acids by conductometry, determination of dissociation constants of monobasic and polybasic acids by potentiometry. The electrical double layer, the rate of charge transfer, polarization and overvoltage, basic principle of polarography, origin of different types of current; equation of polarographic wave, Ilkovic equation.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Physical Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

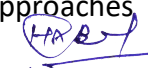
Teaching & Learning Methodology:-

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

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- Work with students at an early stage of the programmer/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs.




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- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures.

Books Recommended:

1. Textbook of physical chemistry – W.J.Moore
2. Textbook of physical chemistry – Glasstone
3. Textbook of physical chemistry – P.Atkins
4. Advanced physical chemistry – Surdeep Raj
5. Advanced physical chemistry – J.N.Gurtu, A.Gurtu
6. Statistical thermodynamics – M.C.Gupta
7. Polymer chemistry – Gowariker
8. Polymer chemistry – Billmayer
9. Principles of polymer science – Bahadur&Sastry
10. Polymer science & technology – Fried
11. Polymer chemistry- Malcolm P. Stevens
12. Nuclear chemistry – Arniker
13. Nuclear and radio chemistry – J.W. Kannedy, G.Friedlander
14. Electrochemistry – Bockris and Reddy

E-Resources

- [https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Book%3A_Thermodynamics_and_Chemical_Equilibrium_\(Elgen\)/01%3A_Introduction - Background and a Look Ahead/1.04%3A_Statistical_Thermodynamics#:~:text=Statistical%20thermodynamics%20is%20a%20theory,of%20macroscopic%20quantities%20of%20compounds.](https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Book%3A_Thermodynamics_and_Chemical_Equilibrium_(Elgen)/01%3A_Introduction_-_Background_and_a_Look_Ahead/1.04%3A_Statistical_Thermodynamics#:~:text=Statistical%20thermodynamics%20is%20a%20theory,of%20macroscopic%20quantities%20of%20compounds.)
- <http://web.thu.edu.tw/ghliu/www/0723/CH16StatMech.pdf>
- <https://uh.edu/engines/StatisticalThermodynamics.pdf>
- <https://byjus.com/chemistry/nuclear-chemistry/>
- http://www.chemistry.wustl.edu/~dgs/chem436/Lectures/Chem-436-Lecture_notes.pdf
- <https://wou.edu/chemistry/courses/online-chemistry-textbooks/ch103-allied-health-chemistry/ch103-chapter-3-radioactivity/>
- <http://web.mit.edu/5.33/www/lec/poly.pdf>
- <https://www.clearitmedical.com/2019/04/chemistry-notes-electrochemistry.html>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Analytical Chemistry - II

Subject Code: 256020204

M.Sc. Semester-2

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental analytical chemistry.

Course outline

Sr. No.	Course Contents	Teaching hours
1	Sample Preparation Techniques Liquid-liquid extraction/solvent extraction-partition coefficient, <u>distribution ratio and percent extraction</u> . Solvent extraction of metal ions-ion association complexes and metal chelates, multiple batch extraction, Craig's counter-current distribution. Accelerated and	14  PRINCIPAL SWARNIM SCIENCE COLLEGE SHOYAN RATHOD, KALOL, GANDHINAGAR.



	Microwave assisted extraction, protein precipitation and solid phase extraction (SPE).	
2	Chromatographic Methods Principles of chromatography, classification of chromatographic techniques based on mechanism of retention, configuration, mobile and stationary phase. Efficiency of separation- plate theory (theoretical plate concept) and rate theory (Van Deemter equation). Principles and applications of Paper chromatography, thin layer chromatography, HPTLC and Ion exchange chromatography. Counter-current chromatography for isolation of natural products.	14
3	pHmetry and Conductometry pH measurement with glass electrode, working of glass electrode, mechanism of pH measurement, calibration of glass electrode, errors in pH measurement. Electrical conductance in solutions of electrolytes, measurement of conductance, conductometric titrations- acid-base, precipitation and complex formation titrations.	14
4	Potentiometry and Ion selective electrodes Electrochemical cell, cell potentials, sign convention for electrode potentials, types of reference and indicator electrodes-metallic indicator and membrane indicator electrodes. Classification of membrane electrodes-ion-selective and molecular-selective electrodes. Principle, properties and design of ion-selective electrodes. Crystalline and non-crystalline membrane electrodes. Gas-sensing probes and enzyme substrate electrodes. Applications of potentiometric titrations.	14

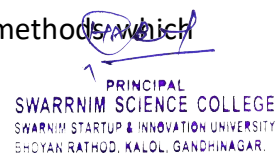
Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Analytical Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology

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The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:



- Work with students at an early stage of the programmer/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs.
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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programmer/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures.

Books Recommended

1. "Quantitative Chemical Analysis" by Daniel C. Harris, 5th Edition, W.H. Freeman and Company, New York.
2. "Analytical Chemistry" by Gary D. Christian, 6th Edition, John Wiley and Sons Inc. New Jersey.
3. "Principles of Instrumental Analysis" by Douglas A. Skoog, 3rd Edition, HoltSaunders International Editions.

E-Resources

- <https://www.intechopen.com/books/ideas-and-applications-toward-sample-preparation-for-food-and-beverage-analysis/overview-of-green-sample-preparation-techniques-in-food-analysis>
- [https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_\(Analytical_Chemistry\)/Analytical_Sciences_Digital_Library/Active_Learning/Contextual_Modules/Sample_Preparation/01_Introduction_to_Sample_Preparation](https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Analytical_Sciences_Digital_Library/Active_Learning/Contextual_Modules/Sample_Preparation/01_Introduction_to_Sample_Preparation)
- <https://onlinelibrary.wiley.com/doi/pdf/10.1002/0471457817.fmatter>
- <https://www.slideshare.net/rev216/spect>
- <https://www.azolifesciences.com/article/What-is-a-pH-Meter-and-How-Does-it-Work.aspx>
- <http://web.colby.edu/ch331public/ph-measurements/>
- [https://chem.libretexts.org/Bookshelves/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/General_Chemistry_Labs/Online_Chemistry_Lab_Manual/Chem_12_Experiments/05%3A_pH_Measurement_and_Its_Applications_\(Experiment\)](https://chem.libretexts.org/Bookshelves/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/General_Chemistry_Labs/Online_Chemistry_Lab_Manual/Chem_12_Experiments/05%3A_pH_Measurement_and_Its_Applications_(Experiment))
- <https://www.basinc.com/assets/library/issues/18-3/cs18-3c.pdf>
- [https://chem.libretexts.org/Bookshelves/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/General_Chemistry_Labs/Online_Chemistry_Lab_Manual/Chem_9_Experiments/07%3A_Electrical_Conductivity_of_Aqueous_Solutions_\(Experiment\)](https://chem.libretexts.org/Bookshelves/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/General_Chemistry_Labs/Online_Chemistry_Lab_Manual/Chem_9_Experiments/07%3A_Electrical_Conductivity_of_Aqueous_Solutions_(Experiment))



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DEPARTMENT OF CHEMISTRY

Chemistry Practical

Subject Code: 256020205

M.Sc. Semester-2

Teaching & Evaluation Scheme

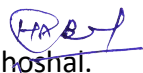
Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
-	-	12	12	8	-	200	-	-	200

M.Sc. Semester II- Practicals

Organic Chemistry

- Mixture analysis mixture to be given. (S+S+S) or (L+L+L). Type determination separation by physical and chemical methods. (both permitted in case of liquids)
- Reference books for practical:
 - A text book of practical organic chemistry – A.I Vogel
 - Practical organic chemistry – Mann and saunders
 - A handbook of quantitative and qualitative analysis – H.T Clarke
 - Comprehensive practical organic chemistry: qualitative analysis V K Ahluwalia & S. Dhingra.
 - Comprehensive practical organic chemistry: Preparations and qualitative analysis V K Ahluwalia and R. Aggarwal universities press.
 - An advance course in practical chemistry, A K Nad, B. Mahapatra and A. Ghoshal.




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Inorganic Chemistry

1. Preparation and determination of purity of double and complex salts. At least ten preparations should be done.
2. Colorimetric estimation of any five out of Cu, Mn, NO₂, Ni, P, Fe, V, Ti, Cr, Co.

Books Recommended:

1. Vogels Textbook of Quantitative Chemical Analysis, 6th Edition, 2002.
2. Advanced Practical Inorganic Chemistry, Gurdeepraj, Goel Publishing House, 2001.
3. An Advanced Course in Practical Chemistry, A.K. Nad, B. Mahapatra, A. Ghosal, New Central Book Agency, 2004

Physical Chemistry

I. Conductometry

1. Test of validity of Ostwald's dilution law and determination of dissociation constant of weak electrolyte like CH₃COOH & ClCH₂COOH
2. Verification of Debye-Huckel-Onsager's equation in case of strong electrolytes like HCl, KCl, NaCl.

II Potentiometry

1. Titration of dibasic acid like malonic, oxalic, succinic acid with NaOH and find the dissociation constant of acid.
2. Precipitation titration → Titration of halids with AgNO₃.
3. Redox titration Ferrous ammonium sulfate –KMnO₄ , K₂Cr₂O₇.

III pH metry

1. Determination of dissociation constant of weak acid like acetic and monochloroacetic acid

IV Adsorption and kinetics

1. Determination of order of reaction between K₂S₂O₈ and KI by a fractional change method.

V Distribution method

1. Distribution method.



Books Recommended::

1. Practical physical chemistry –J.B.Yadav
2. Practicals in physical chemistry – P.S.Sindhu
3. Experimental physical chemistry – R.C.Das, B.Behera
4. Experiments in physical chemistry- P.H.Parsania, F. Karia

Analytical Chemistry

1. Determination of saponification value of oil.
2. Determination of iodine value of oil. 3. Determination of acid value of oil.
3. Determination of dissolved oxygen.
4. Determination of chemical oxygen demand.
5. Determination of iron in iron tablets.

(Any 2 estimation practical)

6. Simultaneous estimation of chromium (III) and iron (III) by EDTA titration.
7. Simultaneous estimation of calcium (II) and zinc (II) by EDTA titration.
8. Simultaneous estimation of lead (II) and magnesium (II) by EDTA titration.
9. Separation of amino acids by TLC.
10. Separation of drugs by TLC.
11. Separation of dyes by TLC.

Books Recommended:

1. Analytical Chemistry Practice, John H. Kennedy, Saunders College Publishing, Second Edition 1990.
2. Vogel's Textbook of Quantitative Chemical Analysis, 6th Edition, 2002.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

CALCULUS AND MATRICES

Subject Code: 253030101

B.Sc. Semester -1

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Student are evaluated on the basis of Mid term examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- To provide students the Concept of vector valued function, determinant and its properties of higher order, matrix, eigen value and eigen vectors of matrices.
- The aim is to present the important ideas in matrix to student whose principal interest lie outside the field of mathematics.
- The emphasis throughout is on imparting an understanding of the significance of the mathematical techniques.
- It is a subject which provide a vital arena where students can see the interaction of mathematics and machine computation.

Prerequisites

A Candidate for admission to the bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.



Course outline: This Course is Designed to enable student to acquire the understanding and practice the application of calculus and Matrices and their properties .


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Sr. No.	Course Contents	Teaching hours
1	Unit 1 Successive Derivatives, standard results for n^{th} derivative, Leibniz's Theorem. Definition of limit of a sequence, Convergence and divergence of an infinite series, Comparison test, Ratio test and Root test.	10
2	Unit-2 Rolle's Theorem, Lagrange's and Cauchy's Mean Value Theorems (MVT), Increasing and decreasing functions, Taylor's and Maclaurin's Theorems (both without proof). Using Taylor's and Maclaurin's Theorem find Maclaurin power series expansion of $\sin x$, $\cos x$, $\log(1+x)$, e^x , $(1+x)^n$ under proper restrictions (if any). Indeterminate forms: all forms of L'Hospital's Rules with proof and all forms	10
3	Unit: 3 Introduction to matrices, different types of matrices, operations on matrices, Theorems on matrices, Elementary operations on matrices and types of matrices, Symmetric and skew-symmetric matrices, Hermitian and skew-hermitian matrices. Linear dependence and independence of row and column matrices. Row rank, column rank and rank of a matrix. Row Reduced Echelon (RRE) form of a matrix and matrix inversion using it.	12
4	Unit: 4 Eigen values, Eigen vectors and the characteristic equation of a matrix. Cayley-Hamilton (CH) theorem and its use in finding inverse of a matrix. Crammer's rule. find A^{-1} by Gauss-Jordan method .	10



Learning Outcomes

After successful Completion of the Course the student will be

- Find the n^{th} Derivative of a function as well as the n^{th} derivative of the product of two functions.
- Practice the application of definite integral for a.) Summation of the series b.) Find the limit of the Series.
- Know about the Convergent and Divergent of the Series .
- Aware with Matrices and their uses in real life .
- Find the Summation and Product of Matrices and apply different properties of Matrices.

Teaching & Learning Methodology

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Differential calculus , by Shantinakaran .
2. Integral Calculus , By Shantinakaran .
3. Calculus , Dr.R.C.Shah .
4. Advance Mathematics , Prin. G.C. Patel .
5. Calculus – James Stewart, Sixth edition, (E-Book).
6. Calculus – T. M. Apostol. Volume I.
7. Differential Calculus – Shanti Narayan, P.K. Mittal, S. Chand and Co.
8. Differential Calculus – Harikishan, Atlantic Publishers.
9. Calculus – M. Spivak



<https://swayam.gov.in/> and <https://nptel.ac.in/>



- cims.nyu.edu/~cfgranda/pages/OBDA_fall17/notes...
- www.sxccal.edu/mathematics-lecture-notes
- <https://users.math.msu.edu/users/gnagy/teaching/la.pdf>




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BHOYAN RATHOD, KALOL, GANDHINAGAR.

SWARNIM STARTUP & INNOVATION UNIVERSITY

SCHOOL OF SCIENCE

DEPARTMENT OF CHEMISTRY

Basic Chemistry-1

CODE : 253020101

B.Sc. 1st Semester

Teaching & Evaluation Scheme: -

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives: -

Prerequisites: - Students should have basic knowledge of chemistry up to 10+2 level.

Course outline: -

Sr. No.	Course Contents	Number of Hours
1	Unit I : Inorganic Chemistry (14 Marks) (a) Lanthanides:- Electron configuration, Oxidation states, Magnetic properties, Color and absorption spectra of lanthanide ions, Lanthanide contraction, Separation and purification of Lanthanides: Ion-exchange and solvent extraction methods. (b) Actinides:- Electron configuration, Oxidation states, Magnetic properties, Color and absorption spectra of actinide ions, actinide contraction, Nuclear synthesis of trans uranic elements, Chain reaction, importance of Uranium, Comparison with lanthanide.	10
2	Unit II : Organic Chemistry (14 Marks) (a) Quantitative Analysis & Determination of Molecular Formula:- Determination of Nitrogen by Kjeldahl's method and Kjeldahl's method modified with boric acid . Molecular weight of organic acid by Ag-salt	12




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	method and organic base by Chloroplatinate method, Numerical based on empirical and molecular formula. (b) Fundamentals of Organic Reactions:- Fission of covalent bond, types of reagents, Substitution Nucleophilic Unimolecular reaction mechanism (SN_1), Substitution Nucleophilic Bimolecular reaction mechanism (SN_2), Electrophilic Aromatic Substitution – Elementary treatment only (Nitration, Sulfonation, Halogenation & Friedel-Crafts Alkylation and Acylation)	
3	Unit III : Organic Chemistry (14 Marks) (a) Alkanes:- (Saturated Hydrocarbons) Introduction, IUPAC nomenclature, Reduction of R-X, Wurtz's reaction, Hydrolysis of R-Mg-X, Decarboxylation of acid, Kolbe's electrolytic process, Free radical mechanism (Chlorination of Methane). (b) Alkenes & Alkynes:- (Unsaturated Hydrocarbons) Introduction, IUPAC nomenclature, Preparations (dehydration, dehalogenation, dehydrohalogenation), Reactions with H_2, X_2, HX, $HOCl$, H_2SO_4, and Hydroboration; Oxidation reactions: (i) with cold alkaline $KMnO_4$ (Baeyer's reagent), (ii) Oxidative cleavage with acidified or hot $KMnO_4$, (iii) Ozonolysis (O_3); Polymerization; Reactions of terminal Acetylenes: (i) Addition of water, (ii) Na / liquid NH_3.	10
4	Unit IV: Physical Chemistry (14 Marks) (a) Thermodynamics:- Zeroth law, first law, Second law of thermodynamics; proof of 2nd law (Carnot's Cycle); Entropy, of Gas and calculation of entropy for different processes; Kirchhoff's equation. (b) Chemical Kinetics:- Basic terms: molecularity, order of reactions. Unit for rate constant; Derivation of: first order rate constant, Second order rate constant for ($a=b$) and ($a \neq b$). Third order rate equation ($a=b=c$). Determination of Half Life Time for 1st, 2nd and 3rd order reactions.	10

Learning Outcomes:-

- Basic knowledge of valence bond theory and its applications.
- Knowledge of f-block elements and their periodic properties.
- Understanding of the concept of lanthanide contraction.
- Understanding of the concepts of general organic chemistry.
- Knowledge of reactions and mechanisms in organic chemistry.
- Basic concepts and theories of thermodynamic chemistry.
- Introduction of analytical chemistry and related terms.



Teaching & Learning Methodology:- Chalk and Talk, Video Lectures


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Books Recommended:-

1	'Source Book on Atomic Energy' by Glastone, 1969.
2	'Modern Inorganic Chemistry' by G.F. Liporni, ELBS, 4th edn, Colling Educational, 1983.
3	'Organic reaction and mechanism, P.S. Kalsi, New Age international Publishers.
4	Text book of organic Chemistry, P.S. Kalsi, New Age international Publishers.
5	Text book of Organic Chemistry, ArunBahal, S.Chand.
6	Physical Chemistry (Question and Answer) by R.N. Madan, G.D. Tuli, S.Chand.
7	Fundamentals of Analytical Chemistry by Skoos& West.
8	Analytical Chemistry, Garry D. Christain.
1	'Inorganic Chemistry' D.F. Shriver, P.W. Atkinss and C.H. Longford, 3 rdedn, ELPS Oxford University Press, 1999.
2	'Nuclear and Redio Chemistry' by G fried lander, J.W. Kennedy, E.S. Macias and J.M. Miller, 3rd edn, John Wiley, 1981.
3	Essentials of Nuclear Chemistry' H.J. Arnical, 4th edn, New Age International, 1995
4	'Concise Inorganic Chemistry' J.D. Lee, 5th edn.
5	'Inorganic Chemistry', D.F. Shriver, P.W. Atkinss, 3rd edn, Oxferd, 1999.
6	Concise Inorganic Chemistry' J.D. Lee, 4th edn, Champman and Hall ELBS, 1991.
7	Inorganic Chemistry' by A.G. Sharp, 3rd edn, ELBS, Longman, 1990.
8	Organic Chemistry Vol. I & II, S.M. Mukherji, S.P.Singh, R.P. Kapoor.
9	Reaction mechanism in Organic Chemistry, S.M. Mukhergi, S.P. Singh. 3rd edn, Macmillan.
10	Reaction Mechanism and Reagents in Organic Chemistry, Gurdeep R. Chatwal 4th edn, Himalaya Publication House.
11	Advance Physical Chemistry by Gurdeepraj.
12	Organic Chemistry, R. Morrison and R. Boyd, 6th edn, Pearson Education 2003.
13	Organic Chemistry, T.W. Graham Solomons , 4th edn, John Wilay, 1998.
14	Principal of Physical Chemistry by Puri, Sharma, Pathania.
15	Chemical Thermodynamics by R.P. Rastogi and R.R. Misra.
16	Nuclear Chemistry by C.V. Shekhar, Dominent-Publisher, New Delhi.
17	Essentials of physical Chemistry by B.S. Bahal, ArunBahal, G.D. Tuli.
18	Physical Chemistry by P.W.Atkins, 5th edn, Oxford 1994 7th edn-2002.
19	Physical Chemistry by R.A. Albert and R.J. Silby, John Wiley1995.
20	Physical Chemistry by G.H. Barrow, 5th edn, Mac Graw Hill, 1988, 6th edn, 1996.
21	Physical Chemistry by W.J. Moore, 4th edn, Orient Longmans 1969.
22	Analytical Chemistry, Day & Underwood.
23	Analytical Chemistry by Lerry&Hergins.
24	Qualitative Analysis by A.I. Vogel, 5th edn.



Practical List:- Chemistry Practicals-253020102

Sr. No.	Practical
1	Inorganic Chemistry Semi micro Analysis:- • Cation analysis; separation and identification of ions from group I, II, III-A, III-B, IV, V-A, V-B. Inorganic Qualitative Analysis (Two Radicals) (Minimum Eight Salts) Water Soluble and Insoluble Inorganic salts of following cations and anions: Cations : Na⁺, K⁺, NH₄⁺, Mg²⁺, Ba²⁺, Ca²⁺, Sr²⁺, Fe²⁺, Fe³⁺, Al³⁺, Cr³⁺, Zn²⁺, Mn²⁺, Co³⁺, Pb²⁺, Cu²⁺. Anions : S²⁻, SO₄²⁻, CO₃²⁻, PO₄³⁻, CrO₄²⁻, Cl⁻, Br⁻, I⁻, NO₃⁻, O₂⁻.
2	Volumetric Analysis (Acid and Base) (1) Preparation and Standardization of NaOH and HCl (2) Succinic Acid-----NaOH (3) Oxalic Acid----- NaOH (Hydrated & Anhydrous) (4) Na₂CO₃.....HCl






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SCHOOL OF SCIENCE

DEPARTMENT OF PHYSICS

Basic Physics-1

Subject Code: 253050101

B.Sc. Semester 1

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

Objectives: -

- Develop a solid grasp of core concepts and applications of classical mechanics, electricity and magnetism, quantum mechanics, and statistical physics. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites

Basic mathematics and fundamentals of Physics.




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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Waves Traveling Waves Speed of propagation of waves in a stretched string longitudinal waves in a bar, Plane waves in a fluid, transmission of energy by a traveling wave. Sound waves Introduction, Intensity & intensity level, Loudness & pitch radiation from a piston, diffraction, radiation efficiency of a sound source. Newton's and Langrang correction. Ultrasonics Magneostriktion method, Piezo-electric oscillator, Piezo-electric detectors, Measurement of velocity of ultrasonic waves, diffraction effect & its application to determine the velocity of the waves, the ultrasonic waves & its use.	8
2	Vector Algebra & Vector Analysis Scalar Triple product, Reciprocal vectors, vector. Triple product, Pseudo vectors and Pseudo Scalars, Differentiation of a vector with respect to time, Integration of vector, Line Integral, Surface Integral, Partial differentiation, Gradient of a scalar point function, Divergence of vector, The equation of continuity, Curl of a vector, More about the vector differential operator, Multiple Del operations, Irrotational and Solenoidal vectors, Some useful identities, Gauss' Theorem, Green's theorem, Stokes Theorem, Physical Significance of the Curl of a vector, Related Examples & Problem.	8
3	Optics Farmat's principle and its applications Farmat's principle of least time, laws at reflection, laws of refraction. Interference in thin films Thin film, Plane parallel film, Interference due to transmitted light, Haidinger fringes, variable thickness (wedge-shaped) film, Newton's ring. Matrices Types of matrices, Inversion of a Matrix, Rank of a Matrix, Diagonalization (3X3 only). Matrix Method in Optics Introduction, The matrix method, Unit planes, Nodal point planes, A system of two thin lenses.	8
4	LASERS	



Principal
Shoyan Rathod

	Introduction, Attenuation of light in an optical medium, Thermal equilibrium, Interaction of light with matter, Einstein coefficients and their relations, Light amplification, Meeting the three requirements, Components of Laser, Lasing action, Principal pumping schemes, Type of lasers, Semiconductor laser, Laser beam characteristics, Applications	

Learning Outcomes

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended



Mechanics, Wave motion & Heat by Francis Weston Sears (Addison Wesley Publication)

text book on oscillations, waves & Acoustics by M. Ghosh, D. Bhattacharya (S. Chand)

Mathematical Methods in Physical Sciences by M. L. Boas (John Wiley & Sons)

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- Introduction to Classical Mechanics by R. G. Takwalw and P. S. Puranik (Tata McGraw-Hill Pub. Com. Ltd.)
- A text book of Optics by N. Subrahmanyam, Brijlal and M. N. Avadhnulu, S. Chand Publication.
- Optics – Ajay Ghatak, TMH Edition,
- Principle of optics – B. K. Mathur
- A text book of Optics by N. Subrahmanyam, Brijlal and M. N. Avadhnulu, S. Chand Publication.
- Fiber Optics and optoelectronics by R. P. Khare, Oxford University Press.
- An introduction to LASERS- Theory and Applications by M. N. Avadhanulu, S. Chand & Comp. Ltd.,

E-Resources

- The Flying Circus of Physics 2nd edition by Jearl Walker, Wiley India
- Six Ideas that shaped physics by Thomas A Moore, McGraw Hill education
- <http://www.howstuffworks.com/> -- Tech stuff
- How things works by Louis A Bloomfeild, Wiley Publications
- Physics of Everyday Phenomena by W. Thomas Griffith, Juliet Brosing, McGraw Hill Education
- Latest journals like BBC Knowledge, How things work-everyday technology explained by




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PHYSICS -102

B.Sc. Semester 1

Practical List

Sr. No.	Practical Name
1	Newton's Ring To find the wave length of light of given monochromatic source To find the radius of curvature of given lens
2	Melde's Experiment (i) To prove P/L constant. (ii) To prove T/l^2 constant
3	Resonator To test the accuracy of relation $n^2 (V + Kv) = \text{constant}$ and to determine the frequency of unknown fork.
4	Value of capacitance For given two capacitors determine the value of capacitance for each of them. AND (i) by connecting them in series. (ii) by connecting them parallel.
5	Value of inductance For given two inductors determine the value of inductance for each of them and (i) by connecting them in series (ii) by connecting them parallel
6	Logic Gates (AND, OR, NOT) (Using discrete components). Verification of truth tables and giving understanding of voltage level for '0' and '1' level
7	Find Solar Cell Efficiency
8	Young's Modulus Study and perform the elasticity of materials like Iron, Aluminium or Brass using Young's Modulus Experiment.
9	Half-Wave Rectifier Obtain load characteristic and %regulation for Full-wave rectifier with-out filter circuit and by using capacitor filter circuit. Determine ripple factor for Full wave rectifier without filter only.



10	To Determine Wave length of LASER light
11	Diagonalization of given matrix (2x2). Evaluate trace of a matrix
12	Decay Constant of Capacitor Decay Constant To verify the exponential law for the decay of a charged capacitor and determine the decay constant of the capacitor.
13	Series Resonance Series Resonance To determine the frequency of a.c. emf by series resonance circuit varying capacitor.
14	Study of Transformer Study of Transformer To determine (i) turn ratio (ii) percentage efficiency (iii) energy loss due to copper, for a given transformer.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

INTRODUCTION TO BIOTECHNOLOGY

Subject Code: 253010101

B.Sc. Semester -1

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives:-

- To provide introduction to biotechnology, basic concepts of genes, DNA & RNA, basic concepts of genetic engineering and applications of biotechnology in industries.
- The graduate program in Biotechnology is a joint interdisciplinary program of the five Departments namely Biology, Chemistry, Food Engineering, Environmental Engineering and Chemical Engineering offering M.Sc. and Ph. D. degrees with thesis.
- Biotechnology will result only from integration of multiplicity of scientific disciplines and technologies, including microbiology, biochemistry, genetics, molecular biology, bioinformatics, chemistry, chemical and process engineering, metabolic engineering and more recently a variety of fields.
- As a merger of science and business, biotechnology industry demands a multi-disciplinary workforce skilled in basic-research, product development, regulatory affairs, technology transfer and commercialization.

Prerequisites:-

- Students have basic knowledge of biotechnology, basic concepts of genes, DNA & RNA, basic concepts of genetic engineering and applications of biotechnology in industries.

Course outline:-




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Unit No.	Course Contents	Teaching Hours
1.	Introduction to Biotechnology: - What is Biotechnology? History, Interdisciplinary nature, Branches of Biotechnology, - Biotechnology in India.	10
2.	Basic concepts of Genes, DNA & RNA: - Gene Concepts, Chemical nature of DNA, chemical composition of DNA, Nucleotides, Nucleosides, Polynucleotide, Physical nature of DNA, - Chargaff's rule of equivalence, Watson and cricks model of DNA, circular and super helical DNA, - Organization of DNA in eukaryotes, - Types of DNA, RNA, Various types of RNA, Structure of RNA.	10
3.	Basic of Genetic Engineering: - What is Genetic Engineering?, - Basic steps involved in Genetic Engineering, - Scope and Importance of Genetic engineering	10
4.	Application of Biotechnology: - Forensics –parental test, DNA fingerprint - Transgenic crop- Bt cotton, Bt Brinjal - Transgenic Animals-Dolly - Biotechnology in Health care- Diagnostic and treatment. - Biotechnology in industries.	10
		40



Learning Outcomes:

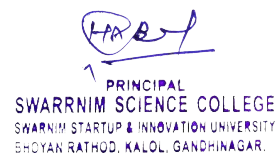
- At the end of the course the student would have basic knowledge of Biotechnology and its application
- Cognitive Knowledge: To provide education that leads to comprehensive understanding of the principles and practices of biotechnology.
- Information and Computer Literacy: To educate and make them up to date with the current scientific literature, computer programs and web information.
- Experimental Skills: To provide broad based training in technical skills in methods of biotechnology.
- Critical Thinking: To empower students with the ability to think and solve problems in the field of biotechnology.
- Scientific Communication: To ensure students are able to effectively communicate with biotech and other interdisciplinary professionals.
- Professional Attitude: To produce responsible biotechnologists that can work within the interdisciplinary framework of biotechnology and related fields.

Teaching & learning Methodology:

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties



- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Basic Text & Reference Books:

- BD Singh. (2003) *Fundamentals of genetics*.
- HK Das. (2004) *Textbook of biotechnology*
- PK Gupta. (2000) *Genetics*
- U. Satyanarayan. *Biotechnology*
- U. Satyanarayan. *Biochemistry*




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SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

Introduction to Microbial world

Subject Code: 253040101

B.Sc. Semester-1

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- To provide basic knowledge of Applications of Microbiology
- The purpose of the course is to provide basic knowledge of natural history of infectious organisms, contribution of various scientist in the field of microbiology, developments of first microscope and other technique used for isolation, study, characterization of microorganism. Instruments required to study the morphology of the microorganisms.
- The present course opens the door to all of the abundant careers in and out of the area of biological sciences including health/ Industrial field/ medical / Environmental Sciences.

Prerequisites

Student Must have Basic idea about Microorganisms, dyes and staining.



Course outline


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Unit. No.	Course Contents	Teaching hours
1	Developments of Microbiology as a new discipline of Biological science • Discovery of Microbial World • Theory of Biogenesis, Discovery of viruses • Developments in Pure culture techniques • Germ Theory of disease and fermentation • Vaccines and Chemotherapy	10
2	The Microbial World • Habitats of Microbes, • Introduction to Prokaryotes and Eukaryotes • Comparison of Prokaryotes and Eukaryotes • Significance of Microbiology • Branches of Microbiology • Applied Microbiology • Genetic Engineering and Biotechnology	10
3	Pure Culture Technique • Principle and Method of Pure Culture Techniques • Method of Isolation and Preservation of Pure Culture • Culture Collection • Techniques used to Study Microorganisms • Principle of Microscopy, Light Microscopy, Dark Field Microscopy • Phase Contrast Microscopy, Fluorescence Microscopy, Electron Microscopy	10
4	Dyes and Staining • Chemistry of Dyes and stain, Smear • Mechanism and type of staining • Microbiological uses of dyes and stains.	10
		40



Learning Outcomes

- The students will be able to understand the historical developments, the tools and techniques of Microbiology.
- The course is designed to give students an understanding of the types of organisms and application of Microbiology in various fields.
- At the end of the course the student would have basic knowledge of microbiology, different microbial techniques, learn about dyes and staining, structure of bacteria, method to isolate the microbes.
- Handling of microscopes and specimen preparation

Teaching & Learning Methodology

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.



Books Recommended

- Gerard Tortora . Berdell Funke . Christine Case. Derek Weber. Warner Bair III
Microbiology: An Introduction 13th Edition Published by Pearson (January 17th 2018)
- H.A. Modi.(2019) Elementary Microbiology ASIN : B081HCRN82
- Pelczar Jr. M J, Chan E C S. Krieg N R. (1986)
- Atlas R. (2015) Principles of Microbiology 2 nd Edition
- Ingraham J L and Ingraham C A Introduction to Microbiology: Thomson Brooks/Cole
- Michael T. Madigan & John M. Martinko (2010) Basic biology of microorganisms (11th edition)




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BHOYAN RATHOD, KALOL, GANDHINAGAR.




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SWARNIM STARTUP & INNOVATION UNIVERSITY (SSIU)

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PHYSICS

B.Sc. Semester 1

Practical List

Sr. No.	Practical Name
1	Newton's Ring To find the wave length of light of given monochromatic source To find the radius of curvature of given lens
2	Melde's Experiment (i) To prove P/L constant. (ii) To prove T/l^2 constant
3	Resonator To test the accuracy of relation $n^2 (V + Kv) = \text{constant}$ and to determine the frequency of unknown fork.
4	Value of capacitance For given two capacitors determine the value of capacitance for each of them. AND (i) by connecting them in series. (ii) by connecting them parallel.
5	Value of inductance For given two inductors determine the value of inductance for each of them and (i) by connecting them in series (ii) by connecting them parallel
6	Logic Gates (AND, OR, NOT) (Using discrete components). Verification of truth tables and giving understanding of voltage level for '0' and '1' level
7	Find Solar Cell Efficiency
8	Young's Modulus Study and perform the elasticity of materials like Iron, Aluminium or Brass using Young's Modulus Experiment.
9	Half-Wave Rectifier Obtain load characteristic and %regulation for Full-wave rectifier with-out filter circuit and by using capacitor filter circuit. Determine ripple factor for Full wave rectifier without filter only.



10	To Determine Wave length of LASER light
11	Diagonalization of given matrix (2x2). Evaluate trace of a matrix
12	Decay Constant of Capacitor Decay Constant To verify the exponential law for the decay of a charged capacitor and determine the decay constant of the capacitor.
13	Series Resonance Series Resonance To determine the frequency of a.c. emf by series resonance circuit varying capacitor.
14	Study of Transformer Study of Transformer To determine (i) turn ratio (ii) percentage efficiency (iii) energy loss due to copper, for a given transformer.



SWARNIM STARTUP & INNOVATION UNIVERSITY

Bachelor of Science

English-1

CODE: 253000102

Semester I

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
2	-	-	2		30	-	70	-	100

Objectives: -

- To enhance students' understanding and usage of Grammar
- To develop writing skill
- To provide icebreaking approach through learning language with the help of literature to develop reading skill.
- To learn new vocabulary.

Prerequisites:-

- Being able to communicate effectively is the most important of all life skills; hence, students are expected to have good spirit for learning English as second language.

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	<i>Wise and otherwise</i> (selected sections only) by Sudha Murti • Stories 1- 5	10
2	Grammar-1 • Parts of speech • Tenses • Auxiliary and Modal auxiliary verb ▪ DO, BE and HAVE as Main Verbs ▪ Modal Auxiliary verbs	8
3	Vocabulary	4
4	Writing Skill Comprehension Practical Composition	8
Total hours:		30



4
8
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Learning Outcomes: -

- Students will learn to utilize use of English language in their technical terms.
- They feel confident in speaking and writing English language.
- Students will be able to improve the language skills i.e. Listening Skill, Speaking Skill, Reading Skill, and Writing Skill (LSRW).

Teaching & Learning Methodology:-

- Power point presentation
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- It includes audio video clips that can provide ample number of exercise to the students
- Face- to face oral communication to provide a platform where they can perform and practice well.

Books Recommended:

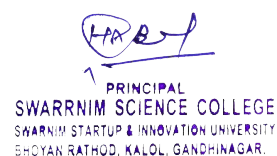
1. *Wise and otherwise- A salute to Life* by Sudha Murti, New Delhi, Penguin books India Pvt Ltd, 2006.
2. David Green: *Contemporary English Grammar Structure and Usage*.
3. Wren & Martin, High school English Grammar, S. Chand and Co. Ltd

E-Resources:

1. <http://www.free-english-study.com/>
2. <http://www.english-online.org.uk/course.htm>
3. <http://www.english-online.org.uk/>

Practical List:-

Sr. No.	Practical
	-----NA---- as per Teaching scheme



SWARNIM STARTUP & INNOVATION UNIVERSITY

Bachelor of Science

English

CODE: _____

Semester 2

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
2	-	-	2		30	-	70	-	100

Objectives: -

- To enhance students' understanding and usage of Grammar
- To develop writing skill
- To provide icebreaking approach through learning language with the help of literature to develop reading skill.
- To learn new vocabulary.

Prerequisites:-

- Being able to communicate effectively is the most important of all life skills; hence, students are expected to have good spirit for learning English as second language.

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	<i>Wise and otherwise</i> (selected sections only) by Sudha Murti • Stories 6- 10	10
2	Vocabulary (Text based)	4
3	Grammar-2 • Active and passive voice • Tenses: • Prepositions (indicating Place, Time, and Direction only) • Determiners	8
4	Writing Skill	8




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	• Letter writing • Application	
	Total hours:	30

Learning Outcomes: -

- Students will learn to utilize use of English language in their technical terms.
- They feel confident in speaking and writing English language.
- Students will be able to improve the language skills i.e. Listening Skill, Speaking Skill, Reading Skill, and Writing Skill (LSRW).

Teaching & Learning Methodology:-

- Power point presentation
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- It includes audio video clips that can provide ample number of exercise to the students
- Face- to face oral communication to provide a platform where they can perform and practice well.

Books Recommended:

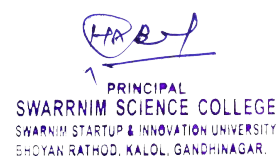
4. *Wise and otherwise- A salute to Life* by Sudha Murti, New Delhi, Penguin books India Pvt Ltd, 2006.
5. David Green: *Contemporary English Grammar Structure and Usage*.
6. Wren & Martin, High school English Grammar, S. Chand and Co. Ltd

E-Resources:

4. <http://www.free-english-study.com/>
5. <http://www.english-online.org.uk/course.htm>
6. <http://www.english-online.org.uk/>

Practical List:-

Sr. No.	Practical
	-----NA----- as per Teaching scheme



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Advanced Abstract Algebra - II

Subject Code: 256050201

M.Sc. Semester -2

Teaching & Evaluation Scheme

This program leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding of the fundamental and advanced content in Mathematics which will be determined by his /her particular choice of courses, according to his/her particular needs and interests.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives :

When one has completed this degree he / she will be able to demonstrate the following skills:

- To connect linear algebra to other fields both within and without mathematics.
- To develop abstract and critical reasoning by studying logical proofs and the axiomatic method as applied to linear algebra .

Prerequisites :

A Candidate for admission to the Master of Science (Mathematics) must have a 10+2 Science and Bachelor degree with mathematics Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline: The objective of this course is to provide knowledge of Ring theory, Unique factorization domain and Field extension.




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Sr. No.	Course Contents	Teaching hours
1	Unit 1 Ring and Field: Definition and examples of Field, General theorems on field, Subfield, Necessary and sufficient condition to be a subfield, Characteristic of a ring, Characteristic of a field, Ordered integral domain, Principal ideal, Principal ideal ring, Units and Associates, Embedding of rings	14
2	Unit 2 Euclidean Ring and Unique Factorization Domains: Prime and Irreducible element, Definition and examples of Euclidean ring, Properties of Euclidean ring, Unique factorization theorem, Definition of Unique factorization domain (UFD), Properties of UFD, Polynomial ring over UFD, Field of quotients of a UFD, Eisenstein's criterion of irreducibility.	12
3	Unit 3 Algebraic Extension of a Field: Field, Subfield, Characteristic of a field, Extension of a field, Simple extension of a field, Algebraic extension of a field, Algebraically closed field.	10
4	Unit 4 Normal and Separable Extension of Fields: Root fields, Splitting field or decomposition field, Normal Extension, Separable and inseparable extensions.	10

Learning Outcomes :

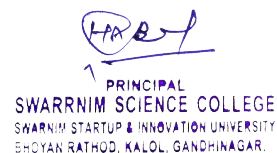
On successful completion of the course, students should be able to

- Identify different types of rings and fields .
- Understand basic knowledge of UFD .
- Explain the fundamental concepts of field extensions.

Teaching & Learning Methodology :

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs



- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. “Advanced Abstract Algebra” by S.K. Pundir, Krishna Prakashan (P) Ltd., Meerut.
2. “A First Course in Abstract Algebra” by John B. Fraleigh, Pearson .
3. “Basic Abstract Algebra” by Bhattacharya, Jain and Nagpal, 2nd Edition.
4. “Algebra” by S. Mc Clane and G. Birkhoff, 2nd Edition.
5. “Basic Algebra” by N. Jacobson, Hind, Pub. Corp, 1984.
6. “A first course in Abstract Algebra” by John Fraleigh (3rd Edition), Narossa Publishing House, New Delhi.

E-Resources

- cims.nyu.edu/~cfgranda/pages/OBDA_fall17/notes...
- www.sxccal.edu/mathematics-lecture-notes
- <https://users.math.msu.edu/users/gnagy/teaching/1a.pdf>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Complex Analysis
Subject Code:256050202
M.Sc. Semester -2

Teaching & Evaluation Scheme

This program leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding of the fundamental and advanced content in Mathematics which will be determined by his /her particular choice of courses, according to his/her particular needs and interests.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives :

When one has completed this degree he / she will be able to demonstrate the following skills:

- Introductory course in complex analysis which provide a working knowledge of the basic definitions and theorems of the differential and integral calculus of functions of a complex variable
- know the similarities and differences between real and complex analysis.

Prerequisites :

A Candidate for admission to the Master of Science (Mathematics) must have a 10+2 Science and Bachelor degree with mathematics Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.




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Course outline: The objective of this course is to provide knowledge of Complex number , The Elementary Functions and Complex Integral , Some definition and Residue .

Sr.No.	Course Contents	Teaching hours
1	Unit 1 Complex Number : Complex numbers and its polar and exponential forms, powers and roots, Regions in the complex plane, Continuity and differentiability of complex functions, Analytic functions, Cauchy- Riemann equations, Harmonic Functions of two variables, Infinite series of complex numbers, Power series functions.	10
2	Unit 2 The Elementary Functions and Complex Integral: Exponential, Trigonometric, Hyperbolic functions, Logarithmic functions and its branches rectifiable arcs, Complex line integral, Complex contour integral, Cauchy's theorem for triangular contours, Anti derivatives.	14
3	Unit 3 Some Important Theorems: Cauchy's integral formula, Derivative of analytic functions, Morera's theorem, Liouville's theorem, Fundamental theorem of algebra, Taylor expansions, Laurent expansions .	10
4	Unit 4 residue: Singularities, Zeros of analytic functions, Poles, Residues, Residue Theorem, Residue at poles, Evaluations of improper integrals.	12

Learning Outcomes :

On successful completion of the course, students should be able to

- Develop facility with complex numbers and the geometry of the complex plane culminating in finding the n th roots of a complex number.
- Set up and directly evaluate contour integrals .
- Identify and classify zeros and singular points of functions.

Teaching & Learning Methodology :

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs




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- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. John Duncan, The Elements of Complex Analysis, John Wiley and Sons Ltd.London(1968).
2. L V Ahlfors, Complex Analysis,3rd edition, McGraw Hill, International Ed. (1966).
3. J B Conway, Functions of One Complex Variables, 2nd edition, Springer Verlag, New York (1967) [Indian edition: Narosa Publication House, New Delhi (1982)].
4. Serge Lang, Complex Analysis, Addison- Wesley, Publishing Co. (1997).
5. B Choudhary, The Elements of Complex, Analysis, 2nd edition, New Age International Ltd Publishers, New Delhi (1992).
6. Dr. Shailesh S. Patel, Dr. Narendra B. Desai, Complex Analysis and Numerical Techniques, Volume IV, Atul Prakashan .

E-Resources

- cims.nyu.edu/~cfgranda/pages/OBDA_fall17/notes...
- www.sxccal.edu/mathematics-lecture-notes
- <https://users.math.msu.edu/users/gnagy/teaching/la.pdf>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Special Function

Subject Code: 256050203

M.Sc. Semester -2

Teaching & Evaluation Scheme

This program leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding of the fundamental and advanced content in Mathematics which will be determined by his /her particular choice of courses, according to his/her particular needs and interests.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives :

The objective of this course is

- To provide an understanding of statistical concepts like measurements of location and dispersion, probability, probability distributions, sampling, estimation, hypothesis testing, regression, correlation analysis, multiple regression and business/economic forecasting .

Prerequisites :

A Candidate for admission to the Master of Science (Mathematics) must have a 10+2 Science and Bachelor degree with mathematics Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility .




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Course outline: The objective of the course is to introduce some special functions that appear in different areas of applied mathematics .

Sr. No.	Course Contents	Teaching hours
1	Unit 1 Legendre's Equation: Definition and general solution of Legendre's equation, Definition of $P_n(x)$ and $Q_n(x)$, Generating function of $P_n(x)$, Laplace's definite integral for $P_n(x)$, Orthogonal properties of $P_n(x)$, Recurrence formulae for $P_n(x)$, Beltrami's result, Christoffel's expansion, , Christoffel's summation formula, Rodrigue's formula, Legendre's function of second kind, Recurrence formula for $Q_n(x)$, Relation between $P_n(x)$ and $Q_n(x)$, Christoffel's second summation formula	12
2	Unit 2 Hypergeometric Function : Definition of Hyper geometric series, Particular cases of Hyper geometric series, Solution of Hyper geometric equation, Integral formula for hyper geometric function, Kummer's theorem, Gauss theorem, Vandermonde's theorem, Differentiation of Hyper geometric function, The confluent Hyper geometric function, Integral representation of the confluent Hyper geometric function, Differentiation of confluent Hyper geometric function, Continuous Hyper geometric function.	10
3	Unit 3 Hyper geometric Function : Definition of Hyper geometric series, Particular cases of Hyper geometric series, Solution of Hyper geometric equation, Integral formula for hyper geometric function, Kummer's theorem, Gauss theorem, Vandermonde's theorem, Differentiation of Hyper geometric function, The confluent Hyper geometric function, Integral representation of the confluent Hyper geometric function, Differentiation of confluent hyper geometric function, Continuous hyper geometric function.	12



4	Unit 4 Boundary value problems : Hermite Polynomial: Hermite differential equation, Solution of Hermite equation, Hermite's polynomials, Generating function, Other forms of Hermite polynomials, To find first few Hermite polynomials, Orthogonal properties of Hermite polynomials, Recurrence formulae for Hermite polynomials. Chebyshev Polynomials: Chebyshev's differential equation, Chebyshev polynomials, To prove that $T_n(x)$ and $U_n(x)$ are independent solutions of Chebyshev's equation, Relation for $T_n(x)$ and $U_n(x)$, To find first few terms of Chebyshev polynomials, Generating function, Orthogonal properties of Chebyshev polynomials, Recurrence formulae for $T_n(x)$ and $U_n(x)$.	12

Learning Outcomes :

On successful completion of the course, students will be able to

- Apply and understand the application of Bessel's and Legendre's functions.
- Apply and understand the application of Hypergeometric function.
- Apply and understand the application of Hermite and Chebyshev polynomials

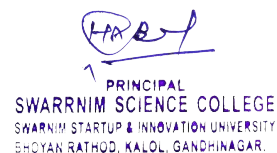
Teaching & Learning Methodology :

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Differential equations with application and historical notes, George F Simmons Tata McGraw – Hill, Publishing Co. Ltd., New Delhi, 1974.



2. Special Functions, J. N. Sharma and R. K. Gupta, Krishna Prakashan Media (P) Ltd. Meerut .
3. An Introduction to Ordinary Differential Equations, E.A Coddington., Prentice-Hall of India Private Ltd., New Delhi, 2001.
4. Elementary Differential Equations (3rd Edition), W. T Martain and E. Relssner, Addison Wesley Publishing Company, inc 1995.
5. Theory of Ordinary Differential Equations, E. A Codington and N Levinson, Tata McGraw hill Publishing co Ltd., New Delhi, 1999.

SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS ORDINARY DIFFERENTIAL EQUATIONS

Subject Code: 256050204

M.Sc. Semester -2

Teaching & Evaluation Scheme

This program leading to this degree provides the opportunities to develop and demonstrate knowledge and understanding of the fundamental and advanced content in Mathematics which will be determined by his /her particular choice of courses, according to his/her particular needs and interests.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives :

When one has completed this degree he / she will be able to demonstrate the following skills:




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- The ability to advance your own knowledge and understanding through independent learning
- Communicate clearly knowledge, ideas and conclusions about mathematics
- Develop problem- solving skills and apply them dependently to problems in pure, applied and applicable mathematics
- Communicate effectively in writing about the subject
- prove his/her own learning and performance.

Prerequisites :

A Candidate for admission to the Master of Science (Mathematics) must have a 10+2 Science and Bachelor degree with mathematics Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline: On successful completion of the course, students will be able to Distinguish between linear, non-linear, partial and ordinary differential equations .

Sr. No.	Course Contents	Teaching hours
1	Unit 1 Introduction to ODE : Singular solution and extraneous loci, Review of Simultaneous Ordinary Differential Equations of First Order, linear differential equation of second order, Exact linear differential equation of nth order	14
2	Unit-2 Non-linear Differential Equations : Non-linear differential equations of particular forms, Total differential equation.	10
3	Unit: 3 Series solution : Ordinary and singular point, Cauchy Euler equation, Series solution near a regular singular point.	12



4	Unit: 4 Numerical Solution : Numerical solution of ordinary differential equations using Euler's method, Runge Kutta method (one stage and two stage)	10

Learning Outcomes :

Identify an ordinary differential equation and its order

- Verify whether a given function is a solution of given ordinary differential equation
- Classify ordinary differential equation in linear and non-linear equations
- Solve first order linear differential equations
- Find solution of separable differential equation and exact differential equation
- Find the general solution of second order linear homogeneous equation with constant coefficient

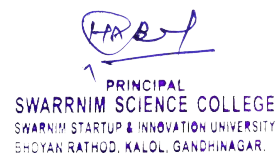
Teaching & Learning Methodology :

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. M.D Raisinghania, Ordinary and Partial Differential Equations, S Chand & Co.
2. H.K. Dass, Advanced Engineering Mathematics, S.Chand
3. Differential Equations, Vol II, Bansal, H.L. and Dhami, H.S.
4. Gupta, Malik and Mittal, Differential Equations, Pragati Prakashan
5. Sharma & Gupta, Differential Equations, Krishna Prakashan Media (P) Ltd.



E- Resources

- cims.nyu.edu/~cfgranda/pages/OBDA_fall17/notes...
- www.sxccal.edu/mathematics-lecture-notes
- <https://users.math.msu.edu/users/gnagy/teaching/la.pdf>




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SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PAPER-1 Mathematical Physics-II & Quantum Mechanics-II

Subject Code: 256050201

M.Sc. Semester -2

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- To equip students with a mathematical background that require to describe the physical phenomena by introducing the essentials of integral transforms, complex analysis, and group theory.
- To introduce perturbative and variational methods for solving the Schrodinger equation and to discuss aspects of non-relativistic scattering theory and relativistic quantum mechanics.

Prerequisites

Student must have studied B.Sc. with Physics as a major subject and knowledge of basic mathematics.




PRINCIPAL
SWARNIM SCIENCE COLLEGE
SWARNIM STARTUP & INNOVATION UNIVERSITY
BHOYAN RATHOD, KALOL, GANDHINAGAR.

Course outline

Sr. No.	Course Contents	Teaching hours
1	Complex Variable Introduction, Analytical Function, Theorems, Illustrative examples, Contour Integral Theorem, Cauchy's Integral Formula Theorem, Illustrative examples, Laurent Series Theorem, Method of finding residues. The Residue Theorem, Evaluation of Definite, Integrals by use of the residue theorem, Examples, Argument principle Example, Additional illustrative examples, The point at infinity, residue at infinity, Mapping Examples, Conformal mapping, Some Application of conformal Mapping examples, Additional illustrative examples.	14
2	Integral equations and Green's functions Introduction, Conversion of differential equation into an integral equation, Linear Harmonic oscillator, Liouville - Neumann series, Separation methods, Examples Non homogeneous boundary value problems and Green's functions, Green's functions for one - dimensional problems, Eigen function expansion of Green's function, Fourier transform method of constructing the Green's function, Green's functions in higher dimensions	14
3	Quantum dynamics, Atoms and Molecules The equations of motion, The Schödinger picture, The Heisenberg picture, Indistinguishable particles, Pauli principle, Inclusion of spin, Spin functions for two electrons, Spin functions for three electrons, The Helium Atom, Central field approximation, Thomas - Fermi Model of the atom, Hartree equation, Hartree Fock equations.	14
4	Einstein's Quantum Theory of Radiation Time dependent perturbation theory, Electric dipole interaction, Quantum electrodynamics, Creation and annihilation operators, Fock states, Quantization of field, Zero point energy, Cohrent state, Description of the electromagnetic field, Interaction of radiation with matter.	14



Learning Outcomes

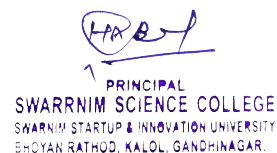
- This is an advanced level course in Mathematical Physics and Quantum mechanics which objects to teach about various approximation methods in physics to calculate the approximate values of energy for various systems.
- Understand the theoretical and practical aspects of the use of numerical analysis. Proficient in implementing numerical methods for a variety of multidisciplinary applications
- Students will be able to learn the methods to find transition probability for absorption and emission. This course will let students appreciate the beauty of quantum mechanics in the form of the approximation methods and its validity.
- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and need.
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge.
- Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.



Books Recommended

1. Mathematical methods in the physical sciences, M.L Boas., JohnWiley, 1966
2. Mathematical Physics, P. K. Chattopadhyaya, Wiley Eastern Ltd.
3. Mathematical methods for Physicists, G. Arfken, Academic Press, 1970
4. Mathematical Physics, S. Satyaprakash, Sultan Chand & Sons, 1990
5. Quantum Mechanics, V. K. Thankappen, Wiely eastern limited.
6. Quantum Mechanics, G. Aruldas Prentice - Hall of India Private Limited.
7. Lasers and non - linear optics, B. B. Laud, New Age International Ltd.
8. Quantum Mechanics, L. I. Schiff, McGraw – Hill
9. Quantum Mechanics : Theory and applications A. Ghatak and S. Lokanathan, Macmillan India Limited

E-Resources

- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics.
<https://swayam.gov.in/> and <https://nptel.ac.in/>
- <https://apps.dtic.mil/dtic/tr/fulltext/u2/717870.pdf>
- <http://www.math.s.chiba-u.ac.jp/~yasuda/ippansug/CV-bookfi.pdf>
- <https://www.griffith.edu.au/centre-quantum-dynamics>
- <https://www.phy.cam.ac.uk/research/research-groups/amop/many-body-quantum-dynamics>
- <http://guweb2.gonzaga.edu/faculty/cronk/CHEM101pub/EM-quanta.html#:~:text=Although%20classical%20physics%20had%20explained,energy%20with%20particle%2Dlike%20characteristics.>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PAPER-2 Classical Mechanics-II and Solid State Properties

Subject Code: 256050202

M.Sc. Semester 2

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- To make familiar students with the basic solid state properties like magnetism, and to introduce the fundamental of superconductivity of material.
- To introduce relativistic electrodynamics in classical field theory and laws that applied to electrodynamics linked with classical theories and relativistic mechanics.

Prerequisites

Student must have studied B.Sc. with Physics as a major subject and knowledge of basic mathematics.




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BHOYAN RATHOD, KALOL, GANDHINAGAR.

Course outline

Sr. No.	Course Contents	Teaching hours
1	Non Linear Oscillations and Chaos Introduction, Analytical Function, Theorems, Illustrative examples, Contour Integral Theorem, Cauchy's Integral Formula Theorem, Illustrative examples, Laurent Series Theorem, Method of finding residues. The Residue Theorem, Evaluation of Definite, Integrals by use of the residue theorem, Examples, Argument principle Example, Additional illustrative examples, The point at infinity, residue at infinity, Mapping Examples, Conformal mapping, Some Application of conformal Mapping examples, Additional illustrative examples.	14
2	Relativistic electrodynamics and classical field theory Relativistic Mechanics, Proper time and proper velocity, Relativistic energy and momentum, Relativistic kinematics, Relativistic dynamics, Relativistic electro dynamics, How field transform. The field tensor, Electro dynamics in tensor notation, Relativistic potentials. The transition from a discrete to a continuous system., The Lagrangian formulation for continuous system, Sound vibrations in gases as an example of Lagrangian formulation, The Hamiltonian formulation for continuous system, Description of fields by variational principles.	14
3	Magnetism Diamagnetism, Paramagnetism, Electron Spin Resonance, Nuclear Magnetic Resonance, Spin Relaxation, Weiss theory of Ferro magnetism, the exchange interaction, The Heisenberg model, Ferromagnetic domains, The Bloch wall, Origin of domains, Neel model of Antiferromagnetism, Neel model of Ferrimagnetism, Spin waves, Magnons in Ferromagnets, The Bloch $T_{3/2}$ law, Magnons in Antiferromagnets	14
4	Superconductivity Introduction, Meissner effect, Heat Capacity, Energy gap, Isotope effect, Thermodynamics of the superconducting transition, London equation, Coherence Length, BCS theory of superconductivity, BCS ground state, Flux quantization in a superconducting ring, Type - I and Type -II superconductors, Vortex state, Single particle tunneling, Josephson superconductor tunneling, DC Josephson effect, AC Josephson effect, Macroscopic quantum interference, Introduction to High T_c Superconductors.	14




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Learning Outcomes

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology:-

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Classical Mechanics, A. B. Bhatia, Narosa Publishing house.
2. Classical Mechanics (2nd Ed), Herbert Goldstein, Addison - Wesley Publishing Co.
3. Classical Mechanics, G. Aruldas PHI Pvt. Ltd.
4. Classical Mechanics, J. C. Upadhyaya Himalaya Publishing House.
5. Classical Mechanics, S. N. Biswas Books and allied (P.) Ltd.
6. Classical Mechanics (3rd ed.), Goldstern, Poole and Safko, Pearson Education.
7. C. Kittel, Introduction to Solid State Physics, 7th Ed., Wiley Eastern Limited, New Delhi
- J.P. Srivastava: Elements of solid state physics, PHI, India.



E-Resources

- SWAYAM PORTEL/ NPTEL- online courses on special topics on mechanics for classical mechanics and solid state physics. <https://swayam.gov.in/> and <https://nptel.ac.in/>
- http://www.iiserpune.ac.in/~santh/course/phy342/phy342_nld.html
- <https://link.springer.com/article/10.1023/A:1009678102891>
- <https://www.osti.gov/etdeweb/servlets/purl/20109628>
- <https://ps.uci.edu/~cyu/p51A/LectureNotes/Chapter2/Chapter2.pdf>
- http://psi.phys.wits.ac.za/teaching/Connell/phys284/2005/lecture-01/lecture_01/node3.html




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SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PAPER-3

and Devices

Subject Code: 256050203

M.Sc. Semester 2

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- Develop a solid grasp of core concepts and applications of semiconductor physics, optoelectric devices and IC fabrication. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites

Basics of solid state physics and electronics

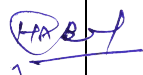



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SWARNIM SCIENCE COLLEGE
SWARNIM STARTUP & INNOVATION UNIVERSITY
BHOYAN RATHOD, KALOL, GANDHINAGAR.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Energy Bands and carrier concentration in Thermal Equilibrium : Energy Bands; Energy levels of isolated atoms, Energy momentum Diagram, Direct and Indirect band gap semiconductors; band diagrams of metals, semiconductors and insulators, Intrinsic carrier concentration, Concept of Fermi factor, Extrinsic semiconductors : Donors and Acceptors, Nondegenerate and Degenerate semiconductors, Carrier Drift : Mobility and its relation with resistivity and conductivity, The Hall effect.	14
2	p-n Junction : Band Diagram of p-n junction in thermal equilibrium; Equilibrium Fermi levels; Space Charge; Depletion region, Abrupt junction; Widths of the depletion region in abrupt junction; Depletion capacitance; Capacitance-voltage characteristics; Current voltage characteristics; Ideal diode equation.	14
3	Field Effect transistors & Optoelectronic Devices Field Effect transistors: JFET: Characteristic Parameters of FET, Effect of Temperature on FET Parameters, FET Amplifiers: Common Drain Amplifier, Common Gate Amplifier, MOSFET: Depletion MOSFET, Enhancement MOSFET, Differences between JFET and MOSFET, Handling precaution for MOSFET Optoelectronic Devices: Sources: LED: Introduction, Radiative transitions, Emission spectra, Methods of excitations, LED Structures; Materials for choice, Definition of efficiencies, Semiconductor Laser: Semiconductor laser structures & Materials, Advantages laser over Optical sources Detectors: Introduction, Photoconductor, Photodiodes, p-i-n & p-n photodiodes, Avalanche photodiode, Phototransistor, Photo voltaic effect and solar cells	14
4	Digital Integrated Circuits Introduction, Level of Integration, Digital IC Families, TTL Logic Family: Introduction , NAND Gate with Totem-pole Output, Types of TTL, TTL parameters: floating inputs, worst-case input/output voltages, profile and windows, compactibility, sourcing and sinking, noise immunity, standard loading, loading rules. Three state TTL Devices. MOS Logic Family: Introduction, MOS Inverters, NMOS - NAND & NOR Gates. CMOS Logic Family : NAND & NOR Gates, Power Dissipation, CMOS characteristics:	12




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	Floating inputs, Compatibility, Sourcing & Sinking, TTL to CMOS and CMOS to TTL interface, Comparison of Various Logic Families	

Learning Outcomes

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology

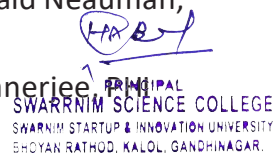
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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Semiconductor Devices : Physics and Technology (2nd Ed) by S.M. Sze, Wiely (India)
2. Physics of Semiconductor Devices (4th Ed), S. M. Sze and Kwok. K. Ng., John Wiely & Co.
3. Semiconductor Physics and Devices: Basic Principle (3rd Edition), Donald Neauman, Tata McGraw Hill
4. Solid State Electronic Devices (6th Edition), Ben G. Streetman and S. Banerjee, PHI
5. Physics of Semiconductor Devices, Michael Shur, PHI Learning.
6. Electronic Devices and Circuits: An Introduction, Allen Motershead , PHI



7. Optoelectronic Devices and Circuits: A.K. Ganguly, (NAROSA)
8. Digital Principles and Applications, Albert Paul Malvino, Donald P. Leach & Goutam Saha, TMH, 7th Edition
9. Digital Circuits and Systems, C.B. Agrawal, & M.K. Garg., Umesh Publications

E-Resources

- SWAYAM / NPTEL portal online courses available of Semiconductor Physics.
<https://swayam.gov.in/> and <https://nptel.ac.in/>
- <https://www.learncbse.in/semiconductor-electronics-materials-devices-simple-circuits-cbse-notes-class-12-physics/>.
- https://www.iare.ac.in/sites/default/files/lecture_notes/semiconductors%20lecture%20notes%20%281%29_0.pdf
- <https://www.dronstudy.com/book/chapter-notes-semiconductors-physics-class-12/>
- <https://courses.engr.illinois.edu/ece110/fa2020/content/courseNotes/files/?logicAndCMOS#:~:text=CMOS%20logic%20circuits%20consist%20of,of%20NMOS%20and%20PMOS%20transistors.>
- https://web.stanford.edu/class/archive/engr/engr40m.1178/slides_sp17/lecture08.pdf
- <http://fourier.eng.hmc.edu/e84/lectures/ch4/node15.html>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PAPER-4 Analog Electronics

Subject Code: 256050204

M.Sc. Semester 2

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- By studying the topics on power amplifiers students will know about the types of the large signal amplifiers their merits and demerits. They also learn to analyze the large signal amplifiers. To make students familiar with the types of multivibrators, their working and applications topic of multivibrators is introduced. Some basic characteristics and applications of operational amplifiers are studied by the students at undergraduate level. In continuation of this study some more applications and characteristics of the operational amplifiers are introduced here.
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems

Prerequisites

Basics of Electronic circuits and electronics communication




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SWARNIM STARTUP & INNOVATION UNIVERSITY
BHOYAN RATHOD, KALOL, GANDHINAGAR.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Power Supply and Regulators IC Regulators using 723, Positive, Negative, Low and High voltage regulators, current booster transistor, fold back current limiting circuit. The Operational Amplifier & Applications : active filters, low pass, high pass, band pass, band reject, notch, first and second order filters, comparators, sample and hold circuits, Logarithmic & antilogarithmic amplifiers.	14
2	Tuned & Wide Band Amplifiers The pole-zero diagram, single tuned amplifier-root locus, inductively coupled circuits, tuned primary amplifiers, tuned secondary FET amplifier, the double tuned transformer, stagger tuned amplifiers, response to pulses, bandwidth requirement for pulse amplification, rise time in pulse amplifier, sag of the pulse, shunt peak video amplifier. Rise time at the shunt peaked amplifier. PLL : Basic PLL operation, Lock range and capture range, PLL as AM and FM detector.	14
3	Power Amplifiers & Multivibrators Power Amplifiers: Class - A large signal amplifiers, transformer coupled Class - A amplifier, second harmonic distortion, push - pull Class - A amplifier, Class - B Push - Pull amplifiers. Multivibrators: Astable, Monostable, Bistable Multivibrators and Schmitt Trigger circuits using transistors. (With analysis)	14
4	Operational Amplifiers & Its Applications Frequency compensation and slew rate, DC and AC amplifiers, Integrator and differentiator, Voltage to current and current to voltage converter, Bridge amplifier, electronic analog computation, sine, square, triangular and saw tooth wave generators, Schmitt trigger.	14



Learning Outcomes

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology

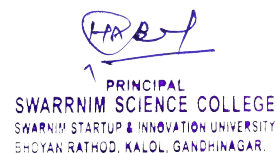
We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. K.R. Botkar, Integrated circuits, Khanna Publishers
2. Electronic Devices and Circuit Theory, Robert Boylested and L.Nashelsky, PHI (3rd Ed.)
3. Electronic Fundamentals and Applications : Integrated and Discrete Systems, John D. Ryder, PHI, Fifth edition.
4. OPAMP & Linear Integrated Circuits, Ramakant Gaiekwad, PHI



E-Resources:

- SWAYAM / NPTEL portal online courses on electronics and communication and electronics circuits. <https://swayam.gov.in/> and <https://nptel.ac.in/>
- http://www.idc-online.com/technical_references/pdfs/electrical_engineering/Power_Supplies_and_Voltage_Regulators.pdf
- <https://cdn.shopify.com/s/files/1/0428/4655/2230/files/nesexinugobuwusijelowej.pdf>
- [https://neurophysics.ucsd.edu/courses/physics_120/Agarwal%20and%20Lang%20\(2005\)%20Foundations%20of%20Analog%20and%20Digital.pdf](https://neurophysics.ucsd.edu/courses/physics_120/Agarwal%20and%20Lang%20(2005)%20Foundations%20of%20Analog%20and%20Digital.pdf)
- https://www.electronics-tutorials.ws/opamp/opamp_8.html
- <https://www.analog.com/media/en/training-seminars/design-handbooks/Op-Amp-Applications/Section1.pdf>




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SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

Microbial Genetics

CODE: 256030201

M.Sc. 2nd Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70		100

Objectives:-

- To provide basic knowledge of bioprocess technology in the industry, how to isolate the micro-organisms, its preservation. How the strain can be improved for industrially important organisms. Types of substrate used for fermentation and about medium optimization.
- This study gives idea about the bioreactor design. Types of bioreactor used in the industry. how the sterilization of media and air can be done. Importance of mass transfer and determination of $K_L a$, inoculum development.
- The student will get an idea about kinetic of substrate and utilization of batch, types of fermentation i.e fed batch and batch fermentation. What can be control system for monitoring the fermentation process.
- To provide the idea about down streaming process how to get end product in the fermentation. What different methods can be used for down streaming process.

Prerequisites: -

Student must have passed BSc Microbiology as major subject with basic knowledge of biology.




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Course outline: -

Sr. No.	Course Contents	Number of Hours
1.	Introduction to bioprocess technology Isolation, preservation and improvement of industrially important organisms. Substrates for fermentation processes Medium optimization	10
2.	Bioreactor design: Laboratory, pilot and large scale reactors. Plug flow reactors, enzyme reactors. Sterilization of media and air. Scale up and Scale down Mass transfer of oxygen: Agitation and aeration, Determination of K_La , factors affecting K_La , fluid rheology. Inoculum development, aseptic inoculation and sampling.	10
3.	Bioprocess kinetics: Kinetics of growth and substrate utilization in batch, fed batch and continuous systems. Control of process parameters: Instrumentation for monitoring bioreactor and fermentation processes, Sensors, Controllers, fermentation control systems and architecture, Incubation and sequence control, advanced control. Dynamic modelling of fermentation processes.	10
4.	Downstream processing: Methods of Cell separation, Disruption and product purification. Fermentation Economics	10

Learning Outcomes:

- Student will learn about the bioprocess technology in the industry, how to isolate the micro-organisms, its preservation. How the strain can be improved for industrially important organisms. Types of substrate used for fermentation and about medium optimization.
- Provide an idea about the bioreactor design. Types of bioreactor used in the industry. how the sterilization of media and air can be done. Importance of mass transfer and determination of K_La , inoculum development.
- Get knowledge about kinetic of substrate and utilization of batch, types of fermentation i.e fed batch and batch fermentation. What can be control system for monitoring the fermentation process.



- To provide the idea about down streaming process how to get end product in the fermentation. What different methods can be used for down streaming process.

Teaching & learning Methodology:

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Basic Text & Reference Books:

- Principles of Fermentation Technology : Whitaker & Stanbury Comprehensive
- Biotechnology : Murray Moo Young
- Methods in Industrial Microbiology : Sikyta
- Fermentation Microbiology and Biotechnology, El Mansi and Bryc

E-Resources

- https://www.slideshare.net/zeal_eagle/fermentation-technology
- <https://www.slideshare.net/asertseminar/bioreactor-ppt>
- <https://www.cheric.org/files/education/cyberlecture/e200402/e200402-901.pdf>
- <https://science.sciencemag.org/content/219/4585/728>
- <https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/downstream-processing>
- <https://www.slideshare.net/AyushJain378/downstream-processing-73275843>






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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

Immunology

Subject Code: 256030202

M.SC. Semester -2

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

Objectives

- To provide students the basic knowledge of immunity, system of immunology, interaction of Ag-Ab.
- The purpose of the course is to give student to introduction of Types of immunity, antigen- antibody reaction, Hypersensitivity reaction etc.
- To provide an understanding of immune system in the body, types of cells etc..

Prerequisites

Student Must have studied M.Sc. with microbiology as a major subject and knowledge of basic Immunology and medical microbiology.




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BHOYAN RATHOD, KALOL, GANDHINAGAR.

Course outline

Sr. No.	Course Contents	Teaching hours
1.	Adaptive immunity and innate immunity: inflammation, role of cells, receptors and proteins in innate immunity, ubiquity of the innate system. Cells and organs of the immune system: Hematopoiesis, cells of the immune system, primary and secondary lymphoid organs. Antigens and antibodies: properties of immunogens, haptens, epitopes, structure and classes of immunoglobulins, biological activities and effector functions, monoclonal antibodies and enzymes. Antibody diversity: models, organization of Ig genes, mechanism of gene rearrangement, generation of diversity; expression, synthesis and class switching, antibody engineering.	10
2.	Antigen-antibody interactions: principles and applications. Complement: components of the system, activation, regulation, biological consequences and deficiency diseases. Major histocompatibility complex and antigen presentation: MHC-organization, inheritance, genes, molecules and peptide binding, expression, disease susceptibility, immune responsiveness, self MHC restriction, cytosolic and endocytic pathway for antigen processing.	10
3.	T-cell receptor, T-cell maturation, activation and differentiation: TCR- genetic organization and rearrangement of genes, TCR-complex, peptide binding, thymic selection, activation and differentiation of T cells. Generation, activation and differentiation of B cells: B cell maturation, activation and proliferation, germinal centres, regulation of the responses. Cytokines: properties, receptors, associated diseases, therapeutic applications. Leukocyte activation and migration: CAM, chemokines, recirculation and extravasation, inflammation and anti-inflammatory agents. Cell mediated cytotoxicity: effector T cells, cytotoxic T cells, NK cells, ADCC.	10
4.	Hypersensitivity reactions: classification and types of hypersensitivity reactions. Immune tolerance and autoimmunity: establishment and failure of tolerance, autoimmune diseases, mechanisms for the induction, animal models, treatment. Transplantation immunology: basis and manifestation of graft rejection, immunosuppressive therapy, immune tolerance. Cancer and immune system. Immunodeficiency.	 10 PRINCIPAL SWARNIM SCIENCE COLLEGE SWARNIM STARTUP & INNOVATION UNIVERSITY BHOYAN RATHOD, KALOL, GANDHINAGAR.




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Learning Outcomes

- The students will be able to understand the Knowledge of the types of immune system , Ag-Ab reaction techniques in the body ,hypersensitivity reaction etc.
- Student should be able to understand basic concepts of immunity and types of the cell, classification of the hypersensitivity :its types and function.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- At the end of the course the student would have basic knowledge of immunity, system of immunology, interaction of Ag-Ab.

Teaching & Learning Methodology

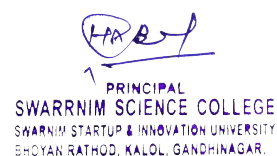
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The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Kuby-Immunology: T. J. Kindt, R. A. Goldsby and B. A. Osborne; W. H. Freeman
- Janeway's Immunology: K. Murphy, P. Travers and M. Walport; Garland Sciences
- Immunology: Ivan Roitt, J. Brostoff and D. Male; Mosby
- Essential immunology: Ivan Roitt; Oxford: Blackwell
- Topic related review articles.



E-Resources

- <https://www.slideshare.net/mobile/Jsiahnabi/types-of-immunity>
- <https://www.slideshare.net/mobile/mprasadnaidu/immunity-32908889>
- <https://www.slideshare.net/mobile/ArunimaSur/antigen-antibody-interaction-55880086>
- <https://www.slideshare.net/mobile/VELSPHARMD/hypersensitivity-24449005>
- <https://www.slideshare.net/mobile/VamsiIntellectual/types-of-cells-and-tissues>




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SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

Bioprocess Technology

CODE: 256030201

M.Sc. 2nd Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70		100

Objectives:-

- To provide basic knowledge of bioprocess technology in the industry, how to isolate the micro-organisms, its preservation. How the strain can be improved for industrially important organisms. Types of substrate used for fermentation and about medium optimization.
- This study gives idea about the bioreactor design. Types of bioreactor used in the industry. how the sterilization of media and air can be done. Importance of mass transfer and determination of $K_L a$, inoculum development.
- The student will get an idea about kinetic of substrate and utilization of batch, types of fermentation i.e fed batch and batch fermentation. What can be control system for monitoring the fermentation process.
- To provide the idea about down streaming process how to get end product in the fermentation. What different methods can be used for down streaming process.

Prerequisites: -

Student must have passed BSc Microbiology as major subject with basic knowledge of biology.




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Course outline: -

Sr. No.	Course Contents	Number of Hours
1.	Introduction to bioprocess technology Isolation, preservation and improvement of industrially important organisms. Substrates for fermentation processes Medium optimization	10
2.	Bioreactor design: Laboratory, pilot and large scale reactors. Plug flow reactors, enzyme reactors. Sterilization of media and air. Scale up and Scale down Mass transfer of oxygen: Agitation and aeration, Determination of K_La , factors affecting K_La , fluid rheology. Inoculum development, aseptic inoculation and sampling.	10
3.	Bioprocess kinetics: Kinetics of growth and substrate utilization in batch, fed batch and continuous systems. Control of process parameters: Instrumentation for monitoring bioreactor and fermentation processes, Sensors, Controllers, fermentation control systems and architecture, Incubation and sequence control, advanced control. Dynamic modelling of fermentation processes.	10
4.	Downstream processing: Methods of Cell separation, Disruption and product purification. Fermentation Economics	10

Learning Outcomes:

- Student will learn about the bioprocess technology in the industry, how to isolate the micro-organisms, its preservation. How the strain can be improved for industrially important organisms. Types of substrate used for fermentation and about medium optimization.
- Provide an idea about the bioreactor design. Types of bioreactor used in the industry. how the sterilization of media and air can be done. Importance of mass transfer and determination of K_La , inoculum development.
- Get knowledge about kinetic of substrate and utilization of batch, types of fermentation i.e fed batch and batch fermentation. What can be control system for monitoring the fermentation process.



- To provide the idea about down streaming process how to get end product in the fermentation. What different methods can be used for down streaming process.

Teaching & learning Methodology:

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Basic Text & Reference Books:

- Principles of Fermentation Technology : Whitaker & Stanbury Comprehensive
- Biotechnology : Murray Moo Young
- Methods in Industrial Microbiology : Sikyta
- Fermentation Microbiology and Biotechnology, El Mansi and Bryc

E-Resources

- https://www.slideshare.net/zeal_eagle/fermentation-technology
- <https://www.slideshare.net/asertseminar/bioreactor-ppt>
- <https://www.cheric.org/files/education/cyberlecture/e200402/e200402-901.pdf>
- <https://science.sciencemag.org/content/219/4585/728>
- <https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/downstream-processing>
- <https://www.slideshare.net/AyushJain378/downstream-processing-73275843>






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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

Tools and techniques in synthetic microbiology

CODE: 256030204

M.Sc. 2nd Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70		100

Objectives:-

- To provide basic knowledge of microscopy & its types, fixation & storage & cytology.
- The aim of the course is to provide students with the basic principles of cytochemistry and histochemistry.
- The preparation techniques for sample analysis used in cytochemistry, histochemistry, immunocytochemistry and in situ hybridization will be illustrated.
- Basic knowledge will also be provided for optical and electronic visualization of biological interest macromolecules.
- Theoretical lessons will be associated with seminars / workshops relating to examples of application of these methods to the study of cellular biology and instrument observation tools.
- The Microscope. Learning Objectives By the end of this topic, you will be able to: Name the parts of the microscope and their functions.

Prerequisites:-

- Student Must have studied B.Sc. with microbiology/biotechnology as a major subject and knowledge of basic biology




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Course outline:-

Sr. No.	Course Contents	Number of Hours
1.	Light microscopy:- Optical corrections, Properties and types of objectives. Oculars, Illumination. Types of light microscopes: Bright field, dark field, fluorescence, phase contrast, polarizing, differential interference contrast. Micrometry.	10
2.	Electron microscopy: Basic components of electron microscopes. Thermionic and field emission electron guns. Types of electron microscopes: TEM, SEM, STEM, ESEM and HVEM	10
3.	Fixation and storage: Classification of fixatives , formulas. (Plant, animal and microbial samples). Factors affecting fixation. Procedures for fixation. Dehydration, infiltration and embedding. Media for embedding. Microtomes: Rotary, sliding cryostat, ultramicrotome and freezing ultra microtome. Preparation of biological samples for light and electron microscopy: Sectioning, maceration, squash and clearing technique. Freeze etching and freeze fracturing. Stains for light and electron microscopy. Staining procedures. Photomicrography.	10
4.	Histochemistry: Histo chemical localization of metabolites:- Starch, proteins, lipids, total carbohydrates, lignin, polyphenols, nucleic acid, histones, cutin, suberin and waxes. Localization of enzymes: Peroxidase, acid phosphatase and succinic dehydrogenase. Ultra structural cytochemistry:- Localization of tannin, protein, cell wall polysaccharide, lignin and membrane. Enzymes: Peroxidase, acid phasphatase. Immunocytochemistry	10

Learning Outcomes:

- At the end of the course the student would have basic knowledge of microscopy & its types, fixation & storage & cytology.



- At the end of the course, the student will have acquired basic theoretical knowledge related to:
 - -preparation techniques of histological samples and their cyto-histochemical staining;
 - main techniques of immunohistochemistry and in situ hybridization;
 - main methods of in situ observation of biological macromolecules in cells and tissues.
 - It is therefore timely to investigate how microscopy techniques can be taught most efficiently.
 - In this study, different teaching activities (TAs) that are currently used for microscopy training of students will be assessed regarding their value for the realization of intended learning outcomes

Teaching & Learning Methodology

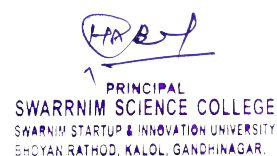
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- Janeway's Immunology: K. Murphy, P. Travers and M. Walport; Garland Sciences
- Immunology: Ivan Roitt, J. Brostoff and D. Male; Mosby



- Essential immunology: Ivan Roitt; Oxford: Blackwell
- Topic related review articles.

E-Resources

- <https://microbenotes.com/category/microscopy/>
- <https://www.khanacademy.org/science/high-school-biology/hs-cells/hs-introduction-to-cells/a/microscopy>
- <https://www.sciencedirect.com/topics/neuroscience/histochemistry>
- <https://www.sciencedirect.com/topics/medicine-and-dentistry/cytochemistry>
- <http://cytochemistry.net/>




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SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

Microbial Genetics

CODE: 256010201

M.Sc. 2nd semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70		100

Objectives

- To provide students basic knowledge of Genetics of microbial organisms.
- The purpose of the course is to give students to introduction of replication, transcription and translation in eukaryotes.
- To provide an understanding of DNA damage and repair system and also get idea about transposons and its applications.

Prerequisites

Student Must have studied B.Sc. with biotechnology/Microbiology as a major subject and knowledge of basic biology.



Course outline


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Sr. No.	Course Contents	Teaching hours
1	Mutation and DNA Repair Mutation, Spontaneous mutations (Random v/s adaptive nature of mutation, Luria and Delbruck experiment, Newcombe experiment, Lederberg's experiment, Mutation rate and its determination, Origin of spontaneous mutations), DNA damages (Deamination of bases, alkylation, damage due to reactive oxygen, UV induced damage) and its repair pathways (Methyl-directed mismatch repair, Nucleotide excision repair, Base excision repair, recombinational repair, SOS inducible repair, specific repair for oxidative DNA damage, pyrimidine dimers and alkylation induced damage and adaptive response). Plasmid Biology Types, compatibility, replication, control of copy number and plasmid segregation	10
2	Recombination Types of recombination, Models for Homologous recombination, Molecular mechanism of homologous recombination, Homologous recombination in eukaryotes, Mating- type switching. Molecular mechanism for site-specific recombination, Biological roles of site-specific recombination Conjugation Conjugation by E. coli F factor (Structure of F-factor, Regulation of F-factor fertility, establishment of cell contact, DNA mobilization and transfer and separation of mating pair, Hfr conjugation and chromosomal transfer, F-prime conjugation and merodiploid, Conjugation of fertility inhibited F-like plasmids, Nonconjugative, mobilizable plasmids, Broad Host Range self-transmissible plasmids, Chromosome mobilization by Non-F plasmids, Plasmid based conjugation in other bacteria (Salmonella, Pseudomonas, Streptomyces and Streptococcus. Interrupted mating and conjugational mapping. Agrobacterium genetics Ti-plasmid, Interkingdom gene transfer (Key early experiments, vir regulon, protein secretion apparatus, conjugation model of T-DNA transfer, Integration products).	10
3	Transformation Mechanism of Natural competence and transformation in Bacillus subtilis, Streptococcus pneumoniae and Haemophiles influenzae. Transformation by inducing artificial competence, Gene linkage and mapping by transformation. Transduction Viral genetics Generalized transduction in P22, P1, T4, γ and Mu bacteriophages, homologous recombination with recipient's chromosome, measuring transduction (cotransduction of markers, marker effects, abortive transduction, transduction of plasmids) Applications of generalized	10




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	transduction. Specialized transduction in λ and its applications. Viral genetics Bacteriophages (T-series, γ -biology, Miniphages (M-13, γ X 174, Mu), Bacteriophage recombination (complementation, fine structure analysis).	
4	Transposons Fungal genetics Tetrad analysis and Mitotic recombination Restriction-Modification systems Role of Restriction-Modification systems, Types of RM systems, Modification, Restriction and Regulation. Transposable elements: Types of transposable elements, Structure, genetic organization and mechanism of transposition of Tn5, Tn3 and related transposons, Bacteriophage Mu, Tn7 and IS911, Integrations, Retrotransposons, Conjugative and Mobilizable transposons. Assays of transposition. Molecular biology of tumor Control of cell proliferation, oncogene activation, role of tumor suppressor genes, Apoptosis.	10

Learning Outcomes

- The students will be able to apply the knowledge of the Genetics of Microbes to understand concepts of various fields like R&D fields, Gene transfer among bacteria, etc.
- Student should be able to understand basic concepts of Mutation, DNA repair, Recombination, Conjugation, Transformation, Viral genetics, Transposons, Restriction-Modification systems, Molecular biology of tumor.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the theoretical data clearly and concisely that incorporates the stylistic conventions used by biotechnologist/Microbiologist worldwide.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:




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- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
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- Provide learning materials in different formats (written, online, audio, video podcast etc.) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Lewin's GENES X, Volume 10 Benjamin Lewin, Jocelyn Krebs, Stephen Kilpatrick, Elliott Goldstein-Jones & Bartlett Learning, 2011
2. Watson JD, Baker TA, Bell SP et al. (2008) Molecular Biology of the Gene, 6th Ed., Benjamin Cummings
3. Molecular biology of the cell (third edition): By B Alberts, D Bray, J Lewis, M Raff, K Roberts and J D Watson.
4. Biotechnology and genomics by P. K. Gupta, Rastogi Publication
5. Molecular Genetics of Bacteria: 3rd (third) Edition-Larry Snyder

E-Resources

- <https://www.nature.com/scitable/topicpage/dna-damage-repair-mechanisms-for-maintaining-dna-344/>
- <https://www.microscopemaster.com/plasmids.html>
- <https://aklectures.com/lecture/cell-cycle-and-cell-division/conjugation-transformation-and-transduction>
- <https://aklectures.com/lecture/cell-cycle-and-cell-division/conjugation-transformation-and-transduction>
- http://grupo.us.es/gfni/dna/genetic_ingeniering/transposons.htm



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

Immunology

Subject Code: 256010202

M.SC. Semester -2

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- To provide students the basic knowledge of immunity, system of immunology, interaction of Ag-Ab.
- The purpose of the course is to give student to introduction of Types of immunity, antigen- antibody reaction, Hypersensitivity reaction etc.
- To provide an understanding of immune system in the body, types of cells etc..

Prerequisites

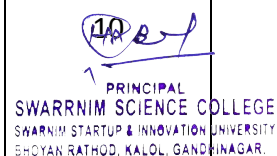
Student Must have studied M.Sc. with microbiology as a major subject and knowledge of basic Immunology and medical microbiology.




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Course outline

Sr. No.	Course Contents	Teaching hours
1.	Adaptive immunity and innate immunity: inflammation, role of cells, receptors and proteins in innate immunity, ubiquity of the innate system. Cells and organs of the immune system: Hematopoiesis, cells of the immune system, primary and secondary lymphoid organs. Antigens and antibodies: properties of immunogens, haptens, epitopes, structure and classes of immunoglobulins, biological activities and effector functions, monoclonal antibodies and enzymes. Antibody diversity: models, organization of Ig genes, mechanism of gene rearrangement, generation of diversity; expression, synthesis and class switching, antibody engineering.	10
2.	Antigen-antibody interactions: principles and applications. Complement: components of the system, activation, regulation, biological consequences and deficiency diseases. Major histocompatibility complex and antigen presentation: MHC-organization, inheritance, genes, molecules and peptide binding, expression, disease susceptibility, immune responsiveness, self MHC restriction, cytosolic and endocytic pathway for antigen processing.	10
3.	T-cell receptor, T-cell maturation, activation and differentiation: TCR- genetic organization and rearrangement of genes, TCR-complex, peptide binding, thymic selection, activation and differentiation of T cells. Generation, activation and differentiation of B cells: B cell maturation, activation and proliferation, germinal centres, regulation of the responses. Cytokines: properties, receptors, associated diseases, therapeutic applications. Leukocyte activation and migration: CAM, chemokines, recirculation and extravasation, inflammation and anti-inflammatory agents. Cell mediated cytotoxicity: effector T cells, cytotoxic T cells, NK cells, ADCC.	10
4.	Hypersensitivity reactions: classification and types of hypersensitivity reactions. Immune tolerance and autoimmunity: establishment and failure of tolerance, autoimmune diseases, mechanisms for the induction, animal models, treatment. Transplantation immunology: basis and manifestation of graft rejection, immunosuppressive therapy, immune tolerance. Cancer and immune system. Immunodeficiency.	10



Learning Outcomes

- The students will be able to understand the Knowledge of the types of immune system , Ag-Ab reaction techniques in the body ,hypersensitivity reaction etc.
- Student should be able to understand basic concepts of immunity and types of the cell, classification of the hypersensitivity :its types and function.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
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Teaching & Learning Methodology

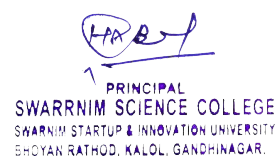
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E-Resources

- <https://www.slideshare.net/mobile/Jsiahnabi/types-of-immunity>
- <https://www.slideshare.net/mobile/mprasadnaidu/immunity-32908889>
- <https://www.slideshare.net/mobile/ArunimaSur/antigen-antibody-interaction-55880086>
- <https://www.slideshare.net/mobile/VELSPHARMD/hypersensitivity-24449005>
- <https://www.slideshare.net/mobile/VamsiIntellectual/types-of-cells-and-tissues>




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SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE
DEPARTMENT OF BIOTECHNOLOGY

Bioprocess Technology

CODE: 256010203

M.Sc. 2nd semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70		100

Objectives:-

- To provide basic knowledge of bioprocess technology in the industry, how to isolate the micro-organisms, its preservation. How the strain can be improved for industrially important organisms. Types of substrate used for fermentation and about medium optimization.
- This study gives idea about the bioreactor design. Types of bioreactor used in the industry. how the sterilization of media and air can be done. Importance of mass transfer and determination of $K_L a$, inoculum development.
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Prerequisites: -

Student must have passed BSc Microbiology as major subject with basic knowledge of biology.




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Course outline: -

Sr. No.	Course Contents	Number of Hours
1.	Introduction to bioprocess technology Isolation, preservation and improvement of industrially important organisms. Substrates for fermentation processes Medium optimization	10
2.	Bioreactor design: Laboratory, pilot and large scale reactors. Plug flow reactors, enzyme reactors. Sterilization of media and air. Scale up and Scale down Mass transfer of oxygen: Agitation and aeration, Determination of K_La , factors affecting K_La , fluid rheology. Inoculum development, aseptic inoculation and sampling.	10
3.	Bioprocess kinetics: Kinetics of growth and substrate utilization in batch, fed batch and continuous systems. Control of process parameters: Instrumentation for monitoring bioreactor and fermentation processes, Sensors, Controllers, fermentation control systems and architecture, Incubation and sequence control, advanced control. Dynamic modelling of fermentation processes.	10
4.	Downstream processing: Methods of Cell separation, Disruption and product purification. Fermentation Economics	10

Learning Outcomes:

- Student will learn about the bioprocess technology in the industry, how to isolate the micro-organisms, its preservation. How the strain can be improved for industrially important organisms. Types of substrate used for fermentation and about medium optimization.
- Provide an idea about the bioreactor design. Types of bioreactor used in the industry. how the sterilization of media and air can be done. Importance of mass transfer and determination of K_La , inoculum development.
- Get knowledge about kinetic of substrate and utilization of batch, types of fermentation i.e fed batch and batch fermentation. What can be control system for monitoring the fermentation process.



- To provide the idea about down streaming process how to get end product in the fermentation. What different methods can be used for down streaming process.

Teaching & learning Methodology:

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Basic Text & Reference Books:

- Principles of Fermentation Technology : Whitaker & Stanbury Comprehensive
- Biotechnology : Murray Moo Young
- Methods in Industrial Microbiology : Sikyta
- Fermentation Microbiology and Biotechnology, El Mansi and Bryc

E-Resources

- https://www.slideshare.net/zeal_eagle/fermentation-technology
- <https://www.slideshare.net/asertseminar/bioreactor-ppt>
- <https://www.cheric.org/files/education/cyberlecture/e200402/e200402-901.pdf>
- <https://science.sciencemag.org/content/219/4585/728>
- <https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/downstream-processing>
- <https://www.slideshare.net/AyushJain378/downstream-processing-73275843>






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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

Tools and techniques in synthetic microbiology

CODE: 256010204

M.Sc. 2ND SEMSTER

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	4	4	6	30	-	70		100

Objectives:-

- To provide basic knowledge of microscopy & its types, fixation & storage & cytology.
- The aim of the course is to provide students with the basic principles of cytochemistry and histochemistry.
- The preparation techniques for sample analysis used in cytochemistry, histochemistry, immunocytochemistry and in situ hybridization will be illustrated.
- Basic knowledge will also be provided for optical and electronic visualization of biological interest macromolecules.
- Theoretical lessons will be associated with seminars / workshops relating to examples of application of these methods to the study of cellular biology and instrument observation tools.
- The Microscope. Learning Objectives By the end of this topic, you will be able to: Name the parts of the microscope and their functions.

Prerequisites:-

- Student Must have studied B.Sc. with microbiology/biotechnology as a major subject and knowledge of basic biology




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Course outline:-

Sr. No.	Course Contents	Number of Hours
1.	Light microscopy:- Optical corrections, Properties and types of objectives. Oculars, Illumination. Types of light microscopes: Bright field, dark field, fluorescence, phase contrast, polarizing, differential interference contrast. Micrometry.	10
2.	Electron microscopy: Basic components of electron microscopes. Thermionic and field emission electron guns. Types of electron microscopes: TEM, SEM, STEM, ESEM and HVEM	10
3.	Fixation and storage: Classification of fixatives , formulas. (Plant, animal and microbial samples). Factors affecting fixation. Procedures for fixation. Dehydration, infiltration and embedding. Media for embedding. Microtomes: Rotary, sliding cryostat, ultramicrotome and freezing ultra microtome. Preparation of biological samples for light and electron microscopy: Sectioning, maceration, squash and clearing technique. Freeze etching and freeze fracturing. Stains for light and electron microscopy. Staining procedures. Photomicrography.	10
4.	Histochemistry: Histo chemical localization of metabolites:- Starch, proteins, lipids, total carbohydrates, lignin, polyphenols, nucleic acid, histones, cutin, suberin and waxes. Localization of enzymes: Peroxidase, acid phosphatase and succinic dehydrogenase. Ultra structural cytochemistry:- Localization of tannin, protein, cell wall polysaccharide, lignin and membrane. Enzymes: Peroxidase, acid phasphatase. Immunocytochemistry	10

Learning Outcomes:

- At the end of the course the student would have basic knowledge of microscopy & its types, fixation & storage & cytology.



- At the end of the course, the student will have acquired basic theoretical knowledge related to:
 - -preparation techniques of histological samples and their cyto-histochemical staining;
 - main techniques of immunohistochemistry and in situ hybridization;
 - main methods of in situ observation of biological macromolecules in cells and tissues.
 - It is therefore timely to investigate how microscopy techniques can be taught most efficiently.
 - In this study, different teaching activities (TAs) that are currently used for microscopy training of students will be assessed regarding their value for the realization of intended learning outcomes

Teaching & Learning Methodology

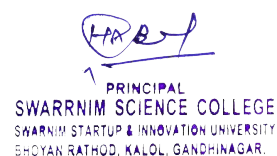
We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Kuby-Immunology: T. J. Kindt, R. A. Goldsby and B. A. Osborne; W. H. Freeman
- Janeway's Immunology: K. Murphy, P. Travers and M. Walport; Garland Sciences
- Immunology: Ivan Roitt, J. Brostoff and D. Male; Mosby



- Essential immunology: Ivan Roitt; Oxford: Blackwell
- Topic related review articles.

E-Resources

- <https://microbenotes.com/category/microscopy/>
- <https://www.khanacademy.org/science/high-school-biology/hs-cells/hs-introduction-to-cells/a/microscopy>
- <https://www.sciencedirect.com/topics/neuroscience/histochemistry>
- <https://www.sciencedirect.com/topics/medicine-and-dentistry/cytochemistry>
- <http://cytochemistry.net/>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Organic Chemistry - II

Subject Code: 256020201

M.Sc. Semester-2

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	--	70	-	100

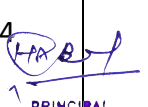
Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

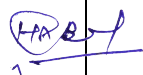
Chemistry majors must have a basic understanding of fundamental organic chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Spectroscopy 13 CNMR: General considerations, chemical shift (aliphatic, olefinic, alkyne, aromatic, heteroaromatic and carbonyl carbon), coupling constants. Mass spectroscopy: Introduction, ion production, EI, CI, FD and FAB, factors affecting fragmentation, ion analysis, ion abundance. Mass spectral fragmentation of organic compounds,	14  PRINCIPAL SWARNIM SCIENCE COLLEGE SWARNIM STARTUP & INNOVATION UNIVERSITY BHOYAN RATHOD, KALO, GANDHINAGAR.

	common functional groups, molecular ion peak, metastable peak, McLafferty rearrangement. Nitrogen rule. High resolution mass spectroscopy. Examples of mass spectral fragmentation of organic compounds, NMR, IR, UV with respect to their structure determination.	
2	(A) Photochemistry (1) Photochemical reactions: Principles of energy transfer, electronic excitation and molecular orbital view of excitation, excited states and fate of excited molecules (modified Jablonski diagram), Photosensitization. (2) Photochemistry of carbonyl compounds: Representation of excited states of ketones, photoreduction Norrish type I & II reactions, Reactions of cyclic Ketone, oxetane formation (Paterno- Buchi reaction) (3) Di-π methane rearrangement, Dienone photochemistry, cis-trans isomerisation and photochemistry of conjugated olefins. (B) Chemistry of Heterocycles (1) Nomenclature of heterocycles: Replacement and systematic nomenclature (Hantzsch-Widman system) for monocyclic, fused and bridged heterocycles. General chemical behavior of aromatic heterocycles. (2) Five-membered and benzo fused five member heterocycles: Oxazole, Isoxazole, Thiazole, Pyrazole, Imidazole, Benzothiazole and Benzimidazole. (3) Six membered and benzofused six membered heterocycles: Pyrazine, Pyridazine, Pyrimidine, Cinnoline, Quinazoline, Quinoxaline, Phenoxaline.	14
3	Name reactions General nature, method, mechanism and synthetic applications of the following reactions: (i) Vilsmeier-Haack reaction (ii) Mitsunobu reaction (iii) Suzuki reaction (iv) Buchwald Hartwig reaction (cross coupling) (v) Sonogashira coupling (vi) Stobbe condensation (vii) Jones oxidation (viii) Swern oxidation reaction (ix) Michael addition (x) Darzens' glycidic ester synthesis (xi) Mannich reaction (xii) Dieckmann reaction (xiii) Birch reduction (xiv) Wittig reaction (xv) Knoevenagel reaction	14




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4	Stereo Chemistry Mechanism selectivity and utility of following reagents: (i) Gilman's reagent-Lithium dimethylcuprate (ii) Lithium diisopropylamide (LDA) (iii) Dicyclohexylcarbodiimide (DCC) (iv) 1,3 – Dithiane (Umpolung reagent) (v) Dess- Martin periodinane (vi) Bakers yeast (vii) Diisobutylaluminium hydride(DIBAL –H) (viii) Sodium cyanoborohydride (NaBH ₃ (CN)) (ix) Grignard reagents (x) Sodium borohydride (xi) DDQ (xii) n-Butyl lithium (xiii) Phase transfer catalysis: Quaternary ammonium and phosphonium salts, crown ethers.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Organic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.



Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a

programmer/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Include group work, with groups representing diverse cultures.

Books Recommended:

1. Modern Synthetic Reactions, H.O.House, W.A. Benjamin.
2. Principles of Organic Synthesis, R.O.C. Norman and J.M. Coxon, 3rd Edition, Blackie Academic and Professional.
3. Spectrometric Identification of Organic Compounds by Robert M. Silverstein, 7th Edition, Wiley.
4. Mass Spectrometry – A Textbook Jurgen Gross, 1st Edition, 2002, Springer – Verlag Berlin Heidelberg.
5. Introductory Photochemistry, A.Cox and T.Camp, McGraw Hill.
6. Photochemistry, R.P. Kundall and A. Gilbert, Thomson Nelson.
7. Organic Photochemistry, J. Coxon and B. Halton, 2nd Edition, Cambridge University Press.
8. Strategic Applications of Named Reactions in Organic Synthesis, Laszlo Kurti and Barbara Czak, 1st Edition, Academic Press.
9. Name Reactions and Reagents in Organic Synthesis, Bradford P. Mundy, Michael G. Eller, Frank G. Favalaro, 2nd Edition, Wiley – Interscience.
10. Name Reactions. A Collection of Detailed Reaction Mechanisms, Jie Jack Li, 3rd Edition, Springer.
11. Heterocyclic Chemistry, volume 1-3, R.R. Gupta, M. Kumar and V. Gupta, Springer-Verlag.
12. Heterocyclic Chemistry, J.A. Joule, K.Mills, and G.F. Smith, 3rd Edition, Chapman and Hall.
13. Heterocyclic Chemistry, T.L. Gilchrist, Longman Scientific Technical.
14. Contemporary Heterocyclic Chemistry, G.R. Nikome and W.W. Poudler, Wiley.
15. Comprehensive Heterocyclic Chemistry, A.R. Kartizky, and C.W. Rees.
16. Encyclopedia of Reagents for Organic Synthesis, Leo A. Paquette, David Crich and Phillip L. Fuchs, John Wiley and Sons Inc.
17. Organic Chemistry, T.W. Graham Solomons and Graig B. Frymes, John Wiley and Sons.
18. Organic Chemistry, F. A. Carey, McGraw Hill Edition.
19. General Organic Chemistry Sachin Kumar Ghose, New Central book agency.
20. Guidebook to Mechanism in Organic Chemistry by Peter Sykes, 6th Edition, Prentice Hall.
21. Advanced Organic Chemistry Part A: Structure and Mechanism and Part B: Reaction and synthesis, Francis A. Carey, Richard J. Sundberg, 5th Edition, SPRINGER.
22. Organic chemistry vol 1-2 I.L Finar 5th edition, ELBS.

E-Resources

➤ <file:///C:/Users/admin/Downloads/spectroscopybasics-180519091436.pdf>

➤ https://www.youtube.com/watch?v=p_BMWraL62w

➤ [https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Book%3A_Basic Principles of Organic Chemistry \(Roberts and Caserio\)/28%3A Photochemistry/28.03%3A Organic Photochemistry](https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Book%3A_Basic_Principles_of_Organic_Chemistry_(Roberts_and_Caserio)/28%3A_Photochemistry/28.03%3A_Organic_Photochemistry)



- http://www.chem.gla.ac.uk/staff/stephenc/teaching/HeterocycleLectures2011_2C12.pdf
- <https://www.organic-chemistry.org/namedreactions/>
- <https://byjus.com/chemistry/named-reactions/>
- <https://nptel.ac.in/courses/104/103/104103111/>
- <https://byjus.com/jee/organic-chemistry/>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Inorganic Chemistry - II

Subject Code: 256020202

M.Sc. Semester-2

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental inorganic chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Chemical Bonding The method of linear combination VSEPR, Walsh diagrams(tri-and penta- atomic molecules), $d\pi - p\pi$ bonds, Bent rule and energetics of hybridization, some simple reactions of covalently bonded	14



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	molecules. Simple Huckel theory of linear conjugated systems, simple Huckel theory of the cyclic conjugated system and aromaticity, self-consistent field method, valence state ionization potentials, Pariser-Parr-Pople approximation. Band theory of solids, Fermi level, electrical properties, insulators, semiconductors and superconductors (properties).	
2	Application of symmetry Application of symmetry to hybrid orbital, molecular orbitals, hybridization schemes for σ orbitals, π bonding and molecular orbital for AB_n type of molecules. Application of symmetry to molecular vibrations, interpretation of IR and Raman spectral data.	14
3	Organometallic Compounds Organometallic compounds of transition elements, stability of metal carbon bond in complexes. Synthesis, uses and structure of organometallic compounds of π bonding organic ligands, 2-electron ligands, olefinic and acetylinic complexes, compound with 3 electron ligand – allylic complexes, compounds. With 4- electron ligands butadiene complexes, n_4 complexes of cyclopentadiene, compounds with 5 electron ligands – cyclopentadienyl, compounds with 6 electron ligands, n_6 complexes of benzene and its derivatives. Role of organometallic compounds in catalytic reaction.	14
4	Reaction Mechanism Mechanism of substitution reaction in square planar complexes. Kinetics of substitution reaction of platinum (II) complexes Effect of leaving group, effect of charge, steric effect, solvent effect, effect of nucleophile, effect of temperature and other effects. Oxidation-Reduction reaction, electron transfer, tunnelling effect, Marcus – Hush theory, one and two electron transfer inner sphere and outer sphere, effect of ions on rate, electron transfer through extended bridges, unstable oxidation states, hydrated electron.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of inorganic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.



Teaching & Learning Methodology


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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures

Books Recommended

1. Introduction to Quantum Chemistry, A. K. Chandra, Tata MacGraw Hill
2. Quantum Chemistry, Ira N. Levine, Prentice Hall
3. Quantum Chemistry by R. K. Prasad, New Age International Publishers (1985)
4. D. A. McQuarrie Quantum Chemistry, OUP 1983
5. M. W. Hanna, Quantum Mechanics in Chemistry, The Benjamin Pub.
6. Lectures on Chemical Bonding and Quantum Chemistry, S. N. Datta, A Prism Book
7. Group theory and symmetry in chemistry, L. H. Hall (McGraw Hill)
8. Coulson's Valence, R. McWeeny, ELBS
9. F. A. Cotton, Chemical Applications of Group theory, Wiley Eastern 2nd Edn. 1992
10. V. Ramkrishnan & M. S. Gopinadhan, Group theory in Chemistry Vishal Pub. 1996.
11. Inorganic Chemistry, Third Edition, Alan G. Sharpe
12. Theoretical Inorganic Chemistry, M. C. Day, J. Shellin
13. Chemistry, Fifth Edition, John E. McMurry, Robert C. Fay
14. An Introduction to Theoretical Chemistry, Jack Simons, Cambridge
15. Progress in inorganic Chemistry, Vols 18 and 38 ed. J. J. Lippard, Wiley
16. Mechanism of Inorganic Reactions, F. Basolo and R. G. Persons, Wiley Pub
17. Reaction Mechanism of Coordination Compounds, C. H. Langford and H. B. Gray
18. Inorganic Reaction Mechanisms, M. L. Tobe, Nelson Pub
19. Inorganic Chemistry, K. F. Purcell and J. C. Kotz.
20. Principles of Bioinorganic Chemistry, S. J. Lippard and J. M. Bers
21. Mehrotra R. C. and Singh A. Organo Metallic Chemistry, Willey Eastern Ltd., New Delhi



22. Coates G. E. Green MIH Wade, K and Aylett B. J. Organo Metallic Comounds
Chapman and Hall, Londo

E-Resources

- <https://www.visionlearning.com/en/library/Chemistry/1/Chemical-Bonding/55>
- <https://www.britannica.com/science/chemical-bonding>
- [https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Modules_and_Websites_\(Inorganic_Chemistry\)/Chemical_Compounds/Introduction_to_Chemical_Bonding](https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Modules_and_Websites_(Inorganic_Chemistry)/Chemical_Compounds/Introduction_to_Chemical_Bonding)
- [https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Map%3A_Inorganic_Chemistry_\(Miessler_Fischer_Tarr\)/04%3A_Symmetry_and_Group_Theory/4.04%3A_Examples_and_Applications_of_Symmetry](https://chem.libretexts.org/Bookshelves/Inorganic_Chemistry/Map%3A_Inorganic_Chemistry_(Miessler_Fischer_Tarr)/04%3A_Symmetry_and_Group_Theory/4.04%3A_Examples_and_Applications_of_Symmetry)
- https://sites.cns.utexas.edu/jones_ch431/section-1-symmetry
- <https://www.britannica.com/science/organometallic-compound>
- <https://www.youtube.com/watch?v=Efh5GkVbhEc>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Physical Chemistry - II

Subject Code: 256020203

M.Sc. Semester-2

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental physical chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Statistical thermodynamics Concepts of distribution of molecules, thermodynamic probability, permutations and combinations, Boltzmann's most probable distribution, partition function - translational, vibrational, rotational, electronic nuclear partition functions.	14



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2	Nuclear chemistry Nuclear properties-nuclear radius, coulombic and nuclear potential radius, nuclear spin and angular momentum, magnetic moment, nuclear binding energy, nuclear models-shell model, liquid drop model, Fermi gas model, collective model, radioactive decay, nuclear reactions, evaporation, spallation, fragmentation, fission and fusion reactions, accelerators, reaction cross section, use of radioisotopes as tracers.	14
3	Polymer chemistry Kinetics and mechanism of polymer processes, criteria of polymer solubility, thermodynamics of polymer solutions, polymer characterization, molecular weight of polymer (number average and weight average) , methods of molecular weight determination, properties of polymers and applications.	14
4	Electrochemistry Sign convention-American, European and IUPAC; Determination of dissociation constant of monobasic acids by conductometry, determination of dissociation constants of monobasic and polybasic acids by potentiometry. The electrical double layer, the rate of charge transfer, polarization and overvoltage, basic principle of polarography, origin of different types of current; equation of polarographic wave, Ilkovic equation.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Physical Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

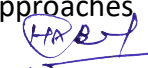
Teaching & Learning Methodology:-

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- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures.

Books Recommended:

1. Textbook of physical chemistry – W.J.Moore
2. Textbook of physical chemistry – Glasstone
3. Textbook of physical chemistry – P.Atkins
4. Advanced physical chemistry – Surdeep Raj
5. Advanced physical chemistry – J.N.Gurtu, A.Gurtu
6. Statistical thermodynamics – M.C.Gupta
7. Polymer chemistry – Gowariker
8. Polymer chemistry – Billmayer
9. Principles of polymer science – Bahadur&Sastry
10. Polymer science & technology – Fried
11. Polymer chemistry- Malcolm P. Stevens
12. Nuclear chemistry – Arniker
13. Nuclear and radio chemistry – J.W. Kannedy, G.Friedlander
14. Electrochemistry – Bockris and Reddy

E-Resources

- [https://chem.libretexts.org/Bookshelves/Physical and Theoretical Chemistry Textbook Maps/Book%3A_Thermodynamics and Chemical Equilibrium \(Ellgen\)/01%3A_Introduction - Background and a Look Ahead/1.04%3A_Statistical Thermodynamics#:~:text=Statistical%20thermodynamics%20is%20a%20theory,of%20macroscopic%20quantities%20of%20compounds.](https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Book%3A_Thermodynamics_and_Chemical_Equilibrium_(Ellgen)/01%3A_Introduction_-_Background_and_a_Look_Ahead/1.04%3A_Statistical_Thermodynamics#:~:text=Statistical%20thermodynamics%20is%20a%20theory,of%20macroscopic%20quantities%20of%20compounds.)
- <http://web.thu.edu.tw/ghliu/www/0723/CH16StatMech.pdf>
- <https://uh.edu/engines/StatisticalThermodynamics.pdf>
- <https://byjus.com/chemistry/nuclear-chemistry/>
- http://www.chemistry.wustl.edu/~dgs/chem436/Lectures/Chem-436-Lecture_notes.pdf
- <https://wou.edu/chemistry/courses/online-chemistry-textbooks/ch103-allied-health-chemistry/ch103-chapter-3-radioactivity/>
- <http://web.mit.edu/5.33/www/lec/poly.pdf>
- <https://www.clearitmedical.com/2019/04/chemistry-notes-electrochemistry.html>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Analytical Chemistry - II

Subject Code: 256020204

M.Sc. Semester-2

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental analytical chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Sample Preparation Techniques Liquid-liquid extraction/solvent extraction-partition coefficient, distribution ratio and percent extraction . Solvent extraction of metal ions-ion association complexes and metal chelates, multiple batch extraction, Craig's counter-current distribution. Accelerated and	14  PRINCIPAL SWARNIM SCIENCE COLLEGE SWARNIM STARTUP & INNOVATION UNIVERSITY BHOYAN RATHOD, KALOL, GANDHINAGAR.



	Microwave assisted extraction, protein precipitation and solid phase extraction (SPE).	
2	Chromatographic Methods Principles of chromatography, classification of chromatographic techniques based on mechanism of retention, configuration, mobile and stationary phase. Efficiency of separation- plate theory (theoretical plate concept) and rate theory (Van Deemter equation). Principles and applications of Paper chromatography, thin layer chromatography, HPTLC and Ion exchange chromatography. Counter-current chromatography for isolation of natural products.	14
3	pHmetry and Conductometry pH measurement with glass electrode, working of glass electrode, mechanism of pH measurement, calibration of glass electrode, errors in pH measurement. Electrical conductance in solutions of electrolytes, measurement of conductance, conductometric titrations- acid-base, precipitation and complex formation titrations.	14
4	Potentiometry and Ion selective electrodes Electrochemical cell, cell potentials, sign convention for electrode potentials, types of reference and indicator electrodes-metallic indicator and membrane indicator electrodes. Classification of membrane electrodes-ion-selective and molecular-selective electrodes. Principle, properties and design of ion-selective electrodes. Crystalline and non-crystalline membrane electrodes. Gas-sensing probes and enzyme substrate electrodes. Applications of potentiometric titrations.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Analytical Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:



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- Work with students at an early stage of the programmer/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs.
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programmer/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures.

Books Recommended

1. "Quantitative Chemical Analysis" by Daniel C. Harris, 5th Edition, W.H. Freeman and Company, New York.
2. "Analytical Chemistry" by Gary D. Christian, 6th Edition, John Wiley and Sons Inc. New Jersey.
3. "Principles of Instrumental Analysis" by Douglas A. Skoog, 3rd Edition, HoltSaunders International Editions.

E-Resources

- <https://www.intechopen.com/books/ideas-and-applications-toward-sample-preparation-for-food-and-beverage-analysis/overview-of-green-sample-preparation-techniques-in-food-analysis>
- [https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_\(Analytical_Chemistry\)/Analytical_Sciences_Digital_Library/Active_Learning/Contextual_Modules/Sample_Preparation/01_Introduction_to_Sample_Preparation](https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Analytical_Sciences_Digital_Library/Active_Learning/Contextual_Modules/Sample_Preparation/01_Introduction_to_Sample_Preparation)
- <https://onlinelibrary.wiley.com/doi/pdf/10.1002/0471457817.fmatter>
- <https://www.slideshare.net/rev216/spect>
- <https://www.azolifesciences.com/article/What-is-a-pH-Meter-and-How-Does-it-Work.aspx>
- <http://web.colby.edu/ch331public/ph-measurements/>
- [https://chem.libretexts.org/Bookshelves/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/General_Chemistry_Labs/Online_Chemistry_Lab_Manual/Chem_12_Experiments/05%3A_pH_Measurement_and_Its_Applications_\(Experiment\)](https://chem.libretexts.org/Bookshelves/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/General_Chemistry_Labs/Online_Chemistry_Lab_Manual/Chem_12_Experiments/05%3A_pH_Measurement_and_Its_Applications_(Experiment))
- <https://www.basinc.com/assets/library/issues/18-3/cs18-3c.pdf>
- [https://chem.libretexts.org/Bookshelves/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/General_Chemistry_Labs/Online_Chemistry_Lab_Manual/Chem_9_Experiments/07%3A_Electrical_Conductivity_of_Aqueous_Solutions_\(Experiment\)](https://chem.libretexts.org/Bookshelves/Ancillary_Materials/Laboratory_Experiments/Wet_Lab_Experiments/General_Chemistry_Labs/Online_Chemistry_Lab_Manual/Chem_9_Experiments/07%3A_Electrical_Conductivity_of_Aqueous_Solutions_(Experiment))



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Chemistry Practical

Subject Code: 256020205

M.Sc. Semester-2

Teaching & Evaluation Scheme

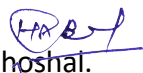
Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
-	-	12	12	8	-	200	-	-	200

M.Sc. Semester II- Practicals

Organic Chemistry

- Mixture analysis mixture to be given. (S+S+S) or (L+L+L). Type determination separation by physical and chemical methods. (both permitted in case of liquids)
- Reference books for practical:
 - A text book of practical organic chemistry – A.I Vogel
 - Practical organic chemistry – Mann and saunders
 - A handbook of quantitative and qualitative analysis – H.T Clarke
 - Comprehensive practical organic chemistry: qualitative analysis V K Ahluwalia & S. Dhingra.
 - Comprehensive practical organic chemistry: Preparations and qualitative analysis V K Ahluwalia and R. Aggarwal universities press.
 - An advance course in practical chemistry, A K Nad, B. Mahapatra and A. Ghoshal.




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Inorganic Chemistry

1. Preparation and determination of purity of double and complex salts. At least ten preparations should be done.
2. Colorimetric estimation of any five out of Cu, Mn, NO₂, Ni, P, Fe, V, Ti, Cr, Co.

Books Recommended:

1. Vogels Textbook of Quantitative Chemical Analysis, 6th Edition, 2002.
2. Advanced Practical Inorganic Chemistry, Gurdeepraj, Goel Publishing House, 2001.
3. An Advanced Course in Practical Chemistry, A.K. Nad, B. Mahapatra, A. Ghosal, New Central Book Agency, 2004

Physical Chemistry

I. Conductometry

1. Test of validity of Ostwald's dilution law and determination of dissociation constant of weak electrolyte like CH₃COOH & ClCH₂COOH
2. Verification of Debye-Huckel-Onsager's equation in case of strong electrolytes like HCl, KCl, NaCl.

II Potentiometry

1. Titration of dibasic acid like malonic, oxalic, succinic acid with NaOH and find the dissociation constant of acid.
2. Precipitation titration → Titration of halids with AgNO₃.
3. Redox titration Ferrous ammonium sulfate –KMnO₄ , K₂Cr₂O₇.

III pH metry

1. Determination of dissociation constant of weak acid like acetic and monochloroacetic acid

IV Adsorption and kinetics

1. Determination of order of reaction between K₂S₂O₈ and KI by a fractional change method.

V Distribution method

1. Distribution method.



Books Recommended::

1. Practical physical chemistry –J.B.Yadav
2. Practicals in physical chemistry – P.S.Sindhu
3. Experimental physical chemistry – R.C.Das, B.Behera
4. Experiments in physical chemistry- P.H.Parsania, F. Karia

Analytical Chemistry

1. Determination of saponification value of oil.
2. Determination of iodine value of oil. 3. Determination of acid value of oil.
3. Determination of dissolved oxygen.
4. Determination of chemical oxygen demand.
5. Determination of iron in iron tablets.

(Any 2 estimation practical)

6. Simultaneous estimation of chromium (III) and iron (III) by EDTA titration.
7. Simultaneous estimation of calcium (II) and zinc (II) by EDTA titration.
8. Simultaneous estimation of lead (II) and magnesium (II) by EDTA titration.
9. Separation of amino acids by TLC.
10. Separation of drugs by TLC.
11. Separation of dyes by TLC.

Books Recommended:

1. Analytical Chemistry Practice, John H. Kennedy, Saunders College Publishing, Second Edition 1990.
2. Vogel's Textbook of Quantitative Chemical Analysis, 6th Edition, 2002.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

DIFFERENTIAL EQUATION AND COORDINATE GEOMETRY

Subject Code: 253030201

B.Sc. Semester -2nd

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Students are evaluated on the basis of Mid term examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- To provide students the Concept of vector valued function, determinant and its properties of higher order, matrix, eigen value and eigen vectors of matrices.
- The aim is to present the important ideas in matrix to student whose principal interest lie outside the field of mathematics.
- The emphasis throughout is on imparting an understanding of the significance of the mathematical techniques.
- It is a subject which provides a vital arena where students can see the interaction of mathematics and machine computation.

Prerequisites

A Candidate for admission to the bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.




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Course outline: This Course is Designed to enable student to acquire the understanding and practice the application how to solve differential equation in both type of equation ordinary as well as partial equations .Also learn the concept of Co-ordinates geometry.

Sr. No.	Course Contents	Teaching hours
1	Unit 1 Methods of solving Differential Equations of first order and first Degree, Variable separable, Homogeneous and non-homogeneous differential equations, Exact differential equations(without proof), Integrating factors, Linear differential equation of first order and first degree, Bernoulli's differential equation & Differential Equations reducible to them. Method of solving differentent equations of first order and higher degree: Clairaut's differential equation(both general and singular), Lagrange's differential equation.	10
2	Unit: 2 Linear differential equations of higher order and degree one: Differential operators (D and θ): Linear differential equations of higher order and degree one with constant coefficients. Complementary and Particular Integrals (Solutions). Inverse operator. Operational methods for its solutions. Euler form of homogeneous linear differential equations with variable coefficients.	10
3	Unit: 3 Sphere and Introduction to conicoid: Definition of a sphere in R^3 , Cartesian equaton of a sphere, General equation of a sphere, Equation of a sphere with diametrically opposite end points, Intersection of a sphere with Line/plane/sphere(No theory but only problems), Equation of a tangent plane to a sphere. The tangency of a plane and normality of a line to a sphere, Orthogonal spheres. Conicoids: Introduction to conicoid, types of central and non central conicoids in R^3 , figures of conicoids.	12



4	Unit: 4 Polar coordinate system and Cone and cylinder in R^3 : Polar coordinates in R^2 & R^3 and its Relationships with Cartesian coordinates, polar equation of line-/circle /conic and properties of conics. Introduction to different types of cone and cylinder, Equations of enveloping cone/cylinder. Right circular cone/cylinder (without proof). Problems on cone and cylinder.	10

Learning Outcomes

After Successfully Completion of the Course the student will be

- In this maths student understand concept of Differential equation and related theorems.
- Concept of co-ordinate geometry they learn about sphere and conicoid.
- Also learn polar co-ordinate system in R^2 & R^3 .
- Coordinate Geometry describes the link between geometry and algebra through graphs involving curves and lines. It provides geometric aspects in Algebra and enables them to solve geometric problems.
- Student able to solve differential equation of first order and first degree.
- Understand the concept of Linear differential equation for higher order and solve them by using different methods.
- be able to find exact solutions of simple first and second-order partial differential equations in two variables.

Teaching & Learning Methodology

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.




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- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Calculus - JAMES STEWART , THOMSON BROOKS/COLE
2. Calculus - T.M.Apostol
3. Calculus - Thomas and Finney , Pearson Education , Asian edition
4. Calculus - Dr. Elliot Mendel son, Mc GrawHill Book co.
5. A first course in calculus fifth edition By Serge Lang , Springer India
6. Ordinary and Partial Differential Equations Theory and Applications, By: Nita H. Shah, PHI
7. Introductory course in Differential equations-Murray
8. Differential equations and their applications, Prentice Hall of India- Zafar Ahsan (1999)
9. Elementary Differential equations –Kella
10. Co-ordinate Geometry By : R.J.T. Bell
11. Solid Geometry(three dimension) – H. K. Das ,S. C. Saxena and Raisinghania , S. Chand

E-Resources

- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics. <https://swayam.gov.in/> and <https://nptel.ac.in/>
- <https://users.math.msu.edu/users/gnagy/teaching/ode.pdf>
- https://www.cs.bgu.ac.il/~leonid/ode_files/Ionascu_LectNotes.pdf
- <https://www.math.wisc.edu/~robbin/461dir/coordinateGeometry.pdf>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Basic Chemistry-2

CODE : 253020201

B.Sc. 2nd Semester

Teaching & Evaluation Scheme: -

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives: -

Prerequisites: -Students should have basic knowledge of chemistry up to 10+2 level.

Course outline: -

Sr. No.	Course Contents	Number of Hours
1	UNIT I : Inorganic Chemistry :- (14 Marks) (a) Chemical Bonding:- Covalent bond-Sidgwick Powel Theory, VSEPR Theory, Examples of NH ₃ , H ₂ O, ClF ₃ , SF ₄ , SF ₆ , I ₃ -, IF ₇ ; Hybridization of atomic orbitals; Rules for Hybridization; Types of Hybridization and shape of some molecules (sp, sp ² , sp ³ , sp ³ d, sp ³ d ²). (b) Complex Compound:- Werner's Theory; Labile and inert complexes; Stability of complex compounds; Factors influencing the stability of complexes; Spectrochemical Series; V. B. theory for complexes – Examples of ML ₄ & ML ₆ type (Fe, Co, Ni, Mn).	15




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2	UNIT II : Inorganic Chemistry:- (14 Marks) (a) Introduction of Wave Mechanics:- Wave equation and wave functions, its interpretation, significance of Ψ and Ψ^2 , Limitations of acceptable wave functions, Normalized and orthogonal (orthonormal) wave functions, Eigen values and Eigen functions (b) Operator Concept in Quantum Chemistry:- Operators, type of operators, Hamiltonian Operator for H atom, H_2 molecule, H_2^+ ion, He, Li, Be and B atom.	10
3	UNIT III : Organic Chemistry:- (14 Marks) (a) Fundamentals of Stereochemistry:- Introduction, Stereochemical aspects of organic molecules, Chirality, Optical isomerism, Enantiomers and Diastereomers, R-S nomenclature, E-Z nomenclature. (b) Conformations:- Conformational analysis of Ethane, n-Butane & Cyclohexane.	12
4	UNIT IV: Physical Chemistry:- (14 Marks) (a) Ionic equilibrium:- Definition of basic terms: Electrical conductance, Specific conductance Equivalent conductance, Molar conductance, Cell constant & degree of Dissociation; Derivation of Ostwald's dilution law , its applications and Limitations; pH Scale, Hydrolysis, Relation between K_a , K_b , K_h , & K_w for Strong acid Strong base Strong acid Weak base Weak acid Strong base Buffer Solution, (Henderson – Hasselbalch equation), Indicator theory, Useful pH range of indicator for acid base titration. (b) Nuclear Chemistry:- Radioactivity, Rutherford's disintegration theory, Soddy's group Displacement law, Packing fraction, Factors affecting stability of Nucleus (Mass defect, Binding energy, N / P ratio) .	10

Learning Outcomes:-

- Basic knowledge of valence bond theory and its applications.
- Knowledge of f-block elements and their periodic properties.
- Understanding of the concept of lanthanide contraction.
- Understanding of the concepts of general organic chemistry.
- Knowledge of reactions and mechanisms in organic chemistry.
- Basic concepts and theories of thermodynamic chemistry.
- Introduction of analytical chemistry and related terms.



Teaching & Learning Methodology:-

Books Recommended:-


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Text Books	
1	'Source Book on Atomic Energy' by Glastone, 1969.
2	'Modern Inorganic Chemistry' by G.F. Liporni, ELBS, 4th edn, Colling Educational, 1983.
3	'Organic reaction and mechanism, P.S. Kalsi, New Age international Publishers.
4	Text book of organic Chemistry, P.S. Kalsi, New Age international Publishers.
5	Text book of Organic Chemistry, ArunBahal, S.Chand.
6	Physical Chemistry (Question and Answer) by R.N. Madan, G.D. Tuli, S.Chand.
7	Fundamentals of Analytical Chemistry by Skoos& West.
8	Analytical Chemistry, Garry D. Christain.
Reference Books	
1	'Inorganic Chemistry' D.F. Shriver, P.W. Atkins and C.H. Longford, 3rd edn, ELPS Oxford University Press, 1999.
2	'Nuclear and Radio Chemistry' by G. Friedlander, J.W. Kennedy, E.S. Macias and J.M. Miller, 3rd edn, John Wiley, 1981.
3	Essentials of Nuclear Chemistry' H.J. Arnicall, 4th edn, New Age International, 1995
4	'Concise Inorganic Chemistry' J.D. Lee, 5th edn.
5	'Inorganic Chemistry', D.F. Shriver, P.W. Atkins, 3rd edn, Oxford, 1999.
6	Concise Inorganic Chemistry' J.D. Lee, 4th edn, Chapman and Hall ELBS, 1991.
7	Inorganic Chemistry' by A.G. Sharp, 3rd edn, ELBS, Longman, 1990.
8	Organic Chemistry Vol. I & II, S.M. Mukherji, S.P. Singh, R.P. Kapoor.
9	Reaction mechanism in Organic Chemistry, S.M. Mukherji, S.P. Singh. 3rd edn, Macmillan.
10	Reaction Mechanism and Reagents in Organic Chemistry, Gurdeep R. Chatwal 4th edn, Himalaya Publication House.
11	Advance Physical Chemistry by Gurdeepraj.
12	Organic Chemistry, R. Morrison and R. Boyd, 6th edn, Pearson Education 2003.
13	Organic Chemistry, T.W. Graham Solomons, 4th edn, John Wiley, 1998.
14	Principles of Physical Chemistry by Puri, Sharma, Pathania.
15	Chemical Thermodynamics by R.P. Rastogi and R.R. Misra.
16	Nuclear Chemistry by C.V. Shekhar, Dominant-Publisher, New Delhi.
17	Essentials of physical Chemistry by B.S. Bahal, ArunBahal, G.D. Tuli.
18	Physical Chemistry by P.W. Atkins, 5th edn, Oxford 1994 7th edn-2002.
19	Physical Chemistry by R.A. Albert and R.J. Silby, John Wiley 1995.
20	Physical Chemistry by G.H. Barrow, 5th edn, Mac Graw Hill, 1988, 6th edn, 1996.
21	Physical Chemistry by W.J. Moore, 4th edn, Orient Longmans 1969.
22	Analytical Chemistry, Day & Underwood.
23	Analytical Chemistry by Lerry&Hergins.
24	Qualitative Analysis by A.I. Vogel, 5th edn.



Practical List:- Chemistry Practicals 253020202

Sr. No.	Practical
1	(a) Organic Spotting :- (06 Solids and 04 Liquids). List organic compounds having different mono functional groups: Solids : Acids : (i) Benzoic acid (ii) Oxalic acid (iii) Succinic acid Phenols : (i) β-Naphthol (ii) α-Naphthol Neutral : (i) Urea (ii) Thiourea (iii) Benzamide (iv) Napthalene Liquids : (i) Aniline (ii) Nitrobenzene (iii) Benzaldehyde (iv) Ethanol (v) Ethylacetate (vi) Chloroform (vii) Chlorobenzene (viii) Acetone
2	(b) Volumetric Analysis:- Redox Titrations:- (1) KMnO_4 $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ (2) $\text{K}_2\text{Cr}_2\text{O}_7$ $\text{FeSO}_4 (\text{NH}_4)_2 \text{SO}_4 \cdot 6\text{H}_2\text{O}$ Complexometric Titration by EDTA:- (1) Estimation of Ca^{+2} EDTA (2) Estimation of Mg^{+2} EDTA






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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

Basic Physics-2

Subject Code: 253050201

B.Sc. Semester 2

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- Develop a solid grasp of core concepts and applications of electrostatics, plasma physics and nuclear physics. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites

Basic mathematics and core level electrodynamics




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Course outline

Sr. No.	Course Contents	Teaching Hours
1	Electrostatic Differential form of Gauss law, Poisson and Laplace Equation, Field between Two concentric spheres which have equal and opposite charges. A useful Theorem in electrostatics, electrostatic potential, Determination of potential Due to uniformly charged spherical shell. Determination of potential and field by a ring of charges at a point on the axis of the ring. Determination of field of a semicircular uniform distribution of line charge of linear charge density. Determination of a potential and field on the axis and rim of a uniformly charged disc. Electrostatic energy of a continuous distribution of charges, field of a dipole In plane polar coordinate, spherical polar coordinate, Cartesian coordinate System, electric dipole in a non uniform electric field, Mutual potential Energy of two dipoles.	8
2	Electric & Electronic Circuits DC Circuits RL circuits (Growth and decay of current), RC circuit (Charging and discharging of capacitor) L-C-R circuit in series with DC source. AC Bridges Condition for bridge balance, Maxwell bridge, Hay bridge, Schering bridge, Wein bridge Diode circuits Load line analysis of a diode circuit, use of diode in rectifier, Half wave, full wave and bridge rectifier with their performance, Capacitor input filter.	8
3	Plasma Physics: Introduction, Composition & characteristics of a plasma, Collisions, Surface phenomena, Transport (or transfer) phenomena, Diffusion & Mobility : Ambipolar Diffusion, Viscosity : Conductivity, Recombination, Ohm's law, Gas Discharge, Comparison of various natural & man-made plasma, Plasma diagnostics, plasma waves & Instabilities confinement of plasma, space plasma.	8
4	Nuclear Physics: Radioactivity:	8



	The law of radioactive decay (review), Radioactive growth and decay, ideal equilibrium, Transient equilibrium and secular equilibrium, Radio active series, Radioactive isotopes of lighter elements, Artificial radioactivity, Age of earth, Carbon dating (Archaeological time scale)	

Learning Outcomes

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of
- theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology:-

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.



Books Recommended

- Electromagnetics by B. B. Laud, Wiley Eastern Limited
- Modern Electronic Instrumentation and Measurement Techniques
- Helfrick and Cooper, PHI Publication.
- Mechanics and Electrodynamics, Brijlal, N. Subrahmanyam, Jiven Seshan, S. Chand
- Electronics Devices and Circuits, Allen Mottershead
- Basic Electronics and Linear Circuits, Bhargva Kulshreshtha and Gupta TMH
- Electronics Devices and Circuit Theory
- Element of Plasma physics by S. N. Goswami, New Central Book Agency (P)

E-Resources

- Six Ideas that shaped physics by Thomas A Moore, McGraw Hill education
- <http://www.howstuffworks.com/> -- Tech stuff
- How things works by Louis A Bloomfield, Wiley Publications
- Physics of Everyday Phenomena by W. Thomas Griffith, Juliet Brosing, McGraw Hill Education
- Latest journals like BBC Knowledge, How things work-everyday technology explained by National Geographics.




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SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

Origin & Evolution

Subject Code: 253010201

B.Sc. Semester -2

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives:-

- To provide basic knowledge of for origin & evolution of life including of Plant and animal kingdom and the microbial world.
- Evolutionary processes over billions of years gave rise to the biodiversity of life on earth.
- With this overview of the origin and evolution of life, you can improve your understanding of topics like natural selection and random mutation. Concise but filled with helpful information, the lessons are designed to help you with further studies.
- Students can know structure and function of plant parts. Also know pollination, fertilization and germination.
- Describe key changes that occurred as more complex animals evolved from simple animals
- Students will understand how these cellular components are used to generate and utilize energy in cells.
- To identify evolutionary relatedness between the different phyla of animals.




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- Our objective is to provide training in scientific and transferable skills through modular lecture courses, research projects, written work, seminars and supervisions.
- To ensure that you can achieve an up to date level of understanding of plant science.

Prerequisites:-

- Students have basic knowledge of for origin & evolution of life including of Plant and animal kingdom and the microbial world.
- Students must have knowledge of structure and function of plant parts. Also know pollination, fertilization and germination.

Course outline:-




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Unit. No.	Course Contents	Teaching Hours
1.	Origin and evolution of life: - History of earth, Theories of origin of life, millers experiments, Cell Theory, Cell differentiation, - Levels of organization; - Nature of earliest organisms, - Evolution of Prokaryotes, Eukaryotes, Mitochondria and Chloroplast; Quest for extra-terrestrial life, - Whittaker's five-kingdom classification	10
2.	Plant Kingdom: - General Characters of plant, - Body organization: Root, Stem and leaves; Tissues: Dermal, vascular and Ground; - Growth: Primary, Secondary, Morphogenesis and Differentiation, - Common types of plants, adaptation to land and response to environment outline of kingdom <i>Plantae</i>	10
3.	Animal Kingdom: - General characters of animal, - Animal evolution, - Body Organization: Systems, organs, Tissues, Coordination, Energy requirements, - Primitive and advanced marine animals, - Adaptation to land, - Exchange with environment, Outline of Kingdom <i>Animalia</i>	10
4.	The Microbial world: - Structure, General character, Reproduction, Classification and Economic importance of Fungi, Algae and Protozoa; - Structure, Chemistry and Reproduction of Viruses, General characters of Prion, Viroid, and Virusoid; Extreme environment, Biodiversity therein	10
		40



Learning Outcomes:

- At the end of the course the student would have knowledge about plant & animal kingdom, Microbial world.
- At the end of the course you should have increased: Your capacity to think critically; your ability to design and execute an experiment; your confidence and ability in communicating ideas. This will serve as a lasting and practical basis for a career.

Teaching & learning Methodology:

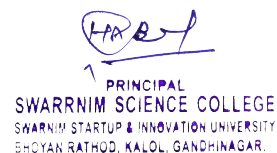
We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Basic Text & Reference Books:

- HK Das. (2004) *Textbook of biotechnology*
- U. Satyanarayan. *Biotechnology*
- U. Satyanarayan. *Biochemistry*
- B.D Singh, Kalyani Publishers. *Biotechnology Expanding Horizons*
- P.K.Gupta, Rastogi Publication. *Elements of Biotechnology*






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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

Basic Bacteriology

Subject Code: 253040201

B.Sc. Semester-2

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- To provide basic knowledge of Applications of Microbiology
- The purpose of the course is to provide basic knowledge of natural history of infectious organisms, contribution of various scientist in the field of microbiology, developments of first microscope and other technique used for isolation, study, characterization of microorganism. Instruments required to study the morphology of the microorganisms.
- To provide basic knowledge of Taxonomy, Morphology, Internal and External structure of Bacteria. Different mode of bacterial nutrition given to the organisms. Methods for controlling the microbial growth.

Prerequisites

Student Must have passed 12th standard with A/B group.

Course outline




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Unit. No.	Course Contents	Teaching hours
1	Typical Prokaryotes: Taxonomy and cellular organization Taxonomy - Principles of binomial system of nomenclature - Introduction to different systems of bacterial classification Cellular organization - Size, shape and arrangement of bacteria - Bacterial endospore Spore structure, Sporulation and Spore germination	10
2	Structure of typical bacterial cell Surface appendages - flagella - pili and fimbriae - Prosthecae and stalks Surface layers - Capsule and slime layer - Cell wall - Cytoplasmic membrane and mesosomes Cytoplasm and cell organelles - Cytoplasm - Ribosome - Nuclear material and Plasmid - Cellular reserve food material	10
3	Introduction to Bacterial nutrition - Nutritional diversities in bacteria - Nutritional requirements of bacteria - Culture media I) Principles of media formulation II) Media ingredients III) Types of media - Cultivation methods of bacteria, Growth characteristics in broth and solid media	10



4	Principles of Microbial control • General principles: Control by killing, inhibition and removal • Physical agents of microbial control: I) Heat II) Radiation III) Osmotic pressure IV) Filtration • Chemical agents of microbial control: • Ideal antimicrobial agent, Major groups of antimicrobial agents: I) Phenols II) Halogens III) Surfactants IV) Alcohols V) Heavy metals VI) Gaseous agents	10
TOTAL		40

Learning Outcomes

- The students will be able to understand and the basic principles and, the tools and techniques of Microbiology.
- The course is designed to give students an understanding of the applications of Microbiology in various fields.
- At the end of the course the student would have basic knowledge of microbiology, different microbial techniques, learn about dyes and staining, structure of bacteria, method to isolate the microbes.
- The students will be able to understand and Describe specialised parts of cells and their functions. } Identify structures in prokaryotic and eukaryotic cells in light micrographs. } Describe the structure of prokaryotic and eukaryotic and the differences between them.



Teaching & Learning Methodology

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Gerard Tortora .Berdell Funke .Christine Case.Derek Weber.Warner Bair III Microbiology An Introduction 13th Edition(2019)
- Pelczar Jr. M J. Chan E C S. Krieg N R. (1986)
- Elementary Microbiology- H.A. Modi (2019)
- Microbiology: An Application Based Approach, 5th edn. McGraw-Hill Book Company, NY
- Ingraham J L and Ingraham C A Introduction to Microbiology: Thomson Brooks/Cole(2001)
- Atlas R M.Principles of Microbiology 2 nd Edition(2015)






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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PHYSICS

B.Sc. Semester 2

Practical List

Sr. No.	Practical Name
1	Stefan Constant To verify the Stefan Boltzman's fourth power law by using dc power source.
2	Radioactive decay Simulation of Nuclear Radioactive decay using Calculator
3	'g' by Bar pendulum To obtain the value of 'g' by bar pendulum.
4	Deflection Magnetometer To determine the magnetic moment (M) of given bar magnate using deflection magnetometer in Gauss A and B position.
5	LDR Characteristics Obtain IV characteristics of given LDR and calculate its resistance (for at least three different light levels).
6	Full-wave Rectifier Obtain load characteristic and %regulation for Full-wave rectifier without filter circuit and by using capacitor filter circuit. Determine ripple factor for Full wave rectifier without filter only
7	Bridge Rectifier Obtain load characteristic and regulation for Bridge rectifier without using filter circuit and by using capacitor filter circuit. Obtain ripple factor without filter circuit.
8	I-V Diode characteristics of a PN-junction diode and its load line analysis



9	Universal Logic Gates NAND, NOR (Using discrete components).
10	Cauchy's constant To determine Cauchy's constant A and B using given formula
11	Projection Method To find the value of low resistance by the method of projection of potential
12	Owen's Bridge To find the value of an inductance of an unknown inductor by using Owen's bridge circuit
13	Parallel Resonance To determine the frequency of a.c. emf by series resonance circuit by varying capacitor.
14	X-ray diffraction



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

BIOTECHNOLOGY -501

CODE : 53010501

B.Sc. 5TH SEMESTER

Teaching & Evaluation Scheme :-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	20	70	30	150

Objectives:- To provide basic knowledge Molecular Techniques

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1.	Electrophoresis- Principle, methodology and factors affecting protein and nucleic acid electrophoresis. PCR- Introduction, Principle, basic methodology, factors affecting and application, Site-directed mutagenesis.	8
2.	Nucleic acid hybridization, colony and plaque hybridization, Southern, Northern and Western blotting, Dot-Blot, differential screening. In situ hybridization, FISH (radioactive and non radioactive detection of hybridization), Autoradiography.	8




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3.	Molecular markers- RFLP, RAPD, AFLP, SNP, Satellite DNA. DNA Fingerprinting- process and its application. Construction of c-DNA library & genomic DNA library.	8
4.	DNA sequencing- chain termination, chemical cleavage and automated. DNA Foot printing- types and application. In vitro transcription and in vitro translation, various systems and application.	8

Learning Outcomes:

At the end of the course the student would have basic knowledge of molecular techniques.

Teaching & learning Methodology:

- Use of audiovisual aids
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Basic Text & Reference Books:

- From genes to clones –Ernst winnaker
- Genetic engineering – Old & Primrose
- Biotechnology and Genomics – PK Gupta
- A text of biotechnology – RC Dubey



SWARNIM STARTUP & INNOVATION UNIVERSITY

SCHOOL OF SCIENCE

DEPARTMENT OF BIOTECHNOLOGY

BIOTECHNOLOGY -502

CODE : 53010502

B.Sc. 3rd Year

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	20	70	30	150

Objectives: - To provide basic knowledge Environmental of Biotechnology

Prerequisites:-

Course outline: - Environmental Biotechnology

Sr. No.	Course Contents	Number of Hours
1.	Types of pollutions (Air, water& land). Water pollution-common pollutants, treatment of industrial and domestic waste water (primary, secondary and tertiary treatment) BOD, COD, TOC, Colour, Odour, alkalinity & acidity	10
2.	Bioleaching of metals (copper) General properties of microorganisms involved in it. Types of bioleaching-Heap, Dump & in situ. Mechanism of leaching direct, Indirect and galvanic. Significance of bioleaching	8




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3.	Biomagnification, Biodegradation of xenobiotics(DDT, nitro aromatic compounds), introduction and application bioremediation & phytoremediation.	8
4.	Biosensor: types, principle, applications and limitations. Bioplastic- Introduction, technology and applications	8

Learning Outcomes:

At the end of the course the student would have basic knowledge of microbiology techniques and bacteria.

Teaching & learning Methodology:

- Use of audiovisual aids
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Basic Text & Reference Books:

- Environmental Pollution Control Engineering – CS Rao
- Industrial Microbiology –Whitaker
- Industrial Microbiology –AH Patel
- A text book of biotechnology – RC Dubey




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SCHOOL OF SCIENCE

DEPARTMENT OF BIOTECHNOLOGY

BIOTECHNOLOGY -503

CODE : 53010503

B.Sc. 3rd Year

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	20	70	30	150

Objectives:- To provide basic knowledge Bio-insrumentation

Prerequisites:-

Course outline:- Bio-insrumentation

Sr. No.	Course Contents	Number of Hours
1.	COLORIMETERY AND SPECTROPHOTOMETRY Principle, Instrumentation Method and Application of UV-Visible Spectroscopy Atomic Absorbtion Spectroscopy Flame Photometry Nephelometry Infra Red Spectroscopy Mass Spectroscopy for Protein Characterization & Identification	10
2.	ELECTROPHORESIS AND CENTRIFUGATION Electrophoresis Principle, Support Media, Methods and Applications of electrophoresis Separation of protein and nucleic acids (PAGE, SDS-	12



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	PAGE, Agarose and IEF) Centrifugation : Basic Principles of Sedimentation Methods and Applications of Density Gradient Centrifugation (Rate Zonal and Isopycnic), Ultracentrifugation (Introduction and Applications)	
3.	CHROMATOGRAPHY Introduction, Definition and Types of Chromatography General Principles Underlying Chromatographic techniques. Working and Applications of :Thin Layer Chromatography, Adsorption chromatography, Ion Exchange Chromatography, Molecular Sieve Chromatography, Gas Liquid Chromatography, HPLC, Affinity Chromatography	10
4.	Bioinformatics: Definition. Branches of Bioinformatics. Aim of Bioinformatics. Scope of Bioinformatics. Databases: Types of Databases, Database retrieval system. Biosensors: Their Principle, Method and Applications. Radioactivity. Nature of Radioactivity, Types of radioactive decay. Safety aspects of Radioactivity. Applications of Radioactivity in Biological Sciences	12

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Bio-instrumentation

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Basic Text & Reference Books:

- Biotechnology and Genetic Engineering - P.K. Gupta
- Biophysical chemistry - principles and techniques - Upadhyay, Upadhyay and Nath
- Instrumental methods of chemical analysis - Chatwal and Anand
- Principles and techniques of Practical biochemistry - Wilson and Walker



- Biochemistry - Zubay, G. L.
- Bioinformatics: Principles & Applications - Ghosh & Mallick




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SCHOOL OF SCIENCE

DEPARTMENT OF BIOTECHNOLOGY

BIOTECHNOLOGY -504

CODE : 53010504

B.Sc. 3rd Year

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	20	70	30	150

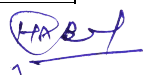
Objectives:- To provide basic knowledge of Metabolism.

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1.	Energy metabolism: Introduction to metabolism, Methods of studying intermediary metabolism ATP (Structure, generation, & role, Modes of ATP generation in bacteria Oxidative phosphorylation - ETC - components and organization. Mechanism of Oxidative phosphorylation, ATP synthase Fermentation and substrate level phosphorylation Bacterial photophosphorylation	12
2.	Carbohydrate metabolism Degradation: EMP, PP & ED pathway of glucose catabolism.	12




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	Reaction and energies of TCA cycle and its importance. Amphibolic nature of TCA, Anapleuretic reaction and glyoxylate cycle. - Regulation of glycolysis and TCA cycle. Biosynthesis: Gluconeogenesis. CO₂ fixation - Calvin Benson cycle.	
3.	Lipid metabolism : Fatty acid degradation: Beta-oxidation of saturated fatty acid - palmitic acid and its energetics Oxidation of mono unsaturated fatty acids - olic acid. Oxidation of Polyunsaturated fatty acid - linoleic acid - α and ω oxidation of fatty acid Biosynthesis of fatty acid: Biosynthesis of saturated fatty acids Biosynthesis of mono unsaturated fatty acids - aerobic and anaerobic pathway Biosynthesis of poly unsaturated fatty acids - archidonic acid.	10
4.	Biosynthesis of Amino acids: Aspartate family and Aromatic family. Biosynthesis of Peptidoglycan: Catabolism of Amino acids: Transamination, oxidative deamination, - Urea cycle , Stickland reaction.	10

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Metabolism.

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Basic Text & Reference Books:

- Principles of Biochemistry - Lehninger ,Nelson and Cox ,4th edition
- Biochemistry - Zubay, G. L.
- Biochemistry - Stryer, L.
- General Microbiology - Stanier, R. Y.
- Principles of Microbiology - Ronald M. Atlas




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- Biochemistry - Voett and Voett
- Microbiology - Prescott, L. M.
- Microbiology Vol. I & II - Powar & Dagainawala
- Biochemistry - S. Satyanarayana




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Chemistry-501
CODE : 53020501
B.Sc. 5th Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	50	50	-	150

Objectives:- To provide basic knowledge Chemistry

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	(A) Carbohydrates Disaccharides, structure of (+) maltose, (+) cellobiose, (+) lactose and (+) sucrose. (B) Purine and Pyrimidines (i) Purines – Synthesis of Purines, Adenine and Guanine. (ii) Pyrimidines – Synthesis of Pyrimidine, Uracil, Thymine and Cytosine.	14
2	(A) Nucleophilic Substitution at a Saturated Carbon Atom Characteristics, Scope of reaction, Stereochemistry of SN1 and SN2 reactions, Relative reactivity in substitution, Solvent effect, variation at carbon site, Relative leaving group activity, SNi (substitution nucleophilic internal) Mechanism and Neighboring group participation. Elimination Reactions, E1, E2 and E1cB mechanism, Orientation E1 and E2 reactions, Elimination Vs	14




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	Substitution. (B) Nucleophilic Aromatic Substitution Nucleophilic aromatic substitution, Bimolecular displacement and its mechanism, Reactivity, Orientation, Electron withdrawal by resonance, Evidence for the two steps-mechanism, Elimination-addition mechanism-Benzyne.	
3	(A) Inorganic reagents for Organic synthesis Use of specific reagents and their synthetic applications with mechanism. (i) Aluminium Isopropoxide (ii) Lithium Aluminium Hydride (iii) Adams's catalyst (PtO₂) (iv) Selenium Dioxide (v) Osmium Tetroxide (vi) Lead Tetraacetate (B) Molecular rearrangements and Name Reactions Rearrangements occurring through Carbocations, carbenes and nitrenes Principle, Mechanism and Synthetic applications of the reactions: (i) Wolf rearrangement (ii) Fries migration (iii) Hoffmann reaction (iv) Oppenauer oxidation reaction (v) Diels-Alder reaction (vi) Birch Reduction	14
4	(A) Stereo Chemistry (I) Optical activity in the absence of chiral carbon (Biphenyls, Allenes and Spirans) (B) Stereoselectivity and Stereospecificity Stereoselective and stereospecific reactions. Mechanism "Addition of halogens to alkenes". Stereochemistry of E2 reaction (syn and anti elimination).	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

1. Organic Chemistry: I. L. Finar, Vol-II, 5th Edition, Pearson Education Ltd.
2. (2) Organic Chemistry: Morrison & Boyd, 6th Edition, Prentice Hall of India Pvt. Ltd.
3. (3) Stereochemistry of carbon compounds: E. L. Eliel, Wiley Eastern Ltd.
4. (4) Stereochemistry and mechanism through solved problems: P. S. Kalsi, New Age International.
5. (5) Stereochemistry of Organic Compounds: Principles and Applications: D. Nasipuri; New Academic Science; 4th Revised Edition.
6. (6) Organic Chemistry: Hendrickson, Cram, Hammond, Mc Graw-Hill.
7. (7) Organic Chemistry: 6th Edition, John McMurry, Brooks Cole, International Edition.
8. (8) Organic Chemistry: T.W. Graham Solomons and Craig B. Fryhle Wiley, 8th Edition.



9. (9) Organic Chemistry: Francis A. Carey, Mc Graw-Hill, 7th Edition.
10. (10) Organic Chemistry: Leroy G. Wade, Prentice Hall, 6th Edition.
11. (11) Organic Chemistry: Jonathan Clayden, Nick Greeves, Stuart Warren and Peter Wothers. Oxford University Press, USA.




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Chemistry-502
CODE : 53020502
B.Sc. 5th Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	50	50	-	150

Objectives:- To provide basic knowledge Chemistry

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Molecular symmetry Introduction, symmetry operations and symmetry elements: C_n , σ , S_n , i and E . Point groups for the molecules (excluding S_{2n} and I_h). Multiplication tables of C_{2v} , C_{2h} and C_{3v} point groups.	14
2	(A) Chemical bonding (I) VB and MO treatment of H_2 and H_2^+ , comparison of VB and MO MO treatment of $[FeF_6]^{-4}$, $[Fe(CN)_6]^{-4}$, $[V(CN)_6]^{-3}$, $[IrF_6]^{-4}$, $[NiF_4]^{-2}$, $[PtCl_4]^{-2}$ and $[Ni(CN)_4]^{-2}$. (B) Boron hydrides Preparation, properties and structure of diborane. Types of bonds found in higher boranes. Structure of B_4H_{10} , B_5H_9 , B_5H_{11} , B_6H_{10} and $B_{10}H_{14}$.	14
3	(A) Co-ordination chemistry Reaction, kinetics and mechanism. Trans effect and trans influence, Applications of trans effect in synthesis and analysis. Polarisation theory, π - bonding theory, MO theory. Lability, inertness, stability and instability.	14



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	(B) Kinetics and reaction rates of substitution Ligand field effect and reaction rates, mechanism of substitution reaction. Nucleophilic substitution reaction (S_N1 and S_N2) in octahedral complexes. Substitution in square planar Pt (II) complexes. Substitution in octahedral Co (III) complexes. Acid hydrolysis, base hydrolysis. Cis effect. Electron transfer reaction. Mechanism of redox reaction (inner-sphere and outer-sphere).	
4	(A) Inorganic polymers Classification of inorganic polymers. Polymers containing boron and silicon: methods of preparation, physical and chemical properties, structures and their uses. (B) Mossbauer Spectroscopy Principle and Instrumentation. Experimental technique Application for iron complexes	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

1. Concise Inorganic Chemistry: J.D. Lee; Wiley India, 5th Edition (1996).
2. 'Shriver and Atkins' Inorganic Chemistry: Atkins, Overton, Rourke, Weller, Armstrong;
3. Oxford University Press, 5th Edition (2011).
4. Advanced Inorganic Chemistry: F.A. Cotton and Wilkinson G.; John Wiley, 5th Edition (1988).
5. Introductory Quantum Chemistry: A.K. Chandra; Tata- McGraw Hill, 4th Edition (1994).
6. Quantum chemistry: R.K. Prasad; New Age International, 4th Edition (2010).
7. Electron and chemical bonding: H. B. Grey, W.A. Benjamin. INC, New York.
8. Inorganic chemistry: James E. Huheey, 4th Edition, Wesley Publishing Company.
9. Mechanism of Inorganic reaction: Basalo and Pearson, 2nd Edition, Wiley Eastern Pvt Ltd.
10. Introduction to Advanced Inorganic chemistry, Durrant and Durrant, John Wiley.
11. Advanced Inorganic chemistry: (Vol. 1) Satya Prakash, Tuli, Basu and Madan; S. Chand
12. Advanced Inorganic chemistry: Gurdeep Raj; Goel Publishing House, 23rd Edition (1998).



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Chemistry-503
CODE : 53020503
B.Sc. 5th Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	50	50	-	150

Objectives:- To provide basic knowledge Chemistry

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Thermodynamics Zeroth law of Thermodynamics, Clausius - Clapeyron equation, Trouton's Rule, Craft's equation, van't Hoff's isotherm and isochore equations.	14
2	Electrochemistry Electrochemical cell and Electrolytic cell, Reversible and irreversible electrodes and cell, Poggendorff's compensation method and Weston cell, Reference electrodes (i) Saturated Calomel Electrode (ii) Standard Hydrogen Electrode (iii) Quinhydrone Electrode, Nernst's single electrode potential equation, Applications of emf measurements to calculate ΔG , ΔG° , ΔH , ΔS , K_{eq} , K_{sp} , K_w and K_h .	14
3	(A) Chemical Kinetics Prediction of reaction rate, Heterogeneous reactions, Retarded reaction. (B) Polymer Chemistry Polymerization and types of Polymerization, Co-polymers, Bio-	14



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	polymers, Polymer additives, Thermodynamics of polymer solution, Molecular weight determination of polymers: Number average molecular weight, Weight average molecular weight, Viscosity and Osmotic pressure method.	
4	(A) Nuclear Chemistry Detection of isotopes, Velocity focusing mass spectrograph, Bainbridge and Neiers mass spectroscopy, Double focusing mass spectroscopy, Applications of isotopes and trace technique examples (B) Molecular spectra Pure rotational spectra, Equation for frequency of pure rotational spectral line, Vibrational-Rotational spectra, Equation for frequency of vibrational-rotational spectral line, Ortho and Para hydrogen.	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

1. Physical Chemistry: G. M. Barrow, 5th Edition, McGraw-Hill education, India.
2. Advanced Physical Chemistry: Gurdeep Raj, 35th Edition (2009), Goel / Krshina Publishing House.
3. Principles of Physical Chemistry: Puri, Sharma and Pathania, 42nd Edition, Vishal Publishing Company.
4. Polymer Science: Gowariker, Viswanathan and Sreedhar, 1st Edition (2012 reprint) New Age International.
5. Essentials of Nuclear Chemistry: Arnikaar, 4th Edition (2012 reprint), New Age International.
6. Physical Chemistry: Atkins, 9th Edition. Oxford University Press.
7. Advanced Physical chemistry: Gurtu and Gurtu, 11th Edition , Pragati Prakashan.
8. Physical chemistry: Levine, 6th Edition, McGraw-Hill education, India.




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Chemistry-504
CODE : 53020504
B.Sc. 5th Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	50	50	-	150

Objectives:- To provide basic knowledge Chemistry

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	(A) Ultraviolet Spectroscopy Origin of UV Spectra, Principle, Electronic transition ($\sigma\text{-}\sigma^*$, $n\text{-}\sigma^*$, $\pi\text{-}\pi^*$ and $n\text{-}\pi^*$), relative positions of λ_{max} considering conjugative effect, steric effect, solvent effect, red shift (bathochromic shift), blue shift (hypsochromic shift), hyperchromic effect, hypochromic effect (typical examples). Aromatic and Polynuclear aromatic hydrocarbons. (B) Ultraviolet Spectroscopy (Problems) Problems of Dienes and enones using Woodward-Fieser rules. Problems of aromatic ketones, aldehydes and esters using empirical rules.	14
2	(A) Infrared Spectroscopy Introduction, principle of IR spectroscopy, instrumentation, sampling technique, selection rules, types of bonds, absorption of common functional groups. , characteristic stretching frequencies of O-H, N-H, C-H, C-D, C=C, C=N, C=O functions; factors affecting stretching frequencies (H-bonding, mass effect, electronic factors, bond	14



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	multiplicity, ring size). (B) Raman Spectra Basic principal, Instrumentation, Application of Raman spectra, Comparison of IR and Raman spectra.	
3	(A) Nuclear Magnetic Resonance Principal, Magnetic and non magnetic nuclei, absorption of radio frequency. Equivalent and non equivalent protons, chemical shifts, anisotropic effect, relative strength of signals, spin-spin coupling, long range coupling, coupling constant, Deuterium labelling, applications to simple structural problems. (B) Problems based on Spectral data Structural problems based on UV, IR and NMR	14
4	(A) Visible Spectroscopy Introduction, Beer Lambert's law, instrumentation (light source, optical system, wavelength selector, light sensitive device), Accuracy and error of Spectrophotometry. (B) Atomic Spectroscopy Introduction, Principle, Flame Emission Spectroscopy (FES) and Atomic adsorption Spectroscopy (AAS), Principal, comparison and applications, Burners (Total consumption burner and Premix burners), Inductively coupled plasma Emission Spectroscopy (ICPES)	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

1. Introduction to Spectroscopy: Donald L. Pavia, Gary M. Lampman, George S. Kriz
2. Cengage Learning; 4th Edition.
3. Spectrometric Identification of Organic Compounds: Robert M. Silverstein, Francis X. Webster, David Kiemle Wiley; 7th Edition.
4. Infrared spectra of Complex molecules: J. Bellamy, John Wiley & Sons, Inc., 3rd Edition.
5. Spectroscopic Method in Organic Chemistry: Dudley Williams, Ian Fleming McGraw-Hill Education; 6th Edition.
6. Applications of spectroscopic techniques in Organic Chemistry: P.S. Kalsi, New Age International; 6th Edition.
7. Elementary Organic Spectroscopy; Principles And Chemical Applications: Y. R. Sharma, S. Chand & Co Pvt Ltd.
8. Fundamentals of Molecular Spectroscopy: C. M. Banwell and E. McCash, Tata McGraw Hill, 4th Edition.
9. Modern Raman Spectroscopy: A Practical Approach; Ewen Smith, Geoffrey Dent., Wiley; 1st Edition.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SCHOOL OF SCIENCE

SEMESTER-V

DEPARTMENT OF CHEMISTRY

CHEMISTRY PRACTICAL -505

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	50	50	-	150

Objectives:- To provide basic knowledge Chemistry

Practical [I] (Inorganic and Physical Practicals)

[A] Inorganic Qualitative Analysis:

Inorganic Qualitative Analysis of mixture containing six radicals only.
(Minimum 08 mixtures to be done)

[B] Physical Chemistry (Kinetics, Solubility & Instruments)

(1) Kinetics and solubility:

Investigate the order of reaction in experiments no. 1, 2 and 3 by graphical method.

Exp 1: Reaction between $K_2S_2O_8$ and KI (a $\square$ b)

Exp 2: Reaction between $KBrO_3$ and KI (a = b)

Exp 3: Reaction between H_2O_2 and HI (a $\square$ b)

Exp 4: Determine the heat of solution of a given substance (Oxalic acid and Benzoic acid) by solubility method.

(2) Instruments:

Exp 1: Determine dissociation constant of monobasic acid (CH_3COOH) using pH meter.

Exp 2: Determine the amount of bases in given mix ($NaOH+NH_4OH$) Conductometrically using standard solution of HCl

Exp3: Determine the amount of ferrous in the given solution of Ferrous Ammonium Sulphate potentiometrically using standard $KMnO_4$ solution.

Exp 4: Determine the concentration of Cu^{2+} and Fe^{3+} in the given solution by Colourimetry




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Reference Books

- (1) Vogel's "Textbook of Quantitative Chemical Analysis": Pearson Education Ltd. 6th Edition, 2008.
- (2) Vogel's "Qualitative Inorganic Analysis": Pearson Education Ltd. 7th Edition, 2009.
- (3) Gurdeep Raj, "Advanced Practical Inorganic Chemistry": Krishna Prakashan, Meerut, 21st Edition, 2009.
- (4) J. B. Yadav, "Advanced Practical Physical Chemistry": Krishna Prakashan, Meerut, 29th Edition, 2010.
- (5) P. H. Parsania, "Experiments in Physical Chemistry": Neminath Printers Rajkot 1st Edition 2004.
- (6) A. M. James and F. E. Prichard, "Practical Physical Chemistry": Longman Group Limited London 3rd Edition Reprinted 1979. Guj. Uni. Chemistry Syllabus – B.Sc. Sem-V

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Practical [III] (Organic and Analytical Practicals)

[A] Organic Preparation:

- (i) Nitration of Acetanilide
- (ii) Acetanilide from Aniline (Green Preparation)
- (iii) Benzoic Acid from Benzil (Green Preparation)
- (iv) 1,5-Diphenyl-penta-1,4-diene-3-one from Benzaldehyde and Acetone (Green Preparation)
- (v) Diels-Alder reaction between furan and maleic acid (Green Preparation)

[B] Analytical:

(B-1) Organic Estimation:

- (i) Unknown Acid (e.g., Oxalic, Succinic, Citric, Tartaric, Benzoic, Phthalic and Cinnamic acid)
- (ii) Ketone (Acetone)
- (iii) Ester

(B-2) Chromatography [TLC]

Analysis of the following drugs by Thin Layer Chromatography.

- (i) Aspirin (ii) Paracetamol (iii) Ibuprofen

Reference Books

- (1) A. I. Vogel, "Elementary Practical Organic Chemistry Part-II, Qualitative Organic Analysis": CBS Publishers & Distributors, New Delhi, 2nd Edition, 2004.
- (2) A. I. Vogel, "Elementary Practical Organic Chemistry Part III Quantitative Organic Analysis": CBS Publishers & Distributors, New Delhi, 2nd Edition, 2004.
- (3) Hand book of Organic qualitative analysis by H. T. Clarke.
- (4) Practical Organic Chemistry: F. G. Mann and B. C. Saunders. Low – priced Text Book. ELBS, Longman.
- (5) V.K. Ahluwalia, Sunita Dhingra, "Comprehensive Practical Organic Chemistry –Qualitative Analysis": University Press (India) Private Limited, Hyderabad, 1st Indian Edition, 2010.
- (6) "Advanced Practical Organic Chemistry": Stanley Thornes Publishers Ltd., J Leonard, B Lygo, G Procter, 1st Indian Edition, 2004.
- (7) "Quantitative Analysis": R. A. Day, A. L. Underwood, Prentice-Hall of India Pvt. Ltd., New Delhi, 6th Edition, 2004.



SWARNIM SCIENCE COLLEGE
DEPARTMENT OF MICROBIOLOGY
MICROBIOLOGY -501
CODE: 53040501
B.Sc. 3rd Year

Teaching & Evaluation Scheme:-

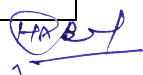
Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	--	50	50	150

Objectives:- To provide basic knowledge of Molecular Genetics of prokaryotes

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Fundamentals: Nature of Genetic material, Gene structure and function, DNA replication: semi-conservative nature, molecular mechanism , Okazaki fragments	10
2	Gene Expression and its regulation: Transcription (Sigma factor, Promoter, Operator), Genetic code, Translation (Initiation, elongation, termination), Regulation of gene expression	10
3	DNA Damages and Repair: Spontaneous and induced mutations, Molecular basis of Mutation(Physical, Chemical, Biological Mutagenesis), Consequences of mutation , Repair mechanism (Direct, Indirect, SOS repair)	10




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4	Gene transfer among Bacteria: Horizontal and vertical gene transfer, Transformation, Transduction, Conjugation (role of sex factor, transfer of genes during $F^+ \times F$, $Hfr \times f$), Bacterial plasmids and transposable elements (Insertion sequences and Tn elements).	10

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Molecular Genetics of prokaryotes

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Basic Text & Reference Books:

- Microbiology- Pelczar, Chan and krieg, 5th Ed.
- Elementary Microbiology- H.A. Modi




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

MICROBIOLOGY-502

CODE: 53040502

B.Sc. 3rd Year

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	--	50	50	150

Objectives: - To provide basic knowledge of Bacterial Metabolism

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Enzymes and Energy: Enzyme kinetics, Metabolic regulation, significance of metabolic regulation, Energy: its generation and conservation, Modes of ATP generation.	10
2	Chemoheterotrophic Metabolism: Utilizable substrates, Catabolism of glucose, TCA Cycle, Catabolism of Fatty acids and Proteins.	10
3	Chemoautotrophic and Phototrophic metabolism: Physiological groups of chemolithotrophs, generation of ATP and reducing power in chemoautotrophs, Phototrophic metabolism.	10




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4	Biosynthesis: Principles governing biosynthesis, assimilation of ammonia, nitrate, molecular nitrogen & sulfate. Biosynthesis of saturated and unsaturated fatty acids, Polymerization, Methods of studying of Biosynthesis	10

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Bacterial Metabolism

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Basic Text & Reference Books:

- Microbiology- Pelczar, Chan and krieg, 5th Ed.
- Elementary Microbiology- H.A. Modi
- Fundamental of Biochemistry- Dr.A.C.Deb




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

MICROBIOLOGY 503

CODE: 53040503

B.Sc. 3rd Year

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	50	50		150

Objectives:- To provide basic knowledge Enzymology

Prerequisites:-

Course outline:- Enzymology

Sr. No.	Course Contents	Number of Hours
1.	Enzymology- General characteristics and classification, Terminology: holoenzymes, coenzymes, Apo enzymes, cofactors, activators, inhibitors, units of enzyme activity, isoenzymes, turn over number, specific activity, first order and zero order reactions. Structure of active site of enzymes, specificity of enzyme action- Types and factors affecting enzyme activity. Brief introduction of allosteric enzymes	8
2.	Enzyme kinetics- Derivation of Michaelis and Menten equation and its modifications (Line	8



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	Weaver & Burk plot, Eadie-Hofstee and Hanes & Woolf plots). Enzyme Inhibition – competitive, non competitive, uncompetitive, mixed & substrate inhibition.	
3.	Enzyme immobilization - types, methods, application, advantages & limitations. Introduction to reverse micelles.	8
4.	Sources and applications of enzymes- amylase, protease and lipase in industries (detergent, leather, food, dairy, Textile and medical). Industrial production of enzymes.	8

Learning Outcomes:

At the end of the course the student would have basic knowledge of Enzymology.

Teaching & learning Methodology:

- Use of audiovisual aids
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Basic Text & Reference Books:

- Enzymology –Palmer
- Textbook of biochemistry – Vasudevan Shreekumari
- Biochemistry - Lehninger



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

MICROBIOLOGY -504

CODE : 53040504

B.Sc. 3rd Year

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	--	50	50	150

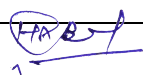
Objectives:- To provide basic knowledge of Metabolism.

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Energy metabolism: Introduction to metabolism, Methods of studying, intermediary metabolism ATP (Structure, generation, & role, Modes of ATP generation in bacteria, Oxidative phosphorylation - ETC - components and organization. Mechanism of ATP synthase Fermentation and substrate level phosphorylation Bacterial photophosphorylation	12
2	Carbohydrate metabolism Degradation: EMP, PP & ED pathway of glucose catabolism.	12




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	Reaction and energies of TCA cycle and its importance. Amphibolic nature of TCA, Anapleuretic reaction and glyoxylate cycle. - Regulation of glycolysis and TCA cycle. Biosynthesis: Gluconeogenesis. CO₂ fixation - Calvin Benson cycle.	
3	Lipid metabolism : Fatty acid degradation: Beta-oxidation of saturated fatty acid - palmitic acid and its energetics, Oxidation of mono unsaturated fatty acids - olic acid., Oxidation of Polyunsaturated fatty acid - linoleic acid - α and ω oxidation of fatty acid Biosynthesis of fatty acid: Biosynthesis of saturated fatty acids, Biosynthesis of mono unsaturated fatty acids - aerobic and anaerobic pathway, Biosynthesis of poly unsaturated fatty acids - archidonic acid.	10
4	Biosynthesis of Amino acids: Aspartate family and Aromatic family. Biosynthesis of Peptidoglycan: Catabolism of Amino acids: Transamination, oxidative deamination, - Urea cycle , Stickland reaction.	10

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Metabolism.

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Basic Text & Reference Books:

- Principles of Biochemistry - Lehninger ,Nelson and cox 4th edition.




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- Biochemistry - Zubay, G. L.
- Biochemistry - Stryer, L.
- General Microbiology - Stanier, R. Y.
- Principles of Microbiology - Ronald M. Atlas
- Biochemistry - Voett and Voett
- Microbiology - Prescott, L. M.
- Microbiology Vol. I & II - Powar & Daginawala
- Biochemistry - S. Satyanarayana

SWARNIM STARTUP & INNOVATION UNIVERSITY (SSIU)

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PHYSICS -501

Code: 53050501




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BHOYAN RATHOD, KALOL, GANDHINAGAR.

B.Sc. Semester 5

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	50	50	50	-	150

Objectives: -

Physics students will:

- Develop a solid grasp of core concepts and applications of differential equation, 2nd order differential equation, classical mechanics and quantum mechanics. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites:- Engineering physics majors must have a basic understanding of fundamental physics and mathematics.

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Differential equations: Some partial differential equations in physics, the method of Separation of variables, separation of Helmboltz equation in Cartesian coordinates, in spherical polar and cylindrical Coordinates, Laplace's equation in various coordinates, Choice of coordinate system and separability of a partial differential equation, Parabolic coordinates system, Prolate Spheroidal coordinates system, various examples based on the separation of variables.	12




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2	2nd order differential equations: Ordinary and Singular points, Series solution around an ordinary point, Series solution around a regular singular point: the method of Frobenius, Getting a second solution, Alternative method of getting the second solution, System of linear first order differential equations, Non-linear differential equations, related examples.	12
3	Classical Mechanics: Lagrangian Formulation: Introduction, Constraints, holonomic and non-holonomic constraints, scleronomous and rheonomous constraints, generalized coordinates, D'alembert's principle, Lagrange's equations, a general expression for kinetic energy, Symmetries and the laws of conservation, Cyclic or ignorable coordinates (including illustrations), Velocity dependent potential of electromagnetic field, Rayleigh's dissipation function. Motion of a rigid body: Introduction, Euler's theorem, Angular momentum and kinetic energy, The inertia tensor, Euler's equations of motion, Torque free motion, Euler's Angles, Motion of a symmetric top, Nutational motion.	12
4	Quantum Mechanics: Exactly soluble Eigenvalue problems: Introduction, the simple harmonic oscillator, the Schrödinger equation and energy eigenvalues, the energy eigenfunctions, properties of stationary states, the abstract operator method, Coherent states, the angular momentum operators, the eigenvalue equation for L^2 , separation of variables, admissibility conditions on solutions, eigenvalues, the eigenfunctions, Spherical harmonics, Physical interpretation, Parity. Angular momentum in stationary states of systems with spherical symmetry	12

Learning Outcomes:- Graduates of the Physics major fulfill the following outcomes as part of their education in physics:

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense. Access information on a topic from a variety of sources, and be able to learn new on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.



Teaching & Learning Methodology:-

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures
- Draw upon the experience and expertise of staff from other countries and/or visiting academics

Books Recommended:

- Mathematical Physics by P.K. Chattopadhyay, New Age International Publishers (2006)
- Mathematical Methods for Physicists by G. Arfken, Academic Press
- Introduction to Classical Mechanics by R. G. Takawale and P. S. Puranik, Tata McGraw-Hill Publishing Co. Ltd.
- Classical Mechanics by A. B. Bhatia, Narosa Publication
- A Text Book of Quantum Mechanics by P. M. Mathews and K. Venketeshan, Tata McGraw-Hill Publishing Co. Ltd.
- Quantum Mechanics : Theory and Applications by A. Ghatak and S. Lokanathan, Macmillan India Limited

E-Resources:

List of Open Source Software/learning website:



Amazing Circus of Physics 2nd edition by Jearl Walker, Wiley India
Six Ideas that shaped physics by Thomas A Moore, McGraw Hill education


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- <http://www.howstuffworks.com/> -- Tech stuff
- How things works by Louis A Bloomfeild, Wiley Publications
- Physics of Everyday Phenomena by W. Thomas Griffith, Juliet Brosing, McGraw Hill Education
- Latest journals like BBC Knowledge, How things work-everyday technology explained by National Geographics.
- <http://www.sciencefairadventure.com/>




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SWARNIM STARTUP & INNOVATION UNIVERSITY
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SWARNIM STARTUP & INNOVATION UNIVERSITY (SSIU)

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PHYSICS -502

Code: 53050502

B.Sc. Semester 5

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	50	50	50	-	150

Objectives: -

Physics students will:

- Develop a solid grasp of core concepts and applications of molecular spectra, Raman spectra, quantum statistics and solid state physics. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites:- Engineering physics majors must have a basic understanding of fundamental physics and mathematics.

Course outline:-

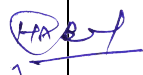
Sr. No.	Course Contents	Number of Hours
1	Types of Molecular Spectra and Molecular Energy States: Separation of electronic and nuclear motion - The Born Oppenheimer approximation, types of molecular spectra. Pure Rotational Spectra: Salient features of Rotational spectra, Molecular requirement for rotation spectra, experimental arrangement, Molecule as a rigid rotator, explanation of	12




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	rotational spectra (without the process of solving Schrodinger equation to get energy formula), the non-rigid rotator, Isotope effect on rotational spectrum, tunable laser and pulse laser - introduction Vibrational - Rotational Spectra: salient features of vibrational - Rotational spectra, Molecule as a harmonic oscillator, Molecule as anharmonic oscillator, Vibrational frequency and force constant for anharmonic oscillator, Fine structure of Infrared bands: Molecule as vibrating rotator, Diatomic molecule as symmetric top, Thermal distribution of vibrational and rotational levels.	
2	Raman Spectra : Nature of the Raman spectra, experimental arrangement for Raman spectra, Classical theory of Raman effect, Quantum theory of Raman effect, Raman spectra and Molecular structure, Infrared spectra versus Raman spectra, Laser as intense source. Classification of Molecular Electronic States: Molecular electronic states, Symmetry properties of electronic eigenfunctions (symmetry classification of electronic states) Fluorescence and Phosphorescence: Luminescence, Mechanism of fluorescent emission, Mechanism of phosphorescent emission, Fluorescence spectrum compared with Raman spectrum.	12
3	Formulation of Quantum Statistics: Density matrix, Liovilles theorem in Quantum Statistical Mechanics, Condition for Statistical equilibrium, Ensemble in Quantum Mechanics, Problems Bose Einstein and Fermi Dirac Distributions: Symmetry of wave functions, the Quantum Distribution functions, the Boltzmann limit of Boson and Fermions Gases, Evaluation of the Partition function, Partition function for Diatomic Molecules (a) translation partition function (b) rotational partition function (c) vibration partition function (d) electronic partition function Equation of state for an Ideal gas, The quantum mechanical Para magnetic susceptibility, problems	12
4	Solid State Physics: Elastic constants and elastic waves: Analysis of elastic strains, Dilation, stress components, Elastic compliance and stiffness constants, Elastic energy density, elastic stiffness constants of cubic crystals, Bulk modulus and compressibility. Elastic waves in cubic crystals, waves in the [100] direction, waves in the [110] direction. Free electron Fermi gas: Introduction, Energy levels in one dimension, Effect of temperature on the Fermi-Dirac distribution, Free electron gas in three dimensions and density of states, Heat capacity of the electron gas and experimental	12




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	heat capacity of metals, Electrical conductivity and ohm's law, Experimental electrical resistivity of metals, Thermal conductivity of metals, ratio of thermal to electrical conductivity.	

Learning Outcomes:- Graduates of the Physics major fulfill the following outcomes as part of their education in physics:

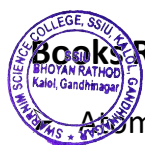
- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology:-

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

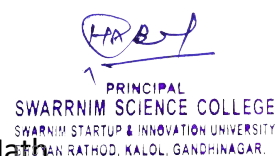
The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures
- Draw upon the experience and expertise of staff from other countries and/or visiting academics



Books Recommended:

Atomic and Molecular Spectra : Laser by Rajkumar, Kedar Nath & Ram Nath



- Fundamentals of Statistical Mechanics by B. B. Laud, New Age International Publishers
- Introduction to Solid State Physics by C. Kittel, (Eight Edition) John Wiley and Sons
- Elements of Solid State Physics by J. P. Srivastava, Prentice-Hall of India Private Limited, New Delhi

E-Resources:

List of Open Source Software/learning website:

- The Flying Circus of Physics 2nd edition by Jearl Walker, Wiley India
- Six Ideas that shaped physics by Thomas A Moore, McGraw Hill education
- <http://www.howstuffworks.com/> -- Tech stuff
- How things works by Louis A Bloomfeild, Wiley Publications
- Physics of Everyday Phenomena by W. Thomas Griffith, Juliet Brosing, McGraw Hill Education
- Latest journals like BBC Knowledge, How things work-everyday technology explained by National Geographics.
- <http://www.sciencefairadventure.com/>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PHYSICS -503

Code: 53050503

B.Sc. Semester 5

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	50	50	50	-	150

Objectives: -

Physics students will:

- Develop a solid grasp of core concepts and applications of electromagnetic induction, Electromagnetic radiation, alpha, beta ray and gamma rays. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites:- Engineering physics majors must have a basic understanding of fundamental physics and mathematics.

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Electromagnetic induction: Hysteresis, Maxwell's equations, Decay of free charge, Potentials of electromagnetic fields, More about the Lorentz gauge condition, Field energy and Field momentum. Electromagnetic waves: Plane waves in non-conducting media, Polarizations, Energy flux in a plane wave, Radiation pressure	12




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	and Momentum, Plane waves in conducting medium, Skin effect.	
2	Electromagnetic Radiation: Retarded Potential, Radiation from an oscillating dipole, Linear Antenna, Lienard-Wiechert Potentials, Potentials for a charge in uniform motion – Lorentz formula, Fields of an accelerated charge, Radiation from an acceleration charged particle at low velocity, Radiation when the velocity and acceleration of the particles are collinear, Radiation from a charged particle moving in a circular orbit, Electric quadrupole radiation.	12
3	Alpha and Beta Rays: Alpha Rays: Range of alpha particles, Disintegration energy of the spontaneous alpha decay, Alpha decay paradox - barrier penetration. Beta Rays: Introduction, Continuous Beta ray spectrum - difficulties encountered to understand it, Pauli's Neutrino Hypothesis, Fermi's theory of Beta decay, the detection of neutrino, Parity non-conservation in Beta decay.	12
4	Gamma Rays and The liquid drop model of the nucleus: Gamma Rays: Introduction, Gamma-ray emission – selection rules, Internal conversion, Nuclear isomerism. The liquid drop model of the nucleus: Introduction, Binding energies of nuclei : plot of B/A against A., Weizsacher's semi empirical mass formula Mass parabolas: prediction of stability against Beta decay for members of an isobaric family, Stability limits against spontaneous fission, Barrier penetration - decay probabilities for spontaneous fission, Nucleon emission.	12

Learning Outcomes:- Graduates of the Physics major fulfill the following outcomes as part of their education in physics:

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology:-




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We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures
- Draw upon the experience and expertise of staff from other countries and/or visiting academics

Books Recommended:

- Electromagnetics by B. B. Laud, 2nd Edition, Wiley Eastern Ltd
- Nuclear Physics - An Introduction by S.B. Patel, New Age International
- Nuclear Physics by D. C. Tayal, Himalaya Publisher

E-Resources:

List of Open Source Software/learning website:

- The Flying Circus of Physics 2nd edition by Jearl Walker, Wiley India
- Six Ideas that shaped physics by Thomas A Moore, McGraw Hill education
- <http://www.howstuffworks.com/> -- Tech stuff
- How things works by Louis A Bloomfeild, Wiley Publications
- Physics of Everyday Phenomena by W. Thomas Griffith, Juliet Brosing, McGraw Hill Education
- Latest journals like BBC Knowledge, How things work-everyday technology explained by National Geographics.
- <http://www.sciencefairadventure.com/>






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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PHYSICS -504

Code: 53050504

B.Sc. Semester 5

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	50	50	50	-	150

Objectives: -

Physics students will:

- Develop a solid grasp of core concepts and applications of differential equation, 2nd order differential equation, classical mechanics and quantum mechanics. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites:- Engineering physics majors must have a basic understanding of fundamental physics and mathematics.

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	General amplifier characteristics: Introduction, concept of amplification, amplifier notations, current gain, voltage gain, power gain, amplifier input resistance, amplifier output resistance, maximum power transfer, conversion efficiency, classes of amplifier operation,	12



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	harmonic distortion, three point method of calculating harmonic distortion, five point method of calculating harmonic distortion, oscilloscope display of an amplifier dynamic transfer curve, measurement of harmonic distortion, other types of amplifier distortion, decibels, other equations for decibel computation, zero dB reference level, use of voltmeter as dB indicator, voltmeter range correction factor, impedance correction factor, frequency response curves, amplifier bandwidth, phase relationship in amplifier square wave testing.	
2	Frequency response of a transistor amplifier: Low frequency response of a transistor amplifier: Effect of an emitter by pass capacitor on low frequency response, effect of coupling capacitor on low frequency response, cascading of CE stages, mid frequency gains, low frequency response of cascaded stages amplifier, low frequency response to a square wave, transformer coupled transistor amplifier, low frequency response of TC amplifier, step response of a TC amplifier. High frequency response of a transistor amplifier: High frequency model for a CE amplifier, approximate CE high frequency model with a resistive load, CE short circuit current gain, high frequency current gain with a resistive load, high frequency response of cascaded CE stages, amplifier high frequency response to a square wave high frequency response of a transformer coupled amplifier.	12
3	Circuit analysis, design and Flip-Flop: Circuit analysis and design: Boolean laws and theorems, sum of products method, truth table to Karnaugh map, pairs, quads and octets, Karnaugh simplification, don't care conditions, product of sums method product of sums simplification, Exclusive OR gate. FLIP- FLOP: RS flip flop, clocked RS flip flop, D flip flop, Edged triggered D flip flop, JK flip flop, JK master slave flip flop	12
4	Network Transformations: Reduction of complicated network, conversion between T and π sections, bridge T network, the lattice network, superposition theorem, the reciprocity theorem, thevenin's theorem, Norton theorem, maximum power transfer theorem, compensation theorem. Resonance : Definition of Q, the figure of merit, series resonance, Bandwidth of the series resonant circuit, parallel resonance or antirsonance, current in antiresonant circuits, Bandwidth of antiresonant circuits.	12

Learning Outcomes:- Graduates of the Physics major fulfill the following outcomes as part of their education in physics:



- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.

Teaching & Learning Methodology:-

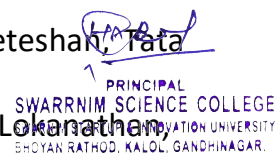
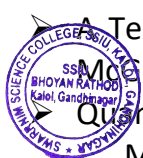
We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures
- Draw upon the experience and expertise of staff from other countries and/or visiting academics

Books Recommended:

- Mathematical Physics by P.K. Chattopadhyay, New Age International Publishers (2006)
- Mathematical Methods for Physicists by G. Arfken, Academic Press
- Introduction to Classical Mechanics by R. G. Takawale and P. S. Puranik, Tata McGraw-Hill Publishing Co. Ltd.
- Classical Mechanics by A. B. Bhatia, Narosa Publication
- A Text Book of Quantum Mechanics by P. M. Mathews and K. Venketeshan, Tata McGraw-Hill Publishing Co. Ltd.
- Quantum Mechanics : Theory and Applications by A. Ghatak and S. Lokanathan, Macmillan India Limited



E-Resources:

List of Open Source Software/learning website:

- The Flying Circus of Physics 2nd edition by Jearl Walker, Wiley India
- Six Ideas that shaped physics by Thomas A Moore, McGraw Hill education
- <http://www.howstuffworks.com/> -- Tech stuff
- How things works by Louis A Bloomfeild, Wiley Publications
- Physics of Everyday Phenomena by W. Thomas Griffith, Juliet Brosing, McGraw Hill Education
- Latest journals like BBC Knowledge, How things work-everyday technology explained by National Geographics.
- <http://www.sciencefairadventure.com/>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

Combined Practical List for all theory papers

B.Sc. Semester 5

Practical List:- Sem-5 (Practical's of Paper 501,502,503 & 504)

Sr. No.	Practical Name
1	Acceleration due to gravity by Kater's pendulum (fixed knife edges).
2	Characteristics of G.M. Tube.
3	Viscosity by Log decrement
4	Refractive index by total internal reflection using Gauss eye piece.
5	An optical method of determining dielectric constant, dipole moment and polarizability of a polar liquid using Hollow prism
6	Determination of capacity of Scherreing Bridge
7	I -V Characteristics of Solar Cell and to determine fill-factor, voltage-factor and efficiency
8	Determination of unknown frequency using Wein Bridge
9	Hartley Oscillator. Measurement of frequency by C.R.O. (Transistorized).
10	Frequency response of CE amplifier
11	A.C. Circuit analysis by C.R.O. Measurement of frequency and phase difference




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

MATHEMATICS-501

Subject Code: 53030501

B.Sc. Semester -5

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Student are evaluated on the basis of Mid term examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	2	-	5	5	50	50	50	-	150

Objectives

- The aim of this subject is to present the important ideas in Linear equation using multiple method to student whose principal interest lie outside the field of mathematics.
- It is a subject which provide a vital arena where students can see the interaction of mathematics and machine computation.

Prerequisites

A Candidate for admission to the bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline:

This Course designed for undergraduate and graduate students working on scientific , engineering, statistics , and mathematics majors This course serves as an introduction to numerical methods used to applied mathematics problems, with applications across the spectrum of discription.



Course Contents

Teaching
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No.		hours
1	Unit: I Sum and product of complex numbers with properties, moduli and conjugate, triangle inequality, polar coordinates, product and quotients in exponential form, roots of complex numbers, De Moivre's theorem and application, the exponential function, trigonometric functions, hyperbolic functions, convergence of sequence and series.	8
2	Unit: II Functions of complex variables, theorems on limits, continuity, derivatives, differentiation formulas, Cauchy-Riemann equations, sufficient condition for differentiability, polar coordinates, analytic functions and harmonic functions. Mapping and Conformal mapping: Elementary functions, mapping by elementary functions, mobius mapping, linear function. Bilinear mapping $w = (az+b)/(cz+d)$, $w=z$, $w=z^2$, $w = \frac{1}{z}$, $w = \exp(z)$	12
3	Unit: III Line integral(complex), Cauchy's integral formula, maximum modulus, (only statement), liouville's theorem. Definition of complex sequence, complex series and power series. Expansion of complex function in Taylor's series and Laurent's series.	14
4	Unit: IV Residues and poles: Definition of a singular point, Isolated singular points, Zeros of complex functions, Poles and residues of complex function, Cauchy's residue theorem, Evaluation of improper real integrals by residue theorem and evaluation of definite integral of trigonometric functions by residue theorem.	10



Learning Outcomes

After Successfully Completion of the Course the student will be

- Derive Numerical methods for various mathematical operation and tasks , such as interpolations,differentiations ,integration,the solution of linear and nonlinear equations, and the solution of linear and nonlinear equation, and the solution of differential equations.
- Analyse and evaluate the accuracy of common numerical methods.
- Derive numerical methods for various mathematical operations and tasks , such as interpolation,differentiations, integrations , the solution of Linear and nonlinear equations..

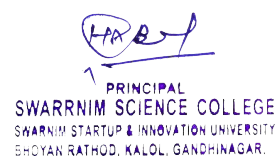
Teaching & Learning Methodology

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. S.S.Sastry, Introductory methods of Numerical analysis, Prentice hall of India, 1990.
2. Numerical Analysis by G. Shankar Rao.
3. Numerical Analysis, B.S.Grawal.
4. Numerical methods by Dr. P. kandasamy.
5. Introduction of Numerical analysis by Josef Stoer and Roland Bulirsch.
6. Analysis of Numerical Methods by Isaacson and Herbert Keller.



- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics.
<https://swayam.gov.in/> and <https://nptel.ac.in/>
- cims.nyu.edu/~cfgranda/pages/OBDA_fall17/notes...
- www.sxccal.edu/mathematics-lecture-notes




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

Mathematics 502

Subject Code: 53030502

B.Sc. Semester -5

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	2	-	5	5	50	50	50	-	150

Objectives:-

- The aim of this subject is to present the important ideas in operation research using multiple method to student whose principal interest lie outside the field of mathematics.
- It is a subject which provides a vital arena where students can see the interaction of industrial mathematics and practical problems.

Prerequisites

- A Candidate for admission to the Bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline:

- This Course designed for undergraduate and graduate students working on scientific, engineering, statistics, and mathematics majors this course serves as an introduction to operation research used to applied mathematics problems, with applications across the spectrum of description.

Sr. No.	Course Contents	Teaching hours




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1	<u>Unit: I</u> Convex Set and Linear Programming Problem Convex set, Extreme points of a convex set, Convex combination, Examples of convex sets and Theorems on Convexity. Formulation Techniques of LP problems (Only Examples). Problem solving techniques for LP problems :Simplex method for solving LPP, Big-M (Penalty) method, Two- Phase method, Integer programming problem (Only Gomory's cutting plane method).	10
2	<u>Unit: II</u> Duality and Dual simplex method Introduction, Definition of the dual problem, General rules for converting any primal problem into its dual, How to interpret the solution of the dual from its primal and vice versa, Comparison of the solution of the primal and its dual. Find initial solution for dual simplex table, Mathematical procedure to find solution by dual simplex method	8
3	<u>Unit: III</u> Introduction of Transportation problems and Assignment problems Mathematical formulation, Tabular representation, Definitions, Methods for finding initial basic feasible solution (North West Corner Rule, Least Cost Method, Vogel's Approximation Method), Optimality test (MODI method), Degeneracy in Transportation Problem, Unbalanced Transportation Problem. Introduction of Assignment problem, Mathematical formulation of Assignment problem, Method for solving Assignment problem (Hungarian Method), Unbalanced Assignment problem, Examples.	14
4	<u>Unit: IV</u> Introduction to game	10

Learning Outcomes:-

- In this Mathematics student will learn how to convert real life problems into linear equations.
- They will learn to solve set of linear equations.



- Students will learn the concept transportation and assignment problems NWC rules and MODI method.

Teaching & Learning Methodology:-

- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video Podcast etc) to support key concepts/knowledge.
- Particularly at the start of a program /module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include inquiry based learning exercises in international or intercultural contexts.
- Include group work, with groups representing diverse cultures and nationalities.

Reference Books:-

- Mathematical models in O.R. - J. K. Sharma, Tata-MacGraw Hills book-company.
- Operations Research – Nita H Shah, Ravi Gor and Hardik Soni. PHI –Learning.
- Optimization method in O.R. & System Analysis - K. V. Mittal, New Age inter. Publishers.
- Operation Research - S. D. Sharma, Kedarnath Ramnath & Co.
- Operation Research - Kanti Swaroop & Man Mohan, Sultan Chand & Co.
- Linear Programming - L. I. Gass, Tata McGraw Hills book-company.
- Linear Programming - G. Hadley, Narosa Publishing house.
- Operation Research- A. M. Natarajan, P. Balasubramani, A. Tamilarasi, Pearson Education.

E-learning websites for operation research:-

https://www.mathcity.org/msc/notes/operation_research

<https://web.itu.edu.tr/topcuil/ya/OR.pdf>

<http://www.svecw.edu.in/Docs%5CCSEOSLNotes2013.pdf>

<https://www.mathcity.org/msc/notes/operation-research-haidar-ali>

<https://www.math.cuhk.edu.hk/course/1920/math3215>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

MATHEMATICS 503

Subject Code: 53030503

B.Sc. Semester -5

Teaching & Evaluation Scheme:-

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Student are evaluated on the basis of Midterm examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	2	-	5	5	50	50	50	-	150

Objectives:-

- The aim of the discrete mathematics is the study of mathematical structures that are fundamentally discrete rather than continuous.
- In contrast to real numbers that have the property of varying "smoothly", the objects studied in discrete mathematics – such as integers, graphs, and statements in logic do not vary smoothly in this way, but have distinct, separated values.
- Discrete mathematics therefore excludes topics in "continuous mathematics" such as calculus and analysis. Discrete objects can often be enumerated by integers.
- More formally, discrete mathematics has been characterized as the branch of mathematics dealing with countable sets (sets that have the same cardinality as subsets of the natural numbers, including rational numbers but not real numbers).

Prerequisites




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A Candidate for admission to the Bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline:

This Course is designed to enable student to acquire the understanding and practice The application how to solve discrete mathematics.

Sr. No.	Course Contents	Teaching hours
1	Unit-I:- Sets and functions Sets, operations on sets , relations ,functions , binary operations , algebraic structures , operations on functions.	10
2	Unit: II: - basics of graph theory Definition of graph, simple graph ,degrees of vertices ,equivalence relation, random graph model ,digraph , paths , sub graphs , direct graph ,trail , walk , vertex sequence , circuit , cycle, multiple paths .	8
3	Unit: III: - lattice theory Introduction , product sets , relations , properties of relation , reflexive ,symmetric , antysymmetric , irreflexive, transitive ,equivalence relation ,partition , partially ordered set, hasse diagram ,minimal member , maximal member ,lattice as poset , properties of meet and join , lattice as an algebraic system , product of two lattices , order preserving , order isomorphism , lattice homomorphism , lattice isomorphism ,sub lattice , complete lattice , bounded lattice .	14
4	Unit: IV:- Boolean algebra Properties of Boolean algebra, Boolean algebra of switching circuits, sub-Boolean algebra, homomorphism and isomorphism of Boolean algebra Boolean ring, direct product of two Boolean algebras, join irreducible element, atom, and the stone representation theorem.	10



Learning Outcomes:-

- In this Math student will understand the Concept of discrete Mathematics.
- They will learn Boolean expression, lattice, basics of graph theory and mathematical induction.

Teaching & Learning Methodology:-

- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties. ➤ Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge.
- Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include inquiry based learning exercises in international or intercultural contexts.
- Include group work, with groups representing diverse cultures and nationalities.

Reference Books:-

- Boolean Algebra and its Application – J. E. Whitesitt, Addison-Wesley Publishing Co. Inc. Foundation of Discrete Mathematics – K. D. Joshi, New Age International Limite Publishers, ISBN 81-224-0120-1.
- Logic and Boolean algebra – B. H. Arnold, P H Inc LCCN 62-19100.
- Introduction to Lattice Theory – D. E. Rutherford, University Mathematical Oliver and Boyed Ltd.
- Modern Applied Algebra - Garret Birkhoff and Thomas C Bartee, CBS Publishers and Distributors.
- Sets Lattices and Boolean Algebras - James C Abbott.
- Combinatorics including concepts of Graph Theory - V. K. Balakrishnan, Schaum's Outline Series, McGraw-Hill, INC.

E- Learning websites:-

- <http://www.freebookcentre.net/maths-books-download/Lecture-Notes-for-College-Discrete-Mathematics.html>
- https://edurev.in/studytube/Discrete-Mathematics-Class-Notes--Handwritten---En/1e99d2ca-6edf-4078-80a1-31d104ba010e_p
- <http://math.bit.edu.cn/docs/20200928043347839160.pdf>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

MATHEMATICS-504

Subject Code: 53030504

B.Sc. Semester -5

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Student are evaluated on the basis of Midterm examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	2	-	5	5	50	50	50	-	150

Objectives

Because of its generality, abstract algebra is used in many fields of science. OBJECTIVE OF THIS COURSE: This course is intended to provide a first approach to the subject of algebra by studying some basic algebraic structures, mapping between them and their substructures.

Prerequisites

A Candidate for admission to the Bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline:

This Course designed for undergraduate and graduate students working on scientific, engineering, statistics, and mathematics majors This course serves as an introduction to numerical methods used to applied mathematics problems, with applications across the spectrum of description.

Sr.	Course Contents	Teaching



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No.		hours
1	Unit I:-Binary operations & groups Binary operations, division algorithm for integers, congruent modulo relation relation in $\mathbb{Z}$, definition and examples of groups, elementary properties of group, equivalent definition of a group, finite groups and their tables, commutative and non commutative groups	10
2	Unit II:- Subgroups and lattice diagrams Subgroups, definition and examples, normalize and centralizers, order of an element , order of a group, cyclic group generated by an element, lattice diagrams of finite groups, cosets and its properties, Lagrange's theorem and its application, Euler's theorem, mFermat's theorem	12
3	Unit III :- Permutations & normal subgroups Permutations, definition and examples, cycle, transposition, even and odd permutation, order of a permutation, inverse of a permutation, symmetric groups and alternating groups, examples, quotient group, normal subgroup: definition and Examples.	12
4	Unit IV :- Homomorphism & isomorphism of groups Isomorphism of groups: definition and examples, isomorphism and equivalence relation, cyclic groups, properties OG cyclic groups, isomorphism of cyclic groups, Homomorphism of groups: definitions and examples, kernel of a homomorphism, fundamental theorem of Homomorphism, Calev's theorem, automorphism of groups	10



LEARNING OUTCOMES:-

- In this Math student will learn the concept of Group theory.
- Students will learn the concept of permutation.
- Students will learn Homomorphism & isomorphism of groups.
- Students will learn the fundamental theorem of homomorphism.

Teaching & Learning Methodology:-

- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge.
- Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include inquiry based learning exercises in international or intercultural contexts.
- Include group work, with groups representing diverse cultures and nationalities.

Reference Books:-

- I N Herstein, *Topics in Algebra*, Wiley Eastern Ltd.
- N. Jacobson, *Basic Algebra Vol I & II*, Hindustan Publishing company.
- Shanti Narayan, *A text book of Modern Algebra*, S.Chand & Co.
- P.B.Bhattacharya, S.K.Jain, S R Nagpal, *Basics Abstract Algebra, (second Edition) Cambridge University Press.*
- N.S. Gopalkrishna, *University Algebra*, Wiley Eastern, New Delhi MacLane Saunders and Birkhoff Garrett, *Algebra*, MacMillan, New York.
- G.F.Simmons, *Introduction to Topology and Modern Analysis*, MacGrawHill Inc., U.S.A.

E-LEARNING WEBSITES:-

http://www.universityofcalicut.info/SDE/Abstract_algebra.pdf

<https://pkalika.in/2019/10/21/abstract-algebra-linear-algebra/>

<http://math.nevai.net/courses/mas4301/misc/syllabus.pdf>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF SCIENCE ENVIRONMENTAL SCIENCE

CODE: 53000503

SEMESTER 2

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	50	70	-	150

Objectives:- To provide a comprehensive knowledge for awareness of environment conservation and hazard management.

Prerequisites:- Environment Conservation & Hazard Management

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Earth Science	6
2	Global Environmental Issues	10
3	Natural Resources and Management	6
4	Biomass Energy	8

Learning Outcomes:- At the closing stage of the course, the students will be able to understand the importance of environment conservation and the concepts of hazard management.

Teaching & Learning Methodology:- The Syllabus for Environmental Studies includes classroom teaching. The syllabus is divided into four units covering 30 lectures. The units are classroom teaching based to enhance knowledge skilled and attitude to environment.




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Books Recommended:

1. R. R. Mahitcha – “Environment Conservation and Hazard Management”, Atul Prakashan.
2. Solanki and Chetan Singh – “Renewable Energy Technologies”, PHI Learning.
3. Izrael Y.A. – “Ecology and Control of the Natural Environment”, Kluwer Academic Publisher.
4. Sharma, Sanjay K. – “Environment Engineering and Disaster Management”, Laxmi Publications.
5. Earnest, Joshua and Wizelius, Tore – “Wind Power Plants and Project Development, PHI Learning.
6. Anandita Basak – “Environmental Studies”, Pearson Publication.
7. K. S. Valadia – “Coping with Natural Hazards Indian Context”, Orient Longman Publication.
8. Edward S. Rubin – “Engineering and Environment”, McGraw Hill Publication

SYLLABUS

Unit-1

Ecology and Environment: Importance of environment and scope, Engineering and Environment issues, The natural system, Biotic and Biotic components and processes of natural system, Eco system, Food chain, webs and other biological Systems, Causes of environmental pollution, Pollution due to solid waste, Water pollution, Air pollution, The noise as pollution, Pollution of land due to industrial and chemical waste, Radiation and its effects on vegetables and animals

Unit-2

Solar power: Features of solar thermal and PV systems, Types of solar cookers and solar water heaters, Solar PV systems and its components and their working, Types of solar PV cells, Rating and Costing.

Unit-3

Seismic engineering and disaster management: Introduction of Seismic engineering and its application, Features of disasters such as floods, Earthquakes, Fires, Epidemics, Gas/radioactive leaks etc., Management and Mitigation of disasters.

Unit-4

Sustainable development: Concept of sustainable development, Natural resources, Abiotic and Biotic resources, Principles of conservation of energy and management, Need of renewable energy, Growth of renewable energy in India and the world, Concept of waste management and recycling.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SCHOOL OF SCIENCE

DEPARTMENT OF BIOTECHNOLOGY

BIOTECHNOLOGY -601

CODE : 53010601

B.Sc. 3rd Year

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	20	70	30	150

Objectives:- To provide basic knowledge Enzymology

Prerequisites:-

Course outline:- Enzymology

Sr. No.	Course Contents	Number of Hours
1.	Enzymology- General characteristics and classification, definition of holoenzymes, coenzymes, apoenzymes, cofactors, activators, inhibitors, units of enzyme activity, isoenzymes, turn over number, specific activity, first order and zero order reactions. Structure of active site of enzymes, specificity of enzyme action- Types and factors affecting enzyme activity. Brief introduction of allosteric enzymes	12
2.	Enzyme kinetics- Derivation of Michaelis and Menten equation and its modifications (Line	10




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	weaver & Burk plot, Eadie-Hofstee and Hanes & Woolf plots). Enzyme Inhibition – competitive, non competitive, uncompetitive, mixed & substrate inhibition.	
3.	Enzyme immobilization- types, methods, application, advantages & limitations. Introduction to reverse micelles.	8
4.	Sources and applications of enzymes- amylase, protease and lipase in industries (detergent, leather, food, dairy, Textile and medical). Industrial production of enzymes.	8

Learning Outcomes:

At the end of the course the student would have basic knowledge of Enzymology.

Teaching & learning Methodology:

- Use of audiovisual aids
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Basic Text & Reference Books:

- Enzymology –Palmer
- Textbook of biochemistry – Vasudevan Shreekumari
- Biochemistry - Lehninger



SWARNIM STARTUP & INNOVATION UNIVERSITY

SCHOOL OF SCIENCE

DEPARTMENT OF BIOTECHNOLOGY

BIOTECHNOLOGY -602

CODE : 53010602

B.Sc. 3rd Year

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	20	70	30	150

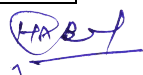
Objectives:- To provide basic knowledge Industrial Microbiology

Prerequisites:-

Course outline:- Industrial Microbiology

Sr. No.	Course Contents	Number of Hours
1.	Fermentation (definition and applications), media (crude and synthetic), and sterilization of media . Screening- primary and secondary. Strain improvement	12
2.	Design of fermentor (aeration, agitation and body construction), Downstream processing- Filtration, centrifugation, cell disruption, precipitation & solvent extraction .	10
3.	Effect of aeration and agitation, methods of estimating C_{crit} and KL_a . Measurement of pH and temperature.	8
4.	Production of ethanol, cheese, beer, red & white	8




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	wine, sparkling wine (champagne) Spoilage and preservation of food.	

Learning Outcomes:

At the end of the course the student would have basic knowledge of industrial microbiology

Teaching & learning Methodology:

- Use of audiovisual aids
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Basic Text & Reference Books:

- Industrial microbiology – Whitaker
- Industrial microbiology –AH Patel
- General microbiology - Frobisher




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SCHOOL OF SCIENCE

DEPARTMENT OF BIOTECHNOLOGY

BIOTECHNOLOGY -603

CODE : 53010603

B.Sc. 3rd Year

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	20	70	30	150

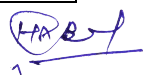
Objectives:- To provide basic knowledge Molecular Biology

Prerequisites:-

Course outline:- Molecular Biology

Sr. No.	Course Contents	Number of Hours
1.	Replication in Eukaryotes-Problems associated with eukaryotic replication Enzymes & Proteins involved in replication with its function, DNA damage and repair, mismatch repair, direct repair, excision repair, SOS repair & post-replicative repair.	8
2.	Transcription in Eukaryotes: Initiation, Elongation and Termination. Types of RNA polymerase, types of promoter, enhancers & silencers, Post Transcriptional modification-types of introns, splicing of RNA, t-RNA, r-RNA, modification of 5' and 3' ends.	10




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3.	Translation in Eukaryote- Initiation, Elongation and Termination. Post-translational modification, protein targeting.	10
4.	Transposons: Types, mechanism and recombination, Applications of transposons in r-DNA technology.	10

Learning Outcomes:

At the end of the course the student would have basic knowledge of microbiology techniques and bacteria.

Teaching & learning Methodology:

- Use of audiovisual aids
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Basic Text & Reference Books:

- Genes – Benjamin Lewin
- Molecular Biology of the gene – Watson et al
- Molecular biology of the cell – Alberts et al



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SCHOOL OF SCIENCE

DEPARTMENT OF BIOTECHNOLOGY

BIOTECHNOLOGY -604

CODE : 53010604

B.Sc. 3rd Year

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	20	70	30	150

Objectives:- To provide basic knowledge Cell Biology

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Fluid Mosaic model of membrane: Functions of plasma membrane. Chemical composition of membrane-types & function of lipids, proteins and carbohydrate. Membrane fluidity.	10
2	Cytoskeleton (microtubules and microfilaments) functions and significance. Molecular motors.	08
3	Cell signaling –basic characteristics of cell signaling & significance, second messenger, Role	08




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	of G protein coupled receptors (GPCR) & receptor tyrosine kinases (RTK) in signaling pathway.	
4	Apoptosis: overview and significance. Regulation and control of apoptosis. caspases, activation of apoptotic pathways by internal and external stimuli. Cancer – introduction, types, mechanism, concept of proto-oncogenes and oncogenes.	08

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Cell Biology.

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Basic Text & Reference Books:

- Biochemistry-Lehninger
- Text book of biochemistry- Vasudevan & shreekumari



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Chemistry-601
CODE : 53020601
B.Sc. 6th Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	50	50	-	150

Objectives:- To provide basic knowledge Chemistry

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	(A) Synthetic Dyes Classification of Dyes- Anionic and Cationic dyes, Mordant and Vat dyes, Reactive and Dispersed dyes, Synthesis of Alizarin, Malachite green, Indigo, Congo red, Eosin. (B) Explosives Preparation of RDX, PETN, Nitroglycerine, Tetryl. (C) Pesticides: Preparation of Aldrine, Malathion, Parathion, Methoxychlor.	14
2	(A) Synthetic Drugs General Classification , Chemotherapy, Antipyretics, Analgesics, Hypnotics, Sedatives, Anaesthetics, Antimalerials, Antiseptics, Cardiovascular drugs. (Minimum two illustrations of each, only names without structures). Methods of preparation and of Antipyrine, Phenacetin, n-Hexyl resorcinol, Alprazolam, Zaleplon,	14



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	Benzocaine, Lidocaine, Chloroquine, Atenolol, Sulphadiazine, Trimethoprim and Tolbutamide. (B) Vitamins Structure and Biochemistry of Vitamin-A (A1) (Retinol), Vitamin-B6 (Pyridoxine).	
3	A) Alkaloids Classification, General method of determining structure, analytical and synthetic methods, structure of Coniine, Nicotine, Atropine and Papaverine. (B) Isoprenoids (Terpenoids) Classification, General method of determining structure, Isoprene rule, Chemistry of Citral, α -Terpineol, Camphor and their synthesis, study of reactions of β -carotene (No Synthesis).	14
4	(A) Stereo Chemistry Concept of prostereo isomerism and chiral synthesis (Asymmetric Induction), Cram's rule, Prelog's generalization, Prelog's rule and assignment of configuration. (B) Stereochemistry of compounds other than Carbon Stereo chemistry of the compounds containing Nitrogen. Phosphorus and Sulphur	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

- (1) Organic Chemistry: I. L. Finar, Vol-II, 5th Edition, Pearson Education Ltd.
- (2) Organic Chemistry: Morrison & Boyd, 6th Edition, Prentice Hall of India Pvt. Ltd.
- (3) Stereochemistry of carbon compounds: E. L. Eliel, Wiley Eastern Ltd.
- (4) Stereochemistry and mechanism through solved problems: P. S. Kalsi, New Age International.
- (5) Stereochemistry of Organic Compounds: Principles and Applications: D. Nasipuri; New Academic Science; 4th Revised Edition.
- (6) Organic Chemistry: Hendrickson, Cram, Hammond, Mc Graw-Hill.
- (7) Organic Chemistry: 6th Edition, John McMurry, Brooks Cole, International Edition.
- (8) Organic Chemistry: T.W. Graham Solomons and Craig B. Fryhle Wiley, 8th Edition.
- (9) Organic Chemistry: Francis A. Carey, Mc Graw-Hill, 7th Edition.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Chemistry-602
CODE : 53020602
B.Sc. 6th Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	50	50	-	150

Objectives:- To provide basic knowledge Chemistry

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Chemical bonding (II) The Huckel Molecular Orbital (HMO) theory, variation principle, solution of Secular equation, HMO treatment to ethylene molecule, allylic cation, allylic free radical and allylic anion, Hybridization: Hybridization wave functions of sp, sp ² and sp ³ .	14
2	(A) Term symbol Russel Saunders coupling and determination of Term symbols of the ground state. Calculation of number of microstates. Pigeon hole diagram of p ² and d ² configurations. Hund's rule. Hole formulation. (B) Electronic spectra of metal complexes Electronic spectra of transition metal complexes, Laporte orbital and spin selection rules. Orgel energy level diagram of d ⁵ and combined diagrams of d ¹ , d ² , d ³ , d ⁴ and their spectra. Jahn Teller distortion. Spectrochemical series.	14
3	(A) Metal carbonyls Mono and poly-nuclear metal carbonyls: Ni(CO) ₄ , Fe(CO) ₅ , Cr(CO) ₆ ,	14



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	$\text{Fe}_2(\text{CO})_9$, $\text{Fe}_3(\text{CO})_{12}$, $\text{Co}_2(\text{CO})_8$, $\text{Mn}_2(\text{CO})_{10}$, $\text{Ir}_4(\text{CO})_{12}$, $\text{Co}_4(\text{CO})_{12}$. Metal nitrosyl and metal carbonyl hydrides. Application of IR spectra in the determination of structure of metal carbonyls. (B) Organometallic compounds Definition, classification, synthesis (general methods), properties, structure and application of organometallic compounds of Mg, Al and Be, Structure of Ferrocene and dibenzene chromium.	
4	Quantum chemistry Setting up of operators for different observables, Hermitian operator, important theorems concerning Hermitian operator, Particle in a three dimensional box, The rigid Rotator, The Schrodinger equation in spherical polar coordinates for hydrogen atom, separation of variables, solution of R, Θ and Φ equations	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

- (1) Concise Inorganic Chemistry: J.D. Lee; Wiley India, 5th Edition (1996).
- (2) 'Shriver and Atkins' Inorganic Chemistry: Atkins, Overton, Rourke, Weller, Armstrong;
- (3) Oxford University Press, 5th Edition (2011).
- (4) Advanced Inorganic Chemistry: F.A. Cotton and Wilkinson G.; John Wiley, 5th Edition (1988).
- (5) Introductory Quantum Chemistry: A.K. Chandra; Tata- McGraw Hill, 4th Edition (1994).
- (6) Quantum chemistry: R.K. Prasad; New Age International, 4th Edition (2010).
- (7) Electron and chemical bonding: H. B. Grey, W.A.Benjamin. INC, New York.
- (8) Inorganic chemistry: James E. Huheey, 4th Edition, Wesley Publishing Company.
- (9) Mechanism of Inorganic reaction: Basalo and Pearson, 2nd Edition, Wiley Eastern Pvt Ltd.
- (10) Advanced Inorganic chemistry: (Vol. 1) Satya Prakash, Tuli, Basu and Madan; S. Chand
- (11) Advanced Inorganic chemistry: Gurdeep Raj; Goel Publishing House, 23rd Edition (1998).




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Chemistry-603

CODE : 53020603

B.Sc. 6th Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	50	50	-	150

Objectives:- To provide basic knowledge Chemistry

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Thermodynamics Colligative properties: Boiling point elevation and freezing point depression. Molal elevation constant (K _b) and Molal depression constant (K _f), Calculation of absolute value of entropy using third law of thermodynamics, Law of mass action using chemical potential, Partial molar quantity.	14
2	Electrochemistry Concentration cell: Cell with and without transference, Electrode concentration cell, Gas electrode concentration cell, Activity and activity coefficient determination, Define liquid junction potential and how it can be avoided, Equation for liquid junction potential, Decomposition potential, Overvoltage, Tafel equation	14
3	(A) Phase Rule Binary system : Zn-Cd and Pb-Ag, Zeotropic and azeotropic mixtures, Steam distillation, Zone refining.	14



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	(B) Osmosis Desalination and reverse osmosis, Electrodialysis, Electrochemistry and pollution control, Removal of Cu, Ag and Fe from waste water.	
4	(A) Photochemistry Laws of Photochemistry : Grothuss-Draper Law, Einstein Law, Quantum yield, Reasons for high and low quantum yield, Fluorescence and Phosphorescence, Chemiluminescence, Photosensitized reactions. (B) Metallic Corrosion Types of corrosion, Electrochemical series, Corrosion in acidic and neutral medium, Differential aeration principle, Atmospheric corrosion, Prevention of corrosion by various factor.	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

- (1) Physical Chemistry: G. M. Barrow, 5th Edition, McGraw-Hill education, India.
- (2) Advanced Physical Chemistry: Gurdeep Raj, 35th Edition (2009), Goel / Krshina Publishing House.
- (3) Principles of Physical Chemistry: Puri, Sharma and Pathania, 42nd Edition, Vishal Publishing Company.
- (4) Polymer Science: Gowariker, Viswanathan and Sreedhar, 1st Edition (2012 reprint) New Age International.
- (5) Essentials of Nuclear Chemistry: Arnikaar, 4th Edition (2012 reprint), New Age International.
- (6) Physical Chemistry: Atkins, 9th Edition. Oxford University Press.
- (7) Advanced Physical chemistry: Gurtu and Gurtu, 11th Edition , Pragati Prakashan.
- (8) Physical chemistry: Levine, 6th Edition, McGraw-Hill education, India.



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Chemistry-604
CODE : 53020604
B.Sc. 6th Semester

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	50	50	-	150

Objectives:- To provide basic knowledge Chemistry

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	(A) Errors and treatment of Analytical data: Significant figures, Accuracy and precision, Types of errors and minimization of errors. Ways of expressing accuracy and precision. Rejection of a result, Test of significance (Q-Test, Student t-Test and F-Test) correlation coefficient. Literature of Analytical Chemistry. (B) Organic reagents used in quantitative Analysis Separation of methods with 8-Hydroxy Quinoline, Cupferron and DMG	14
2	(A) Chromatographic methods: General principle, classification of chromatographic separation. Ion exchange chromatography (Ion Exchange equilibria, Types of Ion Exchange capacity, Application of Ion Exchange resins). Gas Chromatography, Instrumentation and evolution of data. High Performance Liquid Chromatography (HPLC) Principle and Instrumentation.	14



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	(B) Solvent Extraction Separation: Principles of solvent extraction, choice of solvent, distribution coefficient, distribution ratio, percentage (%) extraction. The extraction process, solvent extraction of metals, selective extraction and separation efficiency.	
3	(A) Polarography: Introduction, Principle, electrode, Types of currents, Determination of half wave potential, Ilkovic equation, methods of determining concentration (Standard addition method and Calibration method) (B) Potentiometry: The scope of potentiometric titrations, Precipitation and neutralization titrations, Graphical method including Gran's plot for selecting end point, Differential titration, Dead stop titration, Ion selective Electrode, various types of Ion selective Electrodes and use of Calcium ion selective electrode.	14
4	Miscellaneous Titrations: (A) Acid Base Titrations: Titration of polyprotic acid and mixture of acids, titration of salts, Differential Alkali titration. (B) Redox titration: Titration involving Iodine: iodimetry and iodometry, Titration with reducing agents and oxidising agents, metallic reductors. (C) Complexometric titration: EDTA titration techniques-Direct, Back, Displacement and Indirect Titration, Masking, Demasking agent, ligand effect and Hydrolysis of EDTA complex, Auxiliary complexing agent- EDTA titration with an auxiliary complexing agent.	14

Learning Outcomes:-

At the end of the course the student would have sufficient knowledge of Biochemistry

Teaching & Learning Methodology:-

- Use of audiovisual aids.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Books Recommended:

- (1) Analytical Chemistry: Gary D. Christian, 6th Edition; Wiley & Sons
- (2) Fundamentals of Analytical Chemistry: D. A. Skoog, D. M. West and F. J. Holler, 9th Edition, Cengage Learning.
- (3) Instrumental Methods of analysis: (CBS) H.H . Willard, L.L. Mirrit, J.A. Dean
- (4) Solvent extraction in Analytical Chemistry: G.H. Morrison, F. Frieiser, John Wiley & Sons, NY.
- (5) Instrumental Methods of Inorganic Analysis: A.I. Vogel, ELBS
- (6) Chemical Instrumentation: A Systematic approach- H.A. Strobel
- (7) The principals of ion-selective electrodes and membrane transport: W.E.Morf




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- (8) Principles of Instrumental Analysis: Douglas A. Skoog., F. James Holler, Stanley R. Crouch, Cengage Learning; 6th Edition.
- (9) Quantitative Chemical Analysis: Daniel C. Harris, W H Freeman, New York.
- (10) Ion exchange and solvent extraction of metal compounds: Y. Macros, A.S.Kertes, Wiley, Interscience.




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SWARNIM STARTUP & INNOVATION UNIVERSITY

SCHOOL OF SCIENCE

SEMESTER-VI

DEPARTMENT OF CHEMISTRY

CHEMISTRY PRACTICAL

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	30	20	70	30	150

Objectives:- To provide basic knowledge Chemistry

Practical [I] (Inorganic and Physical Practicals)

[A] Inorganic Quantitative Analysis:

(I) Gravimetric determination of the radicals:

(After removal of interfering radicals in mixed solution)

- (a) BaCl_2 , FeCl_3 and HCl (Determination of Ba as BaSO_4)
- (b) CuCl_2 , MnCl_2 and HCl (Determination of Mn as $\text{Mn}_2\text{P}_2\text{O}_7$)
- (c) CuSO_4 , $\text{FeSO}_4(\text{NH}_4)_2\text{SO}_4$ and H_2SO_4 (Determination of Fe as Fe_2O_3)
- (d) CuSO_4 , $\text{Al}_2(\text{SO}_4)_3$ and H_2SO_4 (Determination of Al as Al_2O_3)

(II) Analysis of Alloy:

- (a) Brass (Cu $\rightarrow$ Volumetrically, Zn $\rightarrow$ Gravimetrically)
- (b) German Silver (Cu $\rightarrow$ Volumetrically, Ni $\rightarrow$ Gravimetrically)

[B] Physical: (Kinetics and Instruments)

(1) Kinetics:

Investigate the order of reaction in the following experiments by graphical method .

Exp 1: Reaction between $\text{K}_2\text{S}_2\text{O}_8$ and KI ($a=b$)




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Exp 2: Reaction between KBrO_3 and KI (a $\square$ b)

Exp 3: Reaction between H_2O_2 and HI (a = b)

(2) Instruments:

Exp 1: Titration of unknown strength of HCl with standard NaOH solution using pH meter.

Exp 2: Conductometric titration involving precipitation of BaCl_2 with K_2CrO_4 .

Exp 3 : To determine the concentration of CrO_4^{2-} and Ni^{2+} in solution by colourimetry.

Exp 4 : To determine specific rotation of glucose and hence to find out unknown concentration of glucose in given solution by optical (polarimetric) measurements.

Reference Books

(1) Vogel's "Textbook of Quantitative Chemical Analysis": Pearson Education Ltd. 6th Edition, 2008.

(2) Vogel's "Qualitative Inorganic Analysis": Pearson Education Ltd. 7th Edition, 2009.

(3) Gurdeep Raj, "Advanced Practical Inorganic Chemistry": Krishna Prakashan, Meerut, 21st Edition, 2009.

(4) J. B. Yadav, "Advanced Practical Physical Chemistry": Krishna Prakashan, Meerut, 29th Edition, 2010.

(5) P. H. Parsania, "Experiments in Physical Chemistry": Neminath Printers Rajkot 1st Edition 2004.

(6) A. M. James and F. E. Prichard, "Practical Physical Chemistry": Longman Group Limited London 3rd Edition Reprinted 1979. Guj. Uni. Chemistry Syllabus – B.Sc. Sem-VI
Page 13

Practical [II] (Organic and Analytical Practicals)

[A] Organic:

Organic separation and Identification:

Separation of Binary Mixtures and Identification (Minimum 8 Mixtures)

(i) Solid + Solid (4 Mixtures)

(ii) Solid + Liquid (2 Mixtures)

(iii) Liquid + Liquid (2 Mixtures)

One Mixture from each of the following should be given Acid-Base, Acid-Phenol, Acid-Neutral, Phenol-Base, Phenol-Neutral, Base-Neutral, and Neutral-Neutral. Water soluble compounds are included.

Identification of separated organic compound must be done by physical and chemical tests, sodium fusion test, M.P / B.P., derivatives and crystallization.

[B] Analytical:

Volumetric Analysis:

(1) Estimation of Fe^{3+} by EDTA (Back Titration)

(2) Estimation of Bi^{3+} by EDTA

(3) Estimation of Chloride by silver nitrate (Mohr's Method)

(4) Estimation of Zn^{2+} and Cd^{2+} in a mixture by EDTA

(5) Estimation of Ca^{2+} and Mg^{2+} in a mixture by EDTA

(6) Determination of percentage purity of H_2O_2 solution by Iodometry method.

Reference Books

(1) A. I. Vogel, "Elementary Practical Organic Chemistry Part-II, Qualitative Organic Analysis": CBS Publishers & Distributors, New Delhi, 2nd Edition, 2004.

(2) A. I. Vogel, "Elementary Practical Organic Chemistry Part III Quantitative Organic Analysis": CBS Publishers & Distributors, New Delhi, 2nd Edition, 2004.

Hand book of Organic qualitative analysis by H. T. Clarke.



- (4) Practical Organic Chemistry: F. G. Mann and B. C. Saunders. Low – priced Text Book. ELBS, Longman.
- (5) V.K. Ahluwalia, Sunita Dhingra, “Comprehensive Practical Organic Chemistry –Qualitative Analysis”: University Press (India) Private Limited, Hyderabad, 1st Indian Edition, 2010.
- (6) “Advanced Practical Organic Chemistry”: Stanley Thornes Publishers Ltd., J Leonard, B Lygo, G Procter, 1st Indian Edition, 2004.
- (7) “Quantitative Analysis”: R. A. Day, A. L. Underwood, Prentice-Hall of India Pvt. Ltd., New Delhi, 6th Edition, 2004.




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SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

MATHEMATICS-601

Subject Code: 53030601

B.Sc. Semester -6

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Student are evaluated on the basis of Mid term examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	2	-	5	5	50	50	50	-	150

Objectives

- To provide students the Concept of Riemann integration, Infinite series and Taylor's series, different type of function.
- The aim of this subject is to present the important ideas in advanced calculus using multiple method to student whose principal interest lie outside the field of mathematics.
- It is a subject which provide a vital arena where students can see the interaction of mathematics and machine computation.

Prerequisites

A Candidate for admission to the bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.

Course outline: This Course designed for undergraduate and graduate students working on Riemann integration and Infinite series.




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Sr. No.	Course Contents	Teaching hours
1	Unit I Riemann Integration Definition of the integral, Properties of the integral Existence theory (monotone, continuous functions etc. (includes Riemann sums) Fundamental theorem Integration by parts and change of variable , Mean value theorems (Weierstrass's Form and Bonnet's Form) (First and Second)	14
2	Unit: II Infinite series Basic Theory (covers upto comparison test), Series with positive terms (Condensation Test, Pringsheim's Test) Absolute convergence (includes alternating series) , ratio and root tests with $\limsup$ And $\liminf$	12
3	Unit: III Infinite Series –II Rearrangement of series, Cauchy Product of Series , Merten's theorem Power Series Improper integrals of the first and second kind.	10
4	Unit: IV Taylor Series Taylor's Theorem with Lagrange and Cauchy form of remainders , Expansions of exponential, logarithmic and trigonometric functions Binomial series theorem Power series solutions of differential equations	10

Learning Outcomes

After Successfully Completion of the Course the student will be

- Student can learn to solve the Riemann IntegrationI, Infinite series and Taylor Series.
- Appreciate how abstract ideas and rigorous methods in mathematical analysis can be applied to important practical problems.




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- Describe fundamental properties of the real numbers that lead to the formal development of real analysis.
- Comprehend rigorous arguments developing the theory underpinning real analysis.
- Demonstrate an understanding of limits and how they are used in sequences, series, differentiation and integration;
- Construct rigorous mathematical proofs of basic results in real analysis;

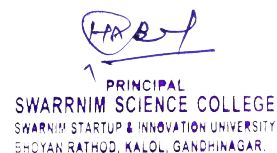
Teaching & Learning Methodology

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. E.Kreyszing , Advanced Engineering Mathematics , Fifth edition , New Age International (P) Ltd., New Delhi , 1997.
2. B.S.Grewal, Higher Engineering Mathematics.
3. Mathematical Analysis by S.C. Malik, Wiley, Eastern Ltd., New Delhi
4. Mathematical Analysis by T.M. Apostol, Narosa Publishing House, New Delhi
5. A course of mathematical Analysis by Shanti Narayan , S.Chand & Co., New Delhi



E-Resources :

- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics. <https://swayam.gov.in/> and <https://nptel.ac.in/>
- <http://www.freebookcentre.net/maths-books-download/Real-Analysis-Lecture-Notes-by-Itay-Neeman.html>
- <http://www.freebookcentre.net/maths-books-download/Real-Analysis-Notes-by-Manonmaniam-Sundaranar-University.html>
- <http://www.freebookcentre.net/maths-books-download/Real-Analysis-Notes-by-Prof.-Sizwe-Mabizela.html>




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SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

MATHEMATICS-602

Subject Code: 53030602

B.Sc. Semester -6

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Student are evaluated on the basis of Mid term examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	2	-	5	5	50	50	50	-	150

Objectives

- To provide students the Concept of Ring, Subring and its properties, Polynomial Ring and Field.
- The aim of this subject is to present the important ideas in advanced calculus using multiple method to student whose principal interest lie outside the field of mathematics.
- It is a subject which provide a vital arena where students can see the interaction of mathematics and machine computation.

Prerequisites

A Candidate for admission to the bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.




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Course outline: This Course designed for undergraduate and graduate students working on Ring and Field. This course serves as an introduction to Ring and Field to Pure mathematics .

Sr. No.	Course Contents	Teaching hours
1	Unit I Rings Definition and examples, commutative ring, division ring, unity and unit elements of a ring, Field, properties of a ring, Boolean ring, Finite rings. Integral Domain: Zero divisor, Definition and examples of Integral Domain (Finite and of infinite order), Characteristic of a ring	14
2	Unit: II Subrings Definition and examples, necessary and sufficient criterion for subring, Ideals: Definition and examples, necessary and sufficient criterion for ideal, principal ideal ring, quotient ring and its operation tables Homomorphism: Definition and some examples, Kernel of homomorphism, Isomorphism of rings, Fundamental theorem on homomorphism, homomorphism and characteristic	12
3	Unit: III Polynomial ring Introduction and definition of polynomial, degree of polynomial, operation between polynomials, Integral domain $D[x]$, different types of polynomials, factorization of polynomials, Division algorithm for polynomials, irreducibility of polynomial over field, Remainder and factor theorem, solution of polynomial equation, zero of polynomial, c, rational zero of polynomial.	10
4	Unit: IV Field Field, Subfield, Extension field, The field of quotients and integral domain, Prime fields, Finite fields, Maximal ideals, Prime ideals and their characterization through quotient ring.	10



Learning Outcomes

After Successfully Completion of the Course the student will be

- Student can understand the concept of Ring , Subring , Polynomial Ring , Field, Factorization of a ring, Homeomorphism and Isomorphism of a ring they can apply different properties on them
- Student able to solve the real word problem by using Ring and Field.
- Students able to solve integration and differentiation of series..
- In Ring .
- Student will understand Field ,integration and differentiation of a series.
- Identify the degree, leading coefficient, and leading term of a polynomial expression

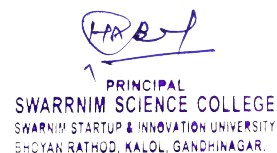
Teaching & Learning Methodology

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs.
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

6. Abstract Algebra by .Scott M Lalonde.



7. Contemmoorary abstract algebra-Joseph A. Gallian(Fourth edition).
8. Abstract Algebra by John Perry.
9. Mathematical Analysis by T.M. Apostol, Narosa Publishing House, New Delhi
10. A course of mathematical Analysis by Shanti Narayan , S.Chand & Co., New Delhi

E-Resources :

- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics. <https://swayam.gov.in/> and <https://nptel.ac.in/>
- <https://open.umn.edu/opentextbooks/textbooks/217>
- <https://ocw.mit.edu/courses/mathematics/18-703-modern-algebra-spring-2013/lecture-notes/>
- <https://www.freebookcentre.net/maths-books-download/Notes-on-Abstract-Algebra-by-John-Perry.html>
- <https://www.freebookcentre.net/maths-books-download/Notes-on-Abstract-Algebra-by-Scott-M.-LaLonde.html>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

MATHEMATICS-603

Subject Code: 53030603

B.Sc. Semester-6

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Students are evaluated on the basis of Mid term examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	2	-	5	5	50	50	50	-	150

Objectives

- To provide students the Concept of Metric space, Continuity and connectedness and integration and differentiation of series.
- The aim of this subject is to present the important ideas in Analysis-III using multiple methods to students whose principal interest lies outside the field of mathematics.
- It is a subject which provides a vital arena where students can see the interaction of mathematics and machine computation.

Prerequisites

A Candidate for admission to the Bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.




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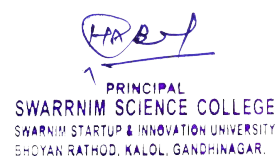
Course outline: This Course designed for undergraduate and graduate students working on Metric Spaces and integration and differentiation of series. This course serves as an introduction to Metric spaces used to Pure mathematics .

Sr. No.	Course Contents	Teaching hours
1	Unit I Metric Spaces Definition and Examples, Open Sets.Closed Sets, Convergence, Completeness and Baire's Theorem.	10
2	Unit: II Continuity, Compactness and Connectedness Compact sets, Connected sets, Continuous functions ,Continuity and compactness Continuity and connectedness	10
3	Unit: III Uniform Convergence, Pointwise Convergence Uniform Convergence, Uniform Convergence and Continuity, Uniform Convergence and Differentiation Term by Term Integration of Series, Term by Term Differentiation of Series	12
4	Unit: IV Power series (advanced), Abel's limit theorem, multiplication of power series(Expert sterling's formula), Taylor's series, Weierstrass approximation theorem, exponential, logarithmic and trigonometric functions	12

Learning Outcomes

After Successfully Completion of the Course the student will be

- Demonstrate understanding of the basic concepts, theorems and calculations of Normed, Metric Spaces.
- Demonstrate understanding of the open-set definition of continuity and its relation to previous notions of continuity, and applications to open or closed sets.
- Demonstrate understanding of the basic concepts, theorems and calculations of the concepts of Compactness, Connectedness and Completeness (CCC).



- Demonstrate understanding of the connections that arise between CCC, their relations under continuous maps, and simple applications.

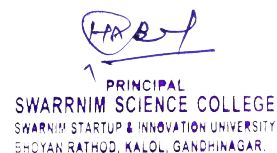
Teaching & Learning Methodology

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

11. E.Kreyszing , Advanced Engineering Mathematics , Fifth edition , New Age International (P) Ltd., New Delhi , 1997.
12. B.S.Grewal, Higher Engineering Mathematics.
13. Mathematical Analysis by S.C. Malik, Wiley, Eastern Ltd., New Delhi
14. Mathematical Analysis by T.M. Apostol, Narosa Publishing House, New Delhi
15. A course of mathematical Analysis by Shanti Narayan , S.Chand & Co., New Delhi
16. W A Sutherland, Introduction to Metric and Topological Spaces, OUP.
17. E T Copson, Metric Spaces, CUP.
18. W Rudin, Principles of Mathematical Analysis, McGraw Hill.



E-Resources :

- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics. <https://swayam.gov.in/> and <https://nptel.ac.in/>
- https://www.mathcity.org/msc/notes/metric_spaces_notes
- https://msu.edu/~schenke6/Lecture_Notes/921_Lecture_Notes.pdf




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MATHEMATICS

MATHEMATICS-604

Subject Code: 53030604

B.Sc. Semester-6

Teaching & Evaluation Scheme

The objective of evaluation is not only to measure the performance of student, but also to motivate them for better performance. Students are evaluated on the basis of Mid term examination and end examination Conducted by university.

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	2	-	5	5	50	50	50	-	150

Objectives

- To provide students the Concept of vector Graph, Representation of a graph and Matrix Representation of a graph . .
- The aim of this subject is to present the important ideas in Graph Theory using multiple method to student whose principal interest lie outside the field of mathematics.
- It is a subject which provide a vital arena where students can see the interaction of mathematics and machine computation.

Prerequisites

A Candidate for admission to the bachelor of Science (Mathematics) must have a 10+2 Science with A and B (Maths and Physics) Group. Provisional admission shall be provided subject to the Clearance of examinations and eligibility.




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Course outline: This Course designed for undergraduate and graduate students working on Graph Theory . This course serves as an introduction to Graph and Matric representation of Graph used to applied mathematics problems. .

Sr. No.	Course Contents	Teaching hours
1	Unit I Introduction of Graphs Definition and elementary properties of graphs, Isomorphism of graphs, Sub graphs, Walks, Paths and circuits, Connected graphs, Euler graphs, Operations on graphs, Hamiltonian circuits, Definition and properties of tree.	10
2	Unit: II Graph Representation Centres in a tree, Rooted and Binary tree, Spanning trees, Fundamental circuits, cut set and its properties, Planar graphs and Representation of planar graphs.	12
3	Unit: III Cut set ,connectivity and Seperability Planar graphs and their different representation , Dual of a planar graph ,Euler's formula , Kuratowski's first and second non-planar graph, vector space associated with a graph , Circuit subspace and cut sets subspace Orthogonal space.	12
4	Unit: IV Matrix Representation of a graph Vertex coloring , Chromatic number ,Index number and partition , Cyclic graph and demyelization of cyclic graphs ,Matrix representation of a graph, Adjacency matrix, Incidence matrix, Path matrix circuit matrix ,fundamental circuit matrix and cut set matrix, relationship of these matrices ,rank of the adjacency matrix.	12

Learning Outcomes

After Successfully Completion of the Course the student will be

- Demonstrate knowledge of the syllabus material.
- Write precise and accurate mathematical definitions of objects in graph theory.
- Use mathematical definitions to identify and construct examples and to distinguish examples from non-examples.




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- Validate and critically assess a mathematical proof.
- Use a combination of theoretical knowledge and independent mathematical thinking in creative investigation of.
- Reason from definitions to construct mathematical proofs.
- Write about graph theory in a coherent.

Teaching & Learning Methodology

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Graph theory with application to engineering and computer science by Narsingh Deo.1993, Prentice Hall of India Pvt. Ltd.
2. Foundation of Discrete Mathematics, K.D. Doshi, New Age International Ltd. Publishers.
3. A first look at Graph theory, by Clark.
4. Discrete Mathematics Structures with application to computer science, by Tremblay I.P & Manohar R.
5. Elements of Discrete Mathematics by L.Liu, Me Edition) by L.Liu, Me.
6. Discrete Mathematics, by Vasta, Vikas Publications.



7. Introduction Graph Theory, By R.J.Willson.
8. Discrete Mathematics Structure, By. Dugragi N.

E-Resources :

- SWAYAM PORTEL/ NPTEL- online courses on mathematical and quantum mechanics. <https://swayam.gov.in/> and <https://nptel.ac.in/>
- <https://cs.bme.hu/fcs/graphtheory.pdf>
- <https://www.geeksforgeeks.org/mathematics-graph-theory-basics-set-1/>
- <http://www.personal.psu.edu/cxg286/Math485.pdf>




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SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

MICROBIOLOGY -601

CODE:53040601

B.Sc. 3rd Year

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	--	50	50	150

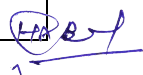
Objectives:- To provide basic knowledge Enzymology

Prerequisites:-

Course outline:- Enzymology

Sr. No.	Course Contents	Number of Hours
1.	Enzymology- General characteristics and classification, definition of holoenzymes, coenzymes, apoenzymes, cofactors, activators, inhibitors, units of enzyme activity, isoenzymes, turn over number, specific activity, first order and zero order reactions. Structure of active site of enzymes, specificity of enzyme action- Types and factors affecting enzyme activity. Brief introduction of allosteric enzymes	12
2.	Enzyme kinetics- Derivation of Michaelis and Menten equation and its modifications (Line	10




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	weaver & Burk plot, Eadie-Hofstee and Hanes & Woolf plots). Enzyme Inhibition – competitive, non competitive, uncompetitive, mixed & substrate inhibition.	
3.	Enzyme immobilization- types, methods, application, advantages & limitations. Introduction to reverse micelles.	8
4.	Sources and applications of enzymes- amylase, protease and lipase in industries (detergent, leather, food, dairy, Textile and medical). Industrial production of enzymes.	8

Learning Outcomes:

At the end of the course the student would have basic knowledge of Enzymology.

Teaching & learning Methodology:

- Use of audiovisual aids
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Basic Text & Reference Books:

- Enzymology –Palmer
- Textbook of biochemistry – Vasudevan Shreekumari
- Biochemistry - Lehninger



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

MICROBIOLOGY -602

CODE : 53040602

B.Sc. 3rd Year

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	--	50	50	150

Objectives:- To provide basic knowledge Industrial Biotechnology

Prerequisites:-

Course outline:- Industrial Biotechnology

Sr. No.	Course Contents	Number of Hours
1.	Fermentation (definition and applications), media (crude and synthetic), and sterilization of media . Screening- primary and secondary. Strain improvement	12
2.	Design of fermentor (aeration, agitation and body construction), Downstream processing- Filtration, centrifugation, cell disruption, precipitation & solvent extraction .	10
3.	Effect of aeration and agitation, methods of estimating C_{crit} and KL_a. Measurement of pH and temperature.	8
4.	Production of ethanol, cheese, beer, red & white	8




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	wine, sparkling wine (champagne) Spoilage and preservation of food.	

Learning Outcomes:

At the end of the course the student would have basic knowledge of industrial microbiology

Teaching & learning Methodology:

- Use of audiovisual aids
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Basic Text & Reference Books:

- Industrial microbiology – Whitaker
- Industrial microbiology –AH Patel
- General microbiology - Frobisher




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

MICROBIOLOGY -603

CODE : 53040603

B.Sc. 3rdYear

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	--	50	50	150

Objectives:- To provide basic knowledge of Metabolism.

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1.	Non Specific Host Defense Mechanisms: Phagocytosis, Complement, Inflammation, Cytokines , Cells, Tissues & Organs of the Immune System.	8
2.	Specific Immune Responses: I Antigens, Haptens, Cluster of Differentiation Molecules, Humoral & Cell Mediated Immunity. T Cell Biology - T Cell receptors, Types of T	8




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	Cells, T Cell Activation. B Cell Biology - B Cell Receptors, B cell Activation.	
3.	Specific Immune Responses: II Antibodies - (Immunoglobulins - Definition, Structure & Function , Classes of Immunoglobulins. Antigen-Antibody Reactions: General Features, Measurement of Antigen & Antibody. Serological Reactions : Precipitation Reactions, Definition, Mechanism - Zone Phenomenon & Lattice Hypothesis. Applications - Precipitation in Liquid Medium. Agglutination reactions- Definition, Applications - Slide agglutination test. Tube agglutination test, Passive agglutination test. Primary & Secondary Antibody response. Diversity of Antibodies , Clonal Selection Theory Monoclonal Antibody Technology.	10
4.	Immune Disorders: Immuno Deficiency. Hypersensitivity Autoimmunity - Mechanism & Classification of Autoimmune diseases. Immunology of Transplantation: Classification of Transplants. Allograft reaction (mechanism) Factors favouring Allograft survival . Graft v/s Host reaction. Immunology of Malignancy.	8

Learning Outcomes:

At the end of the course the student would have basic knowledge of microbiology techniques and bacteria.

Teaching & learning Methodology:




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- Use of audiovisual aids
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Basic Text & Reference Books:

- Text book of Microbiology –Ananthnarayan & Panikar
- Microbiology – Prescott, Harley & Klein




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SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

MICROBIOLOGY -604

CODE : 53040604

B.Sc. 3rd Year

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	2	5	5	50	--	50	50	150

Objectives:- To provide basic knowledge of Metabolism.

Prerequisites:-

Course outline:-

Sr. No.	Course Contents	Number of Hours
1.	Nitrogen fixation - Structure & mechanism of nitrogenase. - Definition, Azotobacter & Rhizobia (With Production) Microbial insecticides.	8
2.	Bioleaching & bioleaching of Copper. Biodeterioration of wood, paint & metal. Bioremediation-introduction. Bioremediation of petroleum hydrocarbon & chlorinated compounds.	8




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	Microbial enhanced oil recovery..	
3.	Concept of xenobiotics & recalcitrance. Biomagnification. Biodegradation of environmental pollutants. (ABS, Chlorinated hydrocarbons, Oil pollutants.) Biodegradable polymers.	8
4.	Introduction to biofuels. Renewable & nonrenewable energy resources. Features of biofuels. Biogas - substrate, microorganisms & production. Advantages & disadvantages of Biogas production.	8

Learning Outcomes:

At the end of the course the student would have basic knowledge of microbiology techniques and bacteria.

Teaching & learning Methodology:

- Use of audiovisual aids
- Use of charts.
- Student interaction, group discussion, seminar, quizzes, assignment, brain storming session.

Basic Text & Reference Books:

- Principles of Microbiology – RM Atlas
- Microbiology – Prescott LM
- Biotechnology- BD Singh



SWARNIM STARTUP & INNOVATION UNIVERSITY (SSIU)

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PHYSICS -601

Code: 53050601

B.Sc. Semester 6

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	50	50	50	-	150

Objectives: -

Physics students will:

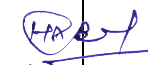
- Develop a solid grasp of core concepts and applications of differential equation, 2nd order differential equation, classical mechanics and quantum mechanics. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites:- Engineering physics majors must have a basic understanding of fundamental physics and mathematics.

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Some special functions in Physics: Bessel functions, Bessel functions of the second kind, Henkel functions, Spherical Bessel functions, Legendre polynomials, Associated Legendre polynomials and spherical harmonics, Hermite polynomials, Laguerre polynomials, The gamma function, the Dirac delta	12




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	function, examples.	
2	Variational principle : Lagrange's and Hamiltons equations : Introduction, Configuration space, Some techniques of calculus of variation, the delta-notation, Applications of the variational principle, Hamilton's principle, Equivalence of Lagrange's and Newton's equations, Advantages of the Lagrangian formulation -Electromechanical analogies, Lagrange's undetermined multipliers, Lagrange's equation for non-holonomic systems, Applications of the Lagrangian method of undetermined multipliers, Hamilton's equations of motion, some applications of the Hamiltonian formulation, Phase space, Comments on the Hamiltonian formulation.	12
3	Three dimensional square well potential: Solutions in interior region, Solutions in the exterior Region and Matching, Solution of the radial Equation: energy levels, Stationary state wave functions, Discussion of bound states, Solution of confluent hypergeometric functions, non localized states, solution in parabolic coordinates, the anisotropic oscillator, the isotropic oscillator, normal modes of coupled systems of particles, a charged particle in a uniform magnetic field	12
4	Representations, Transformations and Symmetries: Quantum states, state vectors and wave function, The Hilbert space of state vectors, Dirac notation, Dynamical variables and linear operators, Representations, Continuous basis - The Schrödinger representation, Degeneracy, Labeling by commuting observable, change of basis, Unitary transformations, Unitary transformation induced by change of coordinate system: translation, Unitary transformation induced by Rotation of coordinate system, The algebra of Rotation generators, transformation of dynamical variables, Symmetries and conservation laws, the space inversion, time reversal.	12

Learning Outcomes:- Graduates of the Physics major fulfill the following outcomes as part of their education in physics:

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.



Teaching & Learning Methodology:-

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programme/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programme/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures
- Draw upon the experience and expertise of staff from other countries and/or visiting academics

Books Recommended:

- Mathematical Physics by P.K. Chattopadhyay, New Age International Publishers (2006)
- Mathematical Methods for Physicists by G. Arfken, Academic Press
- Introduction to Classical Mechanics by R. G. Takawale and P. S. Puranik, Tata McGraw-Hill Publishing Co. Ltd.
- Classical Mechanics by A. B. Bhatia, Narosa Publication
- A Text Book of Quantum Mechanics by P. M. Mathews and K. Venketeshan, Tata McGraw-Hill Publishing Co. Ltd.
- Quantum Mechanics : Theory and Applications by A. Ghatak and S. Lokanathan, Macmillan India Limited

E-Resources:

List of Open Source Software/learning website:

- The Flying Circus of Physics 2nd edition by Jearl Walker, Wiley India
- Six Ideas that shaped physics by Thomas A Moore, McGraw Hill education
<http://www.howstuffworks.com/> -- Tech stuff
- How things works by Louis A Bloomfeild, Wiley Publications



- Physics of Everyday Phenomena by W. Thomas Griffith, Juliet Brosing, McGraw Hill Education
- Latest journals like BBC Knowledge, How things work-everyday technology explained by National Geographics.
- <http://www.sciencefairadventure.com/>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PHYSICS -602

Code: 53050602

B.Sc. Semester 6

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	50	50	50	-	150

Objectives: -

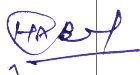
Physics students will:

- Develop a solid grasp of core concepts and applications of differential equation, 2nd order differential equation, classical mechanics and quantum mechanics. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites:- Engineering physics majors must have a basic understanding of fundamental physics and mathematics.

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Electronic Spectra: Electronic Spectra, salient features, formation of electronic spectra, Vibrational (Gross) structure of electronic band system in emission, electronic band spectra in absorption, Rotational structure of electronic bands; Rotational structure of three branch bands; observed intensity	12



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	distribution (vibrational) in band systems : Franck-Condon principle; explanation of intensity distribution in absorption bands from Franck-Condon principle. Explanation of intensity distribution in emission bands : Condon parabola. Line intensities in a band: Rotational intensity distribution. Quantum mechanical Exploring Franck-Condon principle.	
2	Transport Phenomena: Introduction, Mean collision time, Scattering cross-section, viscosity, electrical conductivity, thermal conductivity, thermionic emission, photoelectric effect, molecular collision, effusion, diffusion, Brownian motion, Einstein's relation for mobility	12
3	Theory of Dielectrics: Polarization, Dielectric constant, Local Electric field, Dielectric polarizability, Sources of polarizability, theory of electric polarizability and optical absorption, ionic polarization, polarization from dipole orientation, dielectric losses, Applications to optical phonon modes in ionic crystals, the longitudinal optical mode, the transverse optical mode, the interaction of electromagnetic waves with optical modes, application to the motion of electrons in polar crystals.	12
4	Diamagnetism and paramagnetism: Langevin's theory of diamagnetism, Langevin's theory of paramagnetism, theory of atomic magnetic moment, Hund's Rule, Quantum theory of magnetic susceptibility: A quantum mechanical formulation, Diamagnetism, Paramagnetism, application to magnetic ions in solids: effect of the crystal field, van Vleck paramagnetism, Pauli paramagnetism, Nuclear paramagnetism, Cooling by adiabatic demagnetization, magnetic resonance, ESR, NMR, Spin relaxation, line width and line shape	12

Learning Outcomes:- Graduates of the Physics major fulfill the following outcomes as part of their education in physics:

- Exercise the use of physical intuition, including the ability to guess an approximate or conceptual answer to a physics problem and recognize whether or not the result of a calculation makes physical sense.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically, and/or in writing the results of theoretical calculations and laboratory experiments in a clear and concise manner that incorporates the stylistic conventions used by physicists worldwide.



Teaching & Learning Methodology:-


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We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

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- Include group work, with groups representing diverse cultures
- Draw upon the experience and expertise of staff from other countries and/or visiting academics

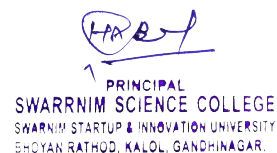
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- Physics of Everyday Phenomena by W. Thomas Griffith, Juliet Brosing, McGraw Hill Education
- Latest journals like BBC Knowledge, How things work-everyday technology explained by National Geographics.
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SWARNIM STARTUP & INNOVATION UNIVERSITY (SSIU)

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF PHYSICS

PHYSICS -603

Code: 53050603

B.Sc. Semester 6

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	50	50	50	-	150

Objectives: -

Physics students will:

- Develop a solid grasp of core concepts and applications of differential equation, 2nd order differential equation, classical mechanics and quantum mechanics. They learn how physics and other disciplines have impacted and continue to impact each other and society
- They develop laboratory skills throughout our curriculum via hands-on experiences with diverse experimental techniques and tools. They learn various approaches to data analysis and become comfortable using computational methods to analyze and solve problems.

Prerequisites:- Engineering physics majors must have a basic understanding of fundamental physics and mathematics.

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Motion of charged particles in Magnetic & Electric field: Microscopic & Macroscopic description, Maxwell's equation & charge conservation, Motion of a charged particle in electric & Magnetic fields, Uniform magnetic field & Oscillating electric field, Drift velocity in a gravitational field, Magnetic field	12




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	varying in space & time : adiabatic variance of the magnetic moment, Inhomogeneous magnetic field : gradient drift & curvature drift, peculiarity of drift motions, Converging magnetic field : magnetic mirror, Longitudinal adiabatic invariant, Periodic magnetic field : Gyro relaxation effect, Motion of magnetic lines of force.	
2	Characteristics of plasma in magnetic field: Description of plasma as gas mixture, Properties of plasma in a magnetic field, Force on plasma in magnetic field, Current in magnetized plasma, Diffusion in a magnetic field, Collisions in fully ionized magnetoplasma, Pinch effect, Oscillations and waves in the Plasma. Application of Boltzmann-Vlasov equation on plasma: Boltzmann equation, Fokker-Planck equation, Debye screening, Equilibrium distribution function and Boltzmann's H-theorem, Application of B-V equation to longitudinal waves: Dispersion relations., Initial value problem: Landau damping, Cyclotron damping, Excitation, two-stream instability: Beam plasma instability, Pinch instability, Plasma sheath, Non-linear effects	12
3	Nuclear Energy : Introduction, Neutron induced fission, Asymmetrical fission - mass yield, Emission of delayed neutrons by fission fragments, Energy released in the fission of U235, Fission of lighter nuclei, Fission chain reaction, neutron cycle in a thermal nuclear reactor, Nuclear reactors. Nuclear Physics in other areas of Physics: The Mossbauer effect, some experiments using Mossbauer effect, Natural Fusion - energy production in stars, Possibility of controlled fusion.	12
4	Elementary particles: The four basic forces, Particles and antiparticles, Families of particles, conservation laws, particle interactions and decays, energetics of particle reactions, the quark model, the standard model, Numerical Examples.	12

Learning Outcomes:- Graduates of the Physics major fulfill the following outcomes as part of their education in physics:

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Teaching & Learning Methodology:-


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We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

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- Include group work, with groups representing diverse cultures
- Draw upon the experience and expertise of staff from other countries and/or visiting academics

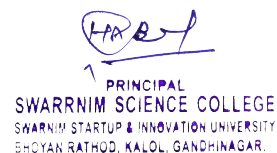
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- Classical Mechanics by A. B. Bhatia, Narosa Publication
- A Text Book of Quantum Mechanics by P. M. Mathews and K. Venketeshan, Tata McGraw-Hill Publishing Co. Ltd.
- Quantum Mechanics : Theory and Applications by A. Ghatak and S. Lokanathan, Macmillan India Limited

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- <http://www.howstuffworks.com/> -- Tech stuff
- How things works by Louis A Bloomfeild, Wiley Publications



- Physics of Everyday Phenomena by W. Thomas Griffith, Juliet Brosing, McGraw Hill Education
- Latest journals like BBC Knowledge, How things work-everyday technology explained by National Geographics.
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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF SCIENCE

ENVIRONMENT CONSERVATION & HAZARD MANAGEMENT

CODE: 53000603

1st Year

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
3	-	-	3	3	30	50	70	-	150

Objectives:- To provide a comprehensive knowledge for awareness of environment conservation and hazard management.

Prerequisites:- Environment Conservation & Hazard Management

Course outline:-

Sr. No.	Course Contents	Number of Hours
1	Ecology and Environment	6
2	Solar power	10
3	Seismic engineering and disaster management	6
4	Sustainable development	8

Learning Outcomes:- At the closing stage of the course, the students will be able to understand the importance of environment conservation and the concepts of hazard management.

Teaching & Learning Methodology:- The Syllabus for Environmental Studies includes classroom teaching. The syllabus is divided into four units covering 30 lectures. The units are classroom teaching based to enhance knowledge skilled and attitude to environment.




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Books Recommended:

1. R. R. Mahitcha – “Environment Conservation and Hazard Management”, Atul Prakashan.
2. Solanki and Chetan Singh – “Renewable Energy Technologies”, PHI Learning.
3. Izrael Y.A. – “Ecology and Control of the Natural Environment”, Kluwer Academic Publisher.
4. Sharma, Sanjay K. – “Environment Engineering and Disaster Management”, Laxmi Publications.
5. Earnest, Joshua and Wizelius, Tore – “Wind Power Plants and Project Development, PHI Learning.
6. Anandita Basak – “Environmental Studies”, Pearson Publication.
7. K. S. Valadia – “Coping with Natural Hazards Indian Context”, Orient Longman Publication.
8. Edward S. Rubin – “Engineering and Environment”, McGraw Hill Publication

SYLLABUS

Unit-1

Ecology and Environment: Importance of environment and scope, Engineering and Environment issues, The natural system, Biotic and Biotic components and processes of natural system, Eco system, Food chain, webs and other biological Systems, Causes of environmental pollution, Pollution due to solid waste, Water pollution, Air pollution, The noise as pollution, Pollution of land due to industrial and chemical waste, Radiation and its effects on vegetables and animals

Unit-2

Solar power: Features of solar thermal and PV systems, Types of solar cookers and solar water heaters, Solar PV systems and its components and their working, Types of solar PV cells, Rating and Costing.

Unit-3

Seismic engineering and disaster management: Introduction of Seismic engineering and its application, Features of disasters such as floods, Earthquakes, Fires, Epidemics, Gas/radioactive leaks etc., Management and Mitigation of disasters.

Unit-4

Sustainable development: Concept of sustainable development, Natural resources, Abiotic and Biotic resources, Principles of conservation of energy and management, Need of renewable energy, Growth of renewable energy in India and the world, Concept of waste management and recycling.



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SCHOOL OF SCIENCE

DEPARTMENT OF BIOTECHNOLOGY

ENZYMOLGY

CODE: 56010302

M.Sc 3rd SEM

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	4	50	50	50		150

Objectives:-

- The objectives of the paper is students will get about the protein structure, classification of enzymes, terminology, enzyme activity and purification of enzymes and strategy for separation and purification.
- The student will get idea about the enzyme kinetics and mechanism. What is significance of Km, Vmax and Kcat and importance of steady state equilibrium. Enzyme inhibition and its types. Thermal kinetics.
- To provide the mechanism and action of enzyme and its role of activators. Allosteric regulation and its mechanism.
- The study will help in understanding the what are isoenzymes and physiological significance role of different types of enzymes.




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Course Outcome:

Unit	Description in Detail	Weightage (In Hours)
1	Introduction: Enzymology and historical developments in enzymology Protein Structure: Primary, secondary, tertiary and quaternary structure, techniques used in enzyme characterization Enzyme classification: IUB enzyme classification. Enzyme Activity: Principle and techniques of enzymatic analysis, factors affecting enzyme Activity, Extraction and Purification of enzyme: Objectives and strategy, separation techniques, test of purity.	08
2	Enzyme Kinetics: Bioenergetics and Catalysis Single substrate kinetics: Equilibrium and Steady state kinetics, significance of Km, Vmax & Kcat. Pre-steady state and Relaxation kinetics. Multisubstrate kinetics: General rate equation, compulsory order, random order and ping-pong mechanisms and their primary and secondary plots. Enzyme inhibition and its kinetics: Reversible and irreversible inhibition, competitive, noncompetitive and uncompetitive, mixed, partial, substrate and allosteric inhibition. Thermal kinetics: Effect of temperature on reaction rate, enzyme stability, Arrhenius equation and activation energy.	10
3	Mechanism of Enzyme Action: Enzyme activators, co-enzymes and co-factors in enzyme catalysis, Enzyme and substrate Specificity Investigation of active Centre, Factors affecting catalytic efficiency, Experimental approaches to determine enzyme mechanisms. Enzyme mechanisms: Lysozyme, Chymotrypsin, Carboxypeptidase, Restriction endonuclease, Aspartate trans carbomylase. Allosteric enzymes and sigmoidal	10



	kinetics: Protein ligand binding, Co-operativity, MWC & KNF models, Regulation of enzyme activity. Control of metabolic pathways.	
4	Isoenzymes and its physiological significance, Ribozymes and Abzymes Enzyme engineering: Chemical modification of enzymes: methods of modification of primary structure, catalytic and allosteric properties, use of group specific reagents. Enzyme Immobilization Enzymes in non conventional media, Enzymes sensors, Enzymes as analytical reagents.	08

Learning Outcomes:

- The students will be able to understand and deals with the biochemical nature and activity of enzymes and is a subject that has relevance to students from a wide range of disciplines.
- Student should be able to understand basic concepts of the present day scope and applications of enzymology.
- The course is designed to give students an understanding of procedures involved in purification of enzymes, enzymes assays and quantitative evaluation of the influencing parameters such as concentrations of substrate / enzyme, pH, temperature and effects of inhibitors on enzyme activity.
- This is a course where the topics to be studied include enzyme active sites / mechanisms of enzyme action; enzyme kinetics and regulation; Isozymes and their clinical significances /function relationship etc as tools for understanding functions of enzymes.

Teaching & Learning Methodology

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual approaches and needs



- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Basic Text & Reference Books:

1. *Enzymes: Biochemistry, Biotechnology, Clinical Chemistry 2nd Edition*, authored by Trevor Palmer and Philip Bonner Affiliated East-West Press Pvt. Ltd.
2. Textbook of biochemistry – Vasudevan Shreekumari
3. Biochemistry – Lehninger 6th edition
4. Fundamentals of Enzymologist: Nicholes C. Price and Lewis Stevens, Oxford Univ. Press.
5. Enzyme Structure and mechanism: Alan Fersht, Reading, USA.
6. The chemical kinetics of enzyme action: K. J. Laider and P. S. Bunting, Oxford University Press, London.
7. Enzymes: M. Dixon, E. C. Webb, C.J.R Thorne and K. F. Tipton, Longmans, London.
8. Biochemistry: Lubert Stryer

E-Resources

- https://www.feedspot.com/infiniterss.php?_src=feed_title&followfeedid=4812449&q=site:https%3A%2F%2Fwww.nature.com%2Fsubjects%2Fbiochemistry.rss
- https://www.sciencedaily.com/news/matter_energy/biochemistry/
- <https://thebiochemistblog.com/>
- <https://www.longdom.org/microbial-biochemical-technology.html>
- <https://bmcbiochem.biomedcentral.com/>
- <https://www.slideshare.net/mohdsakharkar/enzyme-final>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SCHOOL OF SCIENCE

DEPARTMENT OF BIOTECHNOLOGY

Immunology

Subject Code: 56010303

M.SC. Semester -3

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	50	50	50	-	150

Objectives

- To provide students the basic knowledge of immunity, system of immunology, interaction of Ag-Ab.
- The purpose of the course is to give student to introduction of Types of immunity, antigen- antibody reaction, Hypersensitivity reaction etc.
- To provide an understanding of immune system in the body, types of cells etc..

Prerequisites

Student Must have studied M.Sc. with microbiology as a major subject and knowledge of basic Immunology and medical microbiology.




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Course outline

Sr. No.	Course Contents	Teaching hours
1.	Adaptive immunity and innate immunity: inflammation, role of cells, receptors and proteins in innate immunity, ubiquity of the innate system. Cells and organs of the immune system: Hematopoiesis, cells of the immune system, primary and secondary lymphoid organs. Antigens and antibodies: properties of immunogens, haptens, epitopes, structure and classes of immunoglobulins, biological activities and effector functions, monoclonal antibodies and enzymes. Antibody diversity: models, organization of Ig genes, mechanism of gene rearrangement, generation of diversity; expression, synthesis and class switching, antibody engineering.	10
2.	Antigen-antibody interactions: principles and applications. Complement: components of the system, activation, regulation, biological consequences and deficiency diseases. Major histocompatibility complex and antigen presentation: MHC-organization, inheritance, genes, molecules and peptide binding, expression, disease susceptibility, immune responsiveness, self MHC restriction, cytosolic and endocytic pathway for antigen processing.	10
3.	T-cell receptor, T-cell maturation, activation and differentiation: TCR- genetic organization and rearrangement of genes, TCR-complex, peptide binding, thymic selection, activation and differentiation of T cells. Generation, activation and differentiation of B cells: B cell maturation, activation and proliferation, germinal centres, regulation of the responses. Cytokines: properties, receptors, associated diseases, therapeutic applications. Leukocyte activation and migration: CAM, chemokines, recirculation and extravasation, inflammation and anti-inflammatory agents. Cell mediated cytotoxicity: effector T cells, cytotoxic T cells, NK cells, ADCC.	10
4.	Hypersensitivity reactions: classification and types of hypersensitivity reactions. Immune tolerance and autoimmunity: establishment and failure of tolerance, autoimmune diseases, mechanisms for the induction, animal models, treatment. Transplantation immunology: basis and manifestation of graft rejection, immunosuppressive therapy, immune tolerance. Cancer and immune system. Immunodeficiency.	 10 PRINCIPAL SWARNIM SCIENCE COLLEGE SWARNIM STARTUP & INNOVATION UNIVERSITY BHOYAN RATHOD, KALOL, GANDHINAGAR.



Learning Outcomes

- The students will be able to understand the Knowledge of the types of immune system , Ag-Ab reaction techniques in the body ,hypersensitivity reaction etc.
- Student should be able to understand basic concepts of immunity and types of the cell, classification of the hypersensitivity :its types and function.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- At the end of the course the student would have basic knowledge of immunity, system of immunology, interaction of Ag-Ab.

Teaching & Learning Methodology

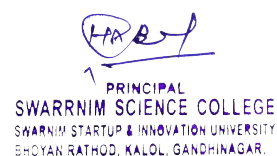
We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Kuby-Immunology: T. J. Kindt, R. A. Goldsby and B. A. Osborne; W. H. Freeman
- Janeway's Immunology: K. Murphy, P. Travers and M. Walport; Garland Sciences
- Immunology: Ivan Roitt, J. Brostoff and D. Male; Mosby
- Essential immunology: Ivan Roitt; Oxford: Blackwell
- Topic related review articles.



E-Resources

- <https://www.slideshare.net/mobile/Jsiahnabi/types-of-immunity>
- <https://www.slideshare.net/mobile/mprasadnaidu/immunity-32908889>
- <https://www.slideshare.net/mobile/ArunimaSur/antigen-antibody-interaction-55880086>
- <https://www.slideshare.net/mobile/VELSPHARMD/hypersensitivity-24449005>
- <https://www.slideshare.net/mobile/VamsiIntellectual/types-of-cells-and-tissues>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF BIOTECHNOLOGY

MICROBIAL BIOTECHNOLOGY

CODE: 56010301

M.Sc 3rd SEM

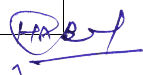
Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	8	50	20	50	30	150

Objectives:- To provide basic knowledge of Microbial Biotechnology. It covers up general concept of microbial biotechnology and fermentation of various products.

Unit	Description in Detail	Weightage (In hours)
1	Microbial production of Amino acids: Glutamic acid, Lysine Industrial Alcohol, Beer and wine Vitamins: Vit B12, B2 Ergot alkaloids	08
2	General concept of Microbial biotechnology Microbial production of Antibiotics: penicillin, streptomycin Enzymes: proteases, amylases Organic acids: Citric acid, acetic acid	08
3	Biotransformations of steroids:	




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	Production of single cell protein from bacteria, fungi and algae: Nutritional value and safety. Edible Mushrooms: Cultivation of edible and medicinal mushrooms. Bioplastics Single cell oil	08
4	Microbial Exopolysaccharides: Xanthan, Alginate Microbial Flavours: Diacetyl, Methyl ketones, Terpenes, Vanillin Fermented food and dairy products: Starter cultures, science and technology of bread, cheese and yogurt manufacture. Fermentation economics	10

Basic Text & Reference Books:

1. Biotechnology: Rehm and Reid.
2. Comprehensive biotechnology: Murray Moo Young.
3. Microbial Technology: Pepler
4. Microbiology and technology of fermented foods: R.W. Hutkins. Blackwell publishing.




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SCHOOL OF SCIENCE

DEPARTMENT OF BIOTECHNOLOGY

Plant Biotechnology

Subject Code: 56010401

M.Sc. Semester-4

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	4	30	--	70		100

Objectives

- To provide basic knowledge of plant biotechnology, secondary metabolites and about genetic engineering technology.
- To provide basic knowledge of Plant Biotechnology. It covers up about cell & tissue culture, methods of propagation, plant tissue culture.
- The present course opens the door to all of the abundant careers in and out of the area of biological sciences including health/ medical / Environmental Sciences.

Prerequisites

Student must have studied B.Sc with microbiology/Biotechnology as a major subject and knowledge of basic microbiology.



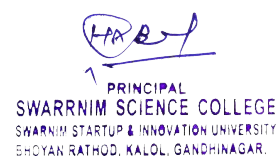

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Course outline

Sr. No.	Course Contents	Teaching hours
1	Cell & tissue culture in plants; callus cultures; in-vitro morphogenesis organogenesis and embryogenesis; Artificial Seeds, Micropropagation (Clonal propagation); Haploidy; anther and ovule cultures, Embryo cultures; Protoplast isolation, culture and protoplast fusion and somatic hybridization, Cybrids, Somaclonal Variation; in-vitro mutation methods; Virus elimination, pathogen indexing; Cryopreservation	08
2	Production of secondary metabolites; Sources of plant secondary metabolites; criteria for cell selection, factors affecting the culture of cells; different bioreactors and their use in secondary metabolite production; biochemical pathways for the production of different secondary metabolites; and biotransformation.	06
3	Principles and methods of genetic engineering, and its applications in Agriculture. Methods for genetic transformation and transgenic plants production through Agro bacterim tumefaciens and A. rhizogenes; Gene transfer methods in plants; PEG mediated, microinjection, particle bombardment, electroporation, Molecular markers and their importance in plant breeding, Marker Assisted Selection (MAS).	10
4	Molecular plant pathology: Mechanisms of disease resistance in plants against pathogens; Signalling pathways and molecular events during pathogen – plant interaction. Biotechnology and intellectual property rights (IPR); Plant genetic resources GATT & TRIPS; Patent for higher plant genes and DNA sequence	08

Learning Outcomes

- The aim of this course is to provide a thorough understanding of theoretical and practical aspects of plant cell and tissue culture. Topics include: plant regeneration, genetic modification, cellular & physiological aspects of differentiation and hormonal regulation of differentiation.



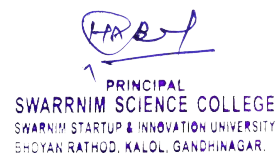
- Student should be able to understand Explain basic metabolic pathways of plants and formation of different secondary metabolites through various biosynthetic pathways in plants
- The course is designed to give students an understanding of the students will have knowledge of tools and strategies used in genetic engineering. Understanding of applications of recombinant DNA technology and genetic engineering. from academic and industrial perspective
- The students will learn how to select and apply the methodologies to be used in molecular plant pathology

Teaching & Learning Methodology

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Elements of Biotechnology – P K Gupta
- Principles of plant biotechnology: An introduction to genetic engineering in plants – S H Mantel, et. al.
- Advances in Biochemical engineering / Biotechnology – Anderson, et. al.
- Plant cell culture technology – M M Yeoman



E-Resources

- <https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/plant-biotechnology>
- https://en.wikipedia.org/wiki/Genetic_engineering#:~:text=Genetic%20engineering
- <https://bsppjournals.onlinelibrary.wiley.com/journal/13643703>
- <https://www.slideshare.net/abhishekindurkar/production-of-secondary-metabolite>
- <https://www.slideshare.net/VamsiIntellectual/types-of-cells-and-tissues>




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SCHOOL OF SCIENCE

DEPARTMENT OF BIOTECHNOLOGY

ENVIRONMENTAL BIOTECHNOLOGY

CODE: 56010402

M.Sc 4th SEM

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	50	50	50		150

Objectives:-

- To provide knowledge about environment monitoring, its assessment using bio-indicators, biomarkers, biosensors and toxicity testing. Various environmental laws.
- Student will get an idea about bioremediation techniques, strategies involved in bioremediation. Phytoremediation, GMO and impact on bioremediation.
- To provide an idea about principles of biodegradation and mechanism of detoxification, biodegradation of various compounds like detergents, pesticide, lignin, hydrocarbon and dyes.
- Provide knowledge about Principles and mechanisms of biodeterioration, Methodology to assess biodeterioration, Prevention and control of biodeterioration, Biodeterioration of selected material.

Prerequisites

Student must have studied B.Sc with microbiology/Biotechnology as a major subject and knowledge of basic microbiology.




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COURSE OUTLINE:

Unit	Description in Detail	Weightage
1	Environmental problems and monitoring: Environmental monitoring: environmental impacts and their assessments using bio-indicators, biomarkers, biosensors and toxicity testing, rDNA technology, Conservation strategies, Environmental laws and policies in India	06
2	Bioremediation: Bioremediation principles, Strategies and techniques of bioremediation: <i>in situ</i> and <i>ex situ</i> , Bioremediation of metals, Phytoremediation, GMOs and their impact on bioremediations	06
3	Biodegradation: Principles of biodegradation and mechanism of detoxification, Biodegradation of detergent, pesticide, lignin, hydrocarbon and dyes	10
4	Biodeterioration: Principles and mechanisms of biodeterioration, Methodology to assess biodeterioration, Prevention and control of biodeterioration, Biodeterioration of selected materials	10

Learning Outcomes

- To provide knowledge about environment monitoring, its assessment using bio-indicators, biomarkers, biosensors and toxicity testing. Various environmental laws.
- Student will get an idea about bioremediation techniques, strategies involved in bioremediation. Phytoremediation, GMO and impact on bioremediation.



- To provide an idea about principles of biodegradation and mechanism of detoxification, biodegradation of various compounds like detergents, pesticide, lignin, hydrocarbon and dyes.
- Provide knowledge about Principles and mechanisms of biodeterioration, Methodology to assess biodeterioration, Prevention and control of biodeterioration, Biodeterioration of selected material.
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Teaching & Learning Methodology

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Biotechnology- U. Satyanarayana
2. Environmental engineering and management- S. K. Dhameja, Publ: Kataria & Sons
3. Textbook of Biotechnology- H.K.Das
4. Methods in Biotechnology- Hans-peter-schmauder
5. Environmental Biotechnology- B.C. Bhattacharyya and R. Banerjee
6. Environmental biotechnology- G. M. Evans and J. C. Furlong
7. Environmental biotechnology- A. Scragg, Oxford

E-Resources

1. <https://www.slideshare.net/Omodhu/bioremediation-71688629>
2. <https://www.slideshare.net/vanithagopal/bioremediation-41934065>
3. <https://www.slideshare.net/halalarahman/phytoremediationppt>
4. https://www.slideshare.net/Christa_belle/phytoremediation-43828173
5. <https://www.slideshare.net/tanujanautiyal/environmental-biotechnology-50099488>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF Chemistry

Industrial Chemistry

Subject Code: 56020304

M.Sc. Semester - III

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental organic chemistry.

Course outline

Sr. No.	Course Contents	Teaching hours
1	Basic principles Basic chemical data, batch versus continuous operation, design, flow charts, chemical process selection, safely, hazardous, fire toxic materials, research and development patents, good manufacturing	14




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	practice and laboratory practice.	
2	Unit processes in organic chemistry Nitration, sulfonation, halogenation, amination and alkylation methods and industrial chemicals derived from benzene, naphthalene and anthracene using unit process.	14
3	Green chemistry -12 principles of green chemistry Green solvents- aqueous phase reactions Wurtz reaction, witting-Horner reaction, Michael reaction - - Ionic liquid as green solvent- hydrogenation, diels-alder reaction, o- alkylation and N-alkylation Green catalysts of green reagents (introduction)	14
4	Manufacture and uses of -Argochemicals (insecticides, fungicides, plant nutrients and plant hormones, Weedicides, pesticides) -Unit operations	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Organic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programmer/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs.



- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programmer/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures.

Books Recommended

1. Unit processes in organic synthesis by P.H.Groggins
2. Industrial Chemical process by R.N.Shreve
3. Riegels handbook of industrial chemistry ed by James and Kent
4. Dryden's outlines of chemical Technology M.Gopal Rao

E-Resources

- <http://ccc.chem.pitt.edu/wipf/Web/HCH.pdf>
- [https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Supplemental Modules \(Organic Chemistry\)/Arenes/Reactivity of Arenes/Nitration and Sulfonation of Benzene](https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Supplemental_Modules_(Organic_Chemistry)/Arenes/Reactivity_of_Arenes/Nitration_and_Sulfonation_of_Benzene)
- <https://www.masterorganicchemistry.com/2018/04/30/electrophilic-aromatic-substitutions-2-nitration-and-sulfonation/>
- <https://www.azocleantech.com/article.aspx?ArticleID=559>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Medicinal Chemistry

Subject Code: 56020302

M.Sc. Semester- III

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental organic chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Antibiotics Antibiotics that interfere with the biosynthesis of bacterial cell wall. A. The β -lactum antibiotics : Penicillin and cephalosporin B. Non lactum antibiotics (only name and structures) C. Bacitracin, vancomycin and cycloserine (only name and	14



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	structures) Antibiotics that interfere with the protein biosynthesis in microorganisms : non lactum antibiotics, tetracycline, chloroamphenicol Structure actively relationship (SAR) among penicillins and tetracyclins Non classifiable antibiotics (only structure and therapeutic uses) Synthesis of penicillin V, ampicillin, cephalosporin and chloroamphenicol.	
2	Psychoactive drugs CNS depressant: A. General and local anaesthetics B. Sedative and hypnotics Antipsychotic drugs A. Antidepressant B. Neuroleptics Synthesis of the following: Thiopental, amobarbital, diazepam, chlorazepan, alprazolam, glutethimide, nitethamide, procaine, lidocaine and dibucaine, Ibuprofen, meclizine sodium, novalgin, pethidine	14
3	Antimalarial and Antituberculosis drugs Antimalarials: Modern chemotherapy of malaria, 4-amino and 8-amino quinolins, 9-amino acridine. Synthesis of mefloquine, chloroquine, primaquine and daraprim Mode of action of antimalarial agents SAR of antimalarial agents Anti tuberculosis: Synthesis of only the following drugs: Isoniazid (INH), Ethionamide, Ethambutol, DDS (Dapsone)	14
4	Cardiovascular, diuretics and hypoglycemic agents Synthesis of amyl nitrate, diltiazem, atenolol, methyl dopa, tolbutamide, chlorpropamide, glibenclamide, acetazolamide, chlorothiazide, furosemide and ethacrynic acid.	14

Learning Outcomes



- At the end of the course the student would have sufficient knowledge of Organic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology

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- Include group work, with groups representing diverse cultures.

Books Recommended

1. Burger's medicinal chemistry and drug design (5/e) 1997, vol 1 to 5 edited by Manfred E. Woltz (John Wiley and sons Mc. New York)
2. Principles of medicinal chemistry by William A. Foye (ied), Lea and Febiys (Philadelphia)
3. Principles of medicinal chemistry vol I & II (5/e) F.S. Kadam, K.R. Mahadik and K.G. Bohra (Nirali publication)
4. Medicinal chemistry by Ashutosh Kar
5. The organic chemistry of drug synthesis vol I, II and III (1980) ed by D. Lednicher and L.A. Mitscher (John Wiley and sons, New York)



6. Wilson and Gisvold text book of organic medicinal and pharmaceutical chemistry (5/e,1982) by Robert Doerge (J.B. lippincott company, phaladophia/ Toppan co.Ltd, Tokyo)
7. Topics in medicinal chemistry vol I & II by rabinowitz Myerson (interscience 1968)
8. The pharmaceutical basis of theraperutics by Geoman and Gilman (Mcmillan co.)

E-Resources

- <https://www.medicalnewstoday.com/articles/10278>
- <https://www.drugs.com/article/antibiotics.html>
- <https://medlineplus.gov/antibiotics.html>
- <https://patient.info/infections/antibiotics-leaflet>
- <http://www.vivo.colostate.edu/hbooks/pathphys/endocrine/basics/steroidogenesis.html>
- <https://www.qmul.ac.uk/sbcs/iupac/class/terp.html>




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SWARNIM SCIENCE COLLEGE

Department of Chemistry

Natural Products and Bio-molecules

Subject Code: 56020301

M.Sc. Semester- III

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental organic chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Natural Pigment Natural colouring matter, general classification, method of synthesis, biosynthesis studies of anthocyanins (cyanine) flavones (chrysoin) and flavanol (Quercetin), Porphyrin-structure, spectral properties and synthesis, general and structure determination of Haemoglobin, chlorophyll and Bilirubin.	14




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2	Alkaloids and Vitamins Alkaloids: General biogenetic studies of alkaloids, chemistry of quinine, morphine, reserpine and colchicine Vitamins : Introduction, synthesis and biochemical function of vitamin B(Thiamine), Vitamin H and α -tocopherol (Vitamin E), vitamin C.	14
3	Steroids and Hormones General biosynthesis studies of steroids, structure of cholesterol and ergosterol (No synthesis). Stereochemistry of steroids, chemistry of bile acids. Chemistry of androgens, oestrogens and gestrogens, their synthesis and biochemical role. Adrenocortical hormones, partial synthesis of cortisone.	14
4	Terpenoids and Carotenoids Classification, nomenclature, general methods of structure determination, chemistry and synthesis of abietic acid and gibberellic acid (gibberlin-A), farnesol, zingiberine and squalene. Biosynthetic studies on triterpenoids and tetraterpenoids.	14






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Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Organic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology

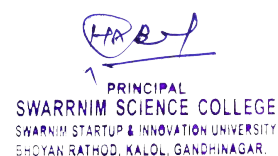
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- Include group work, with groups representing diverse cultures.

Books Recommended:

1. Organic chemistry vol I & II (sixth edition) I.L.Finar
2. Chemistry of vitamins-S.F.Dyke



3. Chemistry of natural products by Bantely, Vol 1-10
4. L.J.Wade Jr. Organic chemistry, Prentice hall, England cliffs, 1987
5. Chemistry of Natural products vol I & II by O.P.Agrawal

E-Resources

- <https://www.invaluable.com/blog/naturalpigments/#:~:text=A%20natural%20pigment%20is%20one,to%20create%20a%20desired%20hue.&text=Artists%20used%20whatever%20pigment%20was,and%20white%20from%20ground%20calcite.>
- <https://www.foodcolor.com/natural-pigments>
- <https://www.britannica.com/science/alkaloid>
- https://en.wikipedia.org/wiki/Steroid_hormone
- https://www.gfmer.ch/Books/Reproductive_health/Steroid_hormone_metabolism.html
- <https://conagen.com/products-we-make/terpenoids-carotenoids/>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Organic Spectroscopy

Subject Code: 56020303

M.Sc. Semester- III

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	-	4	4	30	-	70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

- Chemistry majors must have a basic understanding of fundamental organic chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	UV & IR Spectroscopy UV: Electronic transitions, chromophores, auxochromes, bathochromic and hypsochromic shifts, solvent effects, Woodward-Fieser rules for dienes, enones and aromatic compounds applications of U.V., instrumentation. I.R. Vibrational transitions, important group frequencies, factors affecting I.R. group frequency, applications of I.R. instrumentation	14



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2	NMR Elementary ideas of NMR integration, chemical shifts, Factors affecting, chemical shifts, coupling (first order, analysis) instrumentation and principles and instrumentation, FT, chemical shifts, spin-spin coupling different spin systems, mechanism of spin coupling. E.q. AB, ABX, factors affecting vicinal and geminal couplings, rate processes, long range couplings, spin decoupling, shift reagents, solvent shifts, nuclear overhauser effect. 2D NMR (COSY and HETCOR) applications.	14
3	C13 NMR and Mass spectrometry C13 NMR: elementary ideas, instrumental problems, chemical shift features of hydrocarbons, effect of substituent on chemical shifts olefinic, acetylenic, aromatic and carbonyl carbons, effects of coupling. Mass spectrometry: theory, instrumentation, modes of ionization, types of detectors, modes of fragmentation. Different types of ions, molecular ions, isotopic peaks, factors controlling fragmentation, hyphenated mass spectroscopy techniques.	14
4	Structural elucidation of drug molecules based on joint application of UV, IR, PMR, CMR and mass spectroscopy.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Organic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology:-

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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
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- Include group work, with groups representing diverse cultures.

Books Recommended:

1. Spectroscopic methods in organic chemistry, D.H.Williams and Tan Fleming
2. Spectrometric identification of organic compounds, T.C.Morrill R.M.Silverstein and G.Bassler, 6th edition, John Wiley and sons
3. Introduction to spectroscopy, D.L.Pavia, G.M.Lampman and G.S.Kriz, 3rd edn, Harcourt college publishers.
4. Organic spectroscopy by W.Kemp
5. Organic spectroscopy by P.S.Kalsi

E-Resources

- [https://www.itwreagents.com/iberia/en/sa_spectroscopy-uv-vis-ir#:~:text=The%20UV%2DVis%20spectroscopy%20is,between%20200%20and%20800%20nm\).&text=The%20IR%20spectroscopy%20is%20another%20very%20useful%20analytical%20tool%20for%20compounds%20characterization.](https://www.itwreagents.com/iberia/en/sa_spectroscopy-uv-vis-ir#:~:text=The%20UV%2DVis%20spectroscopy%20is,between%20200%20and%20800%20nm).&text=The%20IR%20spectroscopy%20is%20another%20very%20useful%20analytical%20tool%20for%20compounds%20characterization.)
- [https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Book%3A_Analytical_Chemistry_2.1_\(Harvey\)/10%3A_Spectroscopic_Methods/10.03%3A_UV/Vis_and_IR_Spectroscopy](https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Book%3A_Analytical_Chemistry_2.1_(Harvey)/10%3A_Spectroscopic_Methods/10.03%3A_UV/Vis_and_IR_Spectroscopy)
- <https://www.mps.mpg.de/phd/space-instrumentation-ir-uv-spectroscopy>
- <https://www.youtube.com/watch?v=MW4PwJxxyt0>
- <https://www.youtube.com/watch?v=t5stvnKNXbg>
- <https://www.youtube.com/watch?v=t5stvnKNXbg>
- https://www.youtube.com/watch?v=H6_GgJN39vY
- <https://www.youtube.com/watch?v=EZzYXmX8XGk>
- [http://sppu.in/Syllabi_PDF/revised_2009/sci/6%20%20\(5\)%20%20M.Sc.%20II,%20%20Drug%20Chemistry.pdf](http://sppu.in/Syllabi_PDF/revised_2009/sci/6%20%20(5)%20%20M.Sc.%20II,%20%20Drug%20Chemistry.pdf)
- https://www.researchgate.net/post/Which_is_the_best_spectroscopic_method_for_the_structure_elucidation_of_organic_molecule_without_the_help_of_other_method



- <https://www.arcjournals.org/pdfs/ijarcs/v2-i8/5.pdf>
- <https://www.sydney.edu.au/science/chemistry/~george/spectroscopy.html>
- <https://nptel.ac.in/content/storage2/courses/104106075/Week8/MODULE%2036.pdf>




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SWARNIM SCIENCE COLLEGE

Department of Chemistry

Advanced Organic Chemistry

Subject Code: 56020401

M.Sc. Semester- IV

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-		4	4	30		70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental Organic Chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Pericyclic Reactions Introduction, classification of pericyclic reactions, stereochemistry, molecular orbital symmetry, frontier orbitals of ethylene, 1,3 – butadiene, 1,3,5-hexatriene and allyl system, F.M.O. and PMO approach to cycloaddition and electrocyclic reactions: Generalisation of wood-ward Hoffmann rule, sigmatropic rearrangement-suprafacial and antarafacial shifts of	14



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	H.Stereoselectivity in sigmatropic rearrangement, enantioselectivity in pericyclic reactions.	
2	Conformational Analysis Confirmation at cyclic systems: Confirmation of cyclohexane, mono and disubstituted cyclohexane, heterocyclic compounds, five and six membered heterocycles, stereoelectronic effects, fused bicyclic system, decalin, dodecalin, polycyclic system, perhydrophenanthrene, bridged systems-conformation of sugars, steric strains due to unavoidable crowding, stereochemistry of the compounds containing nitrogen, sulphur and phosphorous.	14
3	Oxidation Introduction, different oxidation processes, hydrocarbons-alkenes, aromatic rings, saturated C-H group (activated and unactivated), alcohols, diols, aldehydes, ketones, amines, hydrazine and sulphides.	14
4	Reduction Introduction, different reductive processes, hydrocarbons-alkanes, alkenes, alkynes and aromatic rings, Carbonyl compounds-aldehydes, ketones, acids and their derivatives, epoxides, nitro, nitroso, azo and oxime groups, Preparation and properties and application of Pd and Ti compounds as organometallic agents	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Organic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology

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- Include group work, with groups representing diverse cultures.

Books Recommended:

1. Advance organic chemistry by Jerry March
2. Advance organic chemistry by Carey and Sundberg,
3. Advance organic chemistry by Francis A. Carey

E-Resources

- <https://www.youtube.com/watch?v=oi03RJHAXOw>
- <https://www.asu.edu/courses/chm332/PericyclicReactions.pdf>
- [https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Supplemental Modules \(Organic Chemistry\)/Reactions/Pericyclic Reactions](https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Supplemental_Modules_(Organic_Chemistry)/Reactions/Pericyclic_Reactions)
- [https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Book%3A Basic Principles of Organic Chemistry \(Roberts and Caserio\)/21%3A Resonance and Molecular Orbital Methods/21.11%3A Pericyclic Reactions](https://chem.libretexts.org/Bookshelves/Organic_Chemistry/Book%3A_Basic_Principles_of_Organic_Chemistry_(Roberts_and_Casero)/21%3A_Resonance_and_Molecular_Orbital_Methods/21.11%3A_Pericyclic_Reactions)
- <https://courses.lumenlearning.com/suny-potsdam-organicchemistry/chapter/conformational-analysis/#:~:text=Conformational%20analysis%20is%20the%20study,through%20space%20interactions%20of%20substituents.>
- https://www.ch.ic.ac.uk/local/organic/conf/c1_definitions.html
- https://www.youtube.com/watch?v=ua0_UNoashU
- <https://www.thoughtco.com/definition-of-oxidation-in-chemistry-605456#:~:text=Oxidation%20is%20the%20loss%20of,%2C%20molecule%2C%20or%20ion%20decreases.>
- <https://www.chemguide.co.uk/inorganic/redox/definitions.html>



- <https://www.khanacademy.org/science/ap-chemistry/redox-reactions-and-electrochemistry-ap/redox-oxidation-reduction-tutorial-ap/v/introduction-to-oxidation-and-reduction>
- <https://chemed.chem.purdue.edu/genchem/topicreview/bp/ch9/redox.php>




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SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Advanced Organic Synthesis

Subject Code: 56020402

M.Sc. Semester- IV

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-		4	4	30		70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental Organic Chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Protection of groups Principle of protection of hydroxyl, amino, carbonyl, carboxylic acid with different reagents and their deprotection, synthetic equivalent groups, synthetic analysis and planning, control of stereochemistry.	14
2		14



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	Disconnection approach An introduction to synthesis, and synthetic equivalents, disconnection approach, functional group inter-conversions, the importance of the order of events in organic synthesis one group C- X and two group C-X disconnections, chemo-selectivity, reversal and polarity.	
3	One group C-C disconnections Alcohols and carbonyl compounds, region-selectivity, alkene synthesis, use of acetylenes and aliphatic nitro compounds in organic synthesis.	14
4	Ring synthesis Saturated heterocycles, synthesis of 3, 4, 5, and 6-membered rings, aromatic heterocycles in organic synthesis.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Organic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology

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- Include group work, with groups representing diverse cultures.

Books Recommended

1. Organic synthesis: the disconnection approach by stuart Warren (wiley student edition)
2. Organic chemistry- clayden, greeves, warren and wothers, (oxford press)

E-Resources

- <https://www.organic-chemistry.org/protectivegroups/>
- https://en.wikipedia.org/wiki/Protecting_group#:~:text=A%20protecting%20group%20or%20protective,role%20in%20multistep%20organic%20synthesis.&text=This%20step%20is%20called%20deprotection.
- <http://www.chem.ucalgary.ca/courses/351/Carey5th/Ch17/ch17-3-4-3.html>
- https://www.youtube.com/watch?v=YYC_vbrgZDY
- https://mazams.weebly.com/uploads/4/8/2/6/48260335/organic_synthesis_the_disconnection_approach_2nd_edition_by_stuart_warren.pdf
- <https://www.chemistry.tcd.ie/assets/pdf/sfchemistry/tg/HandoutsSFLecture%20in%20Introduction%20to%20Organic%20Chemistry%202009.pdf>
- <http://rushim.ru/books/uchebnik/Warren.pdf>
- <https://www.slideshare.net/dragnerkar/retrosynthesis-agc-compatibility-mode>
- <https://www.slideshare.net/RabiaAziz6/retrosynthesis-122337747>
- <https://www.vanderbilt.edu/AnS/Chemistry/Rizzo/chem223/rings6.pdf>



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SWARRNIM SCIENCE COLLEGE

DEPARTMENT OF CHEMISTRY

Bio-organic Chemistry

Subject Code: 56020403

M.Sc. Semester- IV

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-		4	4	30		70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

Chemistry majors must have a basic understanding of fundamental organic chemistry.

Course outline

Sr. No.	Course Contents	Teaching Hours
1	Water and vitamins Water –interaction among biomolecules in aqueous systems, buffering against pH changes, in biological systems, participation of water in biological reactions. Vitamins-classification, introduction, chemistry, absorption transport, mobilization and biochemical functions of Vitamins A, D, E, K, C, B, B2, B6, H and folic acid	14



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2	Proteins and enzymes Proteins: properties and conventions of common amino acids, stereoisomerism in α-amino acid, Peptides: formation, compositions and sizes of protein separation, purification and characterization, sequencing of peptides, sanger's method, edman degradation, outline of other methods, protein sequences and evolution. Oxygen binding proteins, haemoglobin and myoglobin in oxygen transport and storage. Enzymes: classification, nomenclature and extraction factors affecting catalytic activity and specificity in action, regulation of enzyme activity, enzyme inhibition, illustrative enzymatic reactions using chymotrypsin, hexokinase, enolase and lysozyme	14
3	Carbohydrates and nucleic acid Carbohydrates: classification and stereochemistry, biologically important hexose derivatives, nomenclature of disaccharides, structure and role of some homo and hetero polysaccharides, glucoconjugates : proteoglycans, glycoproteins and glycolipids Nucleic acid: compounds of nucleic acids, nomenclature of nucleotides, nucleosides, structure of DNA and structure of RNA	14
4	Lipids Nomenclature, structure and physical properties of some naturally occurring fatty acids, triacylglycerol and waxes as sources of stored energy, insulation of water repellants, types of membrane lipids, introduction to glycerophospho lipids, galactolipids, sphingo lipids, phospholipids and sterols, bile acids.	14

Learning Outcomes

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- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programmer/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures.

Books Recommended:

1. Principles of biochemistry –Donald J.Voet, Judith G.Voet, charlotte w. pratt (John willey and sons)
2. Lehninger principles of biochemistry- David L.Nelson and Michael M.wx (Palgrave Macmillan / w.h. freeman company new york)
3. 3. Biochemistry – U.Satyanarayana Baro and allied P.Ltd., kolkata

E-Resources

- <https://kidshealth.org/en/teens/vitaminsminerals.html#:~:text=The%20water%2Dsoluble%20vitamins%20%E2%80%94can't%20store%20these%20vitamins.>
- <https://www.healthline.com/nutrition/water-soluble-vitamins>
- https://www.who.int/water_sanitation_health/dwg/nutrientschap13.pdf
- <https://www.freedrinkingwater.com/water-education3/34-water-vitamins.htm>
- https://www.medicinenet.com/water_soluble_vitamins_vs_fat_soluble_vitamins/as_k.htm
- <https://extension.colostate.edu/topic-areas/nutrition-food-safety-health/water-soluble-vitamins-b-complex-and-vitamin-c-9-312/>
- <https://www.nature.com/scitable/topicpage/protein-function-14123348/#:~:text=Enzymes%20are%20proteins%2C%20and%20they,highly%20specific%20to%20their%20substrates.>



- <https://www.britannica.com/science/protein/Enzymes>
- [https://chem.libretexts.org/Bookshelves/Biological_Chemistry/Supplemental_Modules_\(Biological_Chemistry\)/Enzymes/3. Proteins as Enzymes](https://chem.libretexts.org/Bookshelves/Biological_Chemistry/Supplemental_Modules_(Biological_Chemistry)/Enzymes/3._Proteins_as_Enzymes)
- <https://www.ncbi.nlm.nih.gov/books/NBK9921/>
- <https://www.ncbi.nlm.nih.gov/books/NBK554481/>
- <https://www.chemistryworld.com/features/when-is-an-enzyme-not-a-protein/9471.article>
- https://www.eufic.org/en/whats-in-food/article/what-are-proteins-and-what-is-their-function-in-the-body?gclid=CjwKCAiAq8f-BRBtEiwAGr3DgT6BNFSW9_FCSbEp-MsZi9Qa6QMyhx7TFmqrMcUCh3-mEhkPIVEDrBoClqQAvD_BwE
- <https://courses.lumenlearning.com/suny-wmopen-biology1/chapter/comparing-biologicalmacromolecules/#:~:text=Proteins%2C%20carbohydrates%2C%20nucleic%20acids%2C,bonds%20to%20form%20larger%20polymers.>
- https://www.merckmillipore.com/IN/en/products/small-molecule-pharmaceuticals/formulation/bioavailability-enhancement/drug-delivery-compounds/lipids-for-pharmaceutical-applications/VWOb.qB.u3cAAAFRDikEZcsR.nav?gclid=CjwKCAiAq8f-BRBtEiwAGr3Dgf6VTAApDXutfY1ChgvXv_K4x2sBJ0ISIPYhIYtIrV-TLR276dFhoCxpUQAvD_BwE
- <https://www.britannica.com/science/lipid>
- <https://www.khanacademy.org/science/biology/macromolecules/lipids/a/lipids>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF Chemistry
Selected topics in Medicinal Chemistry
Subject Code: 56020404
M.Sc. Semester - IV

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-		4	4	30		70	-	100

Objectives

- The students will understand the interdisciplinary nature of chemistry and to integrate knowledge.
- The students will develop the ability to effectively communicate scientific information and research results in written and oral formats.

Prerequisites

- Chemistry majors must have a basic understanding of fundamental Organic Chemistry.

Course outline

Sr. No.	Course Contents	Teaching hours
1	Drug design Introduction, naming of organic medicinal compounds, literature of medicinal chemistry, development of new drugs, procedure followed in drug design, concept of lead compound and lead modification, pro drugs, soft drugs, phase I, II and III clinical trials,	14



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	structure activity relationship, theories of drug activity : occupational theory, rate theory, induced fit theory, quantitative structure activity relationship, history and development of QSAR. Concept of drug receptors, elementary treatment of drug receptor interactions, physio chemical parameters lipophilicity, partition coefficient, electronic ionization constant, concept of 3-D QSAR.	
2	Pharmacokinetic and pharmacodynamics Pharmacokinetics: introduction to drug absorption, distribution, metabolism, elimination. important pharmacokinetic parameters in defining drug deposition and in therapeutics, uses of pharmaceuticals in drug development process Pharmacodynamics: Introduction, elementary treatment of enzyme stimulation, enzyme inhibition, drug metabolism, biotransformation, significance of drug metabolism in medicinal chemistry.	14
3	Dosage forms, Quality control and application of computers in chemistry Dosage forms, types of dosages, different routes of administration, quality control of drugs pharmacopias, modern methods of pharmaceutical analysis. Computer in chemistry Use of computer in chemistry and industry Important websites for data search chemistry Information about online journals for chemistry	14
4	Medicine Overview, Medicinal use of nanomaterials-Drug delivery Protein and peptide delivery –cancer, surgery, visualization, nanoparticle targeting Medical application of molecular nanotechnology-nanorobots, cell repair machines, nanonephrology.	14

Learning Outcomes

- At the end of the course the student would have sufficient knowledge of Organic Chemistry.
- Students will be able to design and carry out scientific experiments as well as accurately record and analyze the result of such experiments.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.




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The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the programmer/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs.
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups.
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties.
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a programmer/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.
- Include group work, with groups representing diverse cultures.

Books Recommended

1. Burger's Medicinal Chemistry and Drug Discovery (5/e), 1997, Vol. 1, 2, 3, 4,5, Edited by ManFred E. Wolff (John Wiley & Sons, inc., New York).
2. Wilson and Gisvold's Text-book of Organic Medicinal and Pharmaceutical Chemistry (5/e, 1982) by Robert F. Doerge (J. B. Lippincott Company, Philadelphia/Toppan Co. Ltd., Tokyo).
3. Principles of Medicinal Chemistry, Vol. I & II (5/e), by S. S. Kadam, K. R. Mahadik, K. G. Bothra (Nirali Prakashan).
4. QSAR: quantitative structure-activity relationships in drug design by Jean-Luc Fauchère. ISBN:084515141X, 9780845151419
5. QSAR : Hansch analysis and related approaches By Hugo Kubinyi

E-Resources

- https://en.wikipedia.org/wiki/Drug_design#:~:text=Drug%20design%2C%20often%20referred%20to,knowledge%20of%20a%20biological%20target.
- <https://www.dovepress.com/journal-editor-drug-design-development-and-therapy-eic19>
- <https://www.pharmatutor.org/articles/drug-designing-review>
- <https://newdrugapprovals.org/drug-design/>
- <https://www.bioagilytix.com/blog/2020/10/05/the-difference-between-pharmacokinetics-and>



[pharmacodynamics/#:~:text=Pharmacokinetics%20is%20the%20study%20of,drug%20does%20to%20the%20body.&text=When%20referring%20to%20pharmaceuticals%2C%20pharmacokinetics,how%20your%20body%20excretes%20it.](#)

- <https://www.ashp.org/-/media/store%20files/p2418-sample-chapter-1.pdf>
- <https://www.ausmed.com/cpd/articles/pharmacokinetics-and-pharmacodynamics>
- <https://en.wikipedia.org/wiki/Medicine>
- <https://www.dictionary.com/browse/medicine>
- <https://www.medicalnewstoday.com/articles/323679#fields-of-medicine>




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SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

ENZYMOLGY

CODE: 56030302

M.Sc 3rd SEM

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	8	30	50	70		150

Objectives:-

- The objectives of the paper is students will get about the protein structure, classification of enzymes, terminology, enzyme activity and purification of enzymes and strategy for separation and purification.
- The student will get idea about the enzyme kinetics and mechanism. What is significance of Km, Vmax and Kcat and importance of steady state equilibrium. Enzyme inhibition and its types. Thermal kinetics.
- To provide the mechanism and action of enzyme and its role of activators. Allosteric regulation and its mechanism.
- The study will help in understanding the what are isoenzymes and physiological significance role of different types of enzymes.




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Course Outcome:

Unit	Description in Detail	Weightage (In Hours)
1	Introduction: Enzymology and historical developments in enzymology Protein Structure: Primary, secondary, tertiary and quaternary structure, techniques used in enzyme characterization Enzyme classification: IUB enzyme classification. Enzyme Activity: Principle and techniques of enzymatic analysis, factors affecting enzyme Activity, Extraction and Purification of enzyme: Objectives and strategy, separation techniques, test of purity.	08
2	Enzyme Kinetics: Bioenergetics and Catalysis Single substrate kinetics: Equilibrium and Steady state kinetics, significance of Km, Vmax & Kcat. Pre-steady state and Relaxation kinetics. Multisubstrate kinetics: General rate equation, compulsory order, random order and ping-pong mechanisms and their primary and secondary plots. Enzyme inhibition and its kinetics: Reversible and irreversible inhibition, competitive, noncompetitive and uncompetitive, mixed, partial, substrate and allosteric inhibition. Thermal kinetics: Effect of temperature on reaction rate, enzyme stability, Arrhenius equation and activation energy.	10
3	Mechanism of Enzyme Action: Enzyme activators, co-enzymes and co-factors in enzyme catalysis, Enzyme and substrate Specificity Investigation of active Centre, Factors affecting catalytic efficiency, Experimental approaches to determine enzyme mechanisms. Enzyme mechanisms: Lysozyme, Chymotrypsin, Carboxypeptidase, Restriction endonuclease, Aspartate trans carbomylase. Allosteric enzymes and sigmoidal	10



	kinetics: Protein ligand binding, Co-operativity, MWC & KNF models, Regulation of enzyme activity. Control of metabolic pathways.	
4	Isoenzymes and its physiological significance, Ribozymes and Abzymes Enzyme engineering: Chemical modification of enzymes: methods of modification of primary structure, catalytic and allosteric properties, use of group specific reagents. Enzyme Immobilization Enzymes in non conventional media, Enzymes sensors, Enzymes as analytical reagents.	08

Learning Outcomes:

- The students will be able to understand and deals with the biochemical nature and activity of enzymes and is a subject that has relevance to students from a wide range of disciplines.
- Student should be able to understand basic concepts of the present day scope and applications of enzymology.
- The course is designed to give students an understanding of procedures involved in purification of enzymes, enzymes assays and quantitative evaluation of the influencing parameters such as concentrations of substrate / enzyme, pH, temperature and effects of inhibitors on enzyme activity.
- This is a course where the topics to be studied include enzyme active sites / mechanisms of enzyme action; enzyme kinetics and regulation; Isozymes and their clinical significances /function relationship etc as tools for understanding functions of enzymes.

Teaching & Learning Methodology

- We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.
- The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:
- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual approaches and needs



- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Basic Text & Reference Books:

1. *Enzymes: Biochemistry, Biotechnology, Clinical Chemistry 2nd Edition*, authored by Trevor Palmer and Philip Bonner Affiliated East-West Press Pvt. Ltd.
2. Textbook of biochemistry – Vasudevan Shreekumari
3. Biochemistry – Lehninger 6th edition
4. Fundamentals of Enzymologist: Nicholes C. Price and Lewis Stevens, Oxford Univ. Press.
5. Enzyme Structure and mechanism: Alan Fersht, Reading, USA.
6. The chemical kinetics of enzyme action: K. J. Laider and P. S. Bunting, Oxford University Press, London.
7. Enzymes: M. Dixon, E. C. Webb, C.J.R. Thorne and K. F. Tipton, Longmans, London.
8. Biochemistry: Lubert Stryer

E-Resources

- https://www.feedspot.com/infiniteress.php?_src=feed_title&followfeedid=4812449&q=site:https%3A%2F%2Fwww.nature.com%2Fsubjects%2Fbiochemistry.rss
- https://www.sciencedaily.com/news/matter_energy/biochemistry/
- <https://thebiochemistblog.com/>
- <https://www.longdom.org/microbial-biochemical-technology.html>
- <https://bmcbiochem.biomedcentral.com/>
- <https://www.slideshare.net/mohdsakharkar/enzyme-final>



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

FOOD & DAIRY MICROBIOLOGY

CODE: 56030303

M.Sc 3rd SEM

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	8	30	50	70		150

Objectives:-

- To provide basic knowledge of food & dairy microbiology.
- In this course the meaning of food microbiology and interaction between microorganism and foods and how food spoilage will be study.
- The pathogenic and non-pathogenic microorganism that found in food and how can they contaminated the foods will be study, in the other hand mycotoxins which is one of the toxin secreted by fungi will be study
- After knowledge of contamination of foods by microorganism the way for preservation of foods from contamination will be study.
- To identify the causative agent in food known as microorganisms
- Understand the mechanism of their reaction in food to make it unsuitable for consumption
- To describe how some microbes proved to be beneficial in the production of food products
- To describe how some bacteria are used in the preservation of food rather than spoil it
- To identify the sources and causes of microbes causing food spoilage




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Prerequisites:-

- Student Must have studied B.Sc. with microbiology/biotechnology as a major subject and knowledge of basic biology

Unit	Description in Detail	Weightage (In hours)
1	1. Scope of food microbiology 2. Food as a substrate a) Microorganisms important in food microbiology- Bacteria, yeast & Moulds b) Factors influencing microbial growth in food.	04
2	1. Food spoilage a) General principles underlying food spoilage and contamination b) Spoilage of canned food, sugar products, vegetables, fruits, meat, milk & milk products, fish, sea food and poultry 2. Food Poisoning a) Indicator food borne pathogens b) Bacterial food borne infections and intoxications- <i>Clostridium</i>, <i>Escherichia</i>, <i>Salmonella</i>, <i>Shigella</i> c) General methods for diagnosis of infections, intoxication and preventive measures.	06
3	Food Preservation a) Principles of food preservation-Asepsis, removal of micro organisms, anaerobic conditions, high and low temperature, drying, irradiation b) Chemical and bio preservatives and food additives c) Food packaging and labeling.	06
4	Genetically modified foods. Biosensors in food research organizations/institutes in India. Recent food borne outbreaks. Food sanitation- Microbiology of food plant sanitation, water and milk testing food laws and quality control-HACCP, Codex alimentarius, PFA, FPO, MFPO, BIS, AGMARK.	08



Learning Outcomes:

- Describe the characteristics of foodborne, waterborne and spoilage microorganisms, and methods for their isolation, detection and identification.
- Explain why microbiological quality control programme are necessary in food production.
- At the end of the course, the students have acquired skills related to: the microbiological food control through appropriate and targeted applications of physical chemical and biological treatments; the use of basic microbiological methods for the evaluation of the microbial load in the different food matrices; the microbial monitoring of fermented foods; the use of selection scheme for starter cultures.

Teaching & Learning Methodology

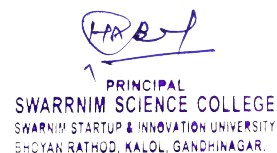
We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- Food microbiology, Frazier and Westhoff
- Food microbiology, Adam and Moss
- Dairy Microbiology By Robinson. Volume I and II
- Fundamental food microbiology, Bibek ray and Arun Bhuniya



E-Resources

- <https://www.slideshare.net/vasanthanvasu/dairy-microbiology-39885550>
- <https://www.slideshare.net/HiwrHastear/food-microbiology-60301420>
- <https://www.biologyexams4u.com/2016/11/12-methods-of-food-preservation.html#.X5v9am4zbcc>
- <https://www.toppr.com/guides/evs/mangoes-round-the-year/food-spoilage/>




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SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

MICROBIAL BIOTECHNOLOGY

Subject Code: 56030301

M.Sc. Semester -3

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	6	50	-	50	50	150

Objectives

- To provide students basic knowledge of Microbial Biotechnology. It covers up general concept of microbial production and fermentation of various products.
- The purpose of the course is to give knowledge about production process of primary & secondary metabolites using fermentation technology and microorganisms.
- To provide an understanding of other microbial products such as microbial polysaccharides, beverages, polyhydroxyalkanoates, bio-surfactants and biotransformation of steroids.
- To understand the concepts of biomass production of microorganisms and its applications.

Prerequisites

Student must have studied First year (FY) of M.Sc. with Microbiology as a major subject and knowledge of basic biotechnology.




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Course outline

Unit No.	Course Contents	Teaching hours
1	Microbial production of primary metabolites - Amino acids: Glutamic acid, Lysine - Enzymes: Proteases, Amylases - Organic acids: Citric acid, Acetic acid - Industrial Alcohol	10
2	Microbial production of secondary metabolites - Antibiotics: Penicillin, Streptomycin - Vitamins: B₁₂, B₂ - Ergot Alkaloids - Carotenoid pigments: β-carotene, lycopene	10
3	Microbial production of other products & Biotransformation - Microbial polysaccharides: Xanthan, Alginate and Dextran - Beverages: Beer, Wine - Polyhydroxyalkanoates: PHA and PHB - Biosurfactants - Steroid transformation	10
4	Biomass production and applications - Fungal biomass- baker's yeast and single cell oil - Mushroom cultivation - Use of Algal biomass. - Microbial production for food and feed	10
		40

Learning Outcomes

- The students will be able to apply the knowledge of the Microbial production to understands concepts of various fields like food and dairy industries, pharmaceutical industries, Fermentation industries, beverages industries, etc.
- Student should be able to understand basic concepts of various products like amino acids, enzymes, vitamins, organic acids, industrial alcohol, beer, wine, microbial polysaccharides, Biosurfactants as well as biotransformation of steroids. Students also apply knowledge of mushroom cultivation, fungal biomass production, algal biomass and other microbial production for food and feed.



Access information on a topic from a variety of sources, and be able to learn new things on one's own.

- Communicate verbally, graphically, and/or in writing the theoretical data clearly and concisely that incorporates the stylistic conventions used by Microbiologists, biotechnologist, researchers and scientists worldwide.

Teaching & Learning Methodology

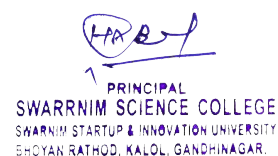
We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc.) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. A.N. Glazer and H. Nikaido. (2007) *Microbial Biotechnology. Fundamentals of Applied Microbiology*. (2nd edition)
2. E. M. T. El-Mansi, E. M. T. El-Mansi, C. F. A. Bryce, Arnold L. Demain, A.R. Allman (2006) *Fermentation Microbiology and Biotechnology* (2nd edition)
3. James.M. Jay, Martin J. Loessner, David. A. Golden (2005). *Modern Food Microbiology* 7th Edition (Food Science Texts Series)
4. Michael J. Waites, Neil L. Morgan, John S. Rockey, Gary Higton (2001). *Industrial Microbiology: An Introduction*



SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

ENVIRONMENTAL MICROBIOLOGY

CODE: 56030401

M.Sc. 4th SEM

Teaching & Evaluation Scheme:-

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	8	30	50	70		150

Objectives:-

- To provide basic knowledge of Environmental Microbiology. It covers up scope of global warming, environmental problems, biodegradation, bioleaching.
- To provide basic knowledge of microbes in environment.
- The main goal is to know and understand the role of microbes in biogeochemical processes in different ecosystems. The students will learn the basic microbiological principles, the methods in microbial ecology and their theoretical and practical use.
- The knowledge can give the base for understanding processes and changes in the environment.
- The students can get some skills to recognise the ecological problems and critical evaluation of the human impacts on pollution, climate changes and as well as environmental protection.
- The lectures will be implemented with individual practical work in the laboratory and presentations of the seminars.
- The students can get general competences in microbial ecology.




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Prerequisites:-

- Student Must have studied B.Sc. with microbiology/biotechnology as a major subject and knowledge of basic biology

Course outline:-

Unit	Description in Detail	Weightage
1	Global environmental problems: Global warming, Ozone depletion, Acid rain. Global warming and infectious diseases. Water pollution: sources and types, physical, chemical and biological pollution. Eutrophication and its control Microbial indicators of water pollution Biodeterioration of wood and metals. Role of microorganism, mechanism and control.	10
2	Bioremediation: Intrinsic bioremediation, Biostimulation and Bioaugmentation. In situ and ex situ bioremediation technologies. Bioremediation of oil spills. Bioremediation of heavy metal pollution, Phytoremediation. Use of GMO in bioremediation. Biological treatment of waste gas (polluted air): biofilters, bioscrubbers, membrane bioreactors, biotrickling filters.	10
3	Biodegradation of organic pollutants: Mechanisms and factors affecting biodegradation. Pollution problems and biodegradation of simple aliphatic, aromatic, polycyclic aromatic hydrocarbons, halogenated hydrocarbons, azo dyes, lignin and pesticides.	10
4	Bioleaching of metals: Characteristics of commercially important microbes, mechanisms of bioleaching, factors affecting bioleaching and current biomining processes. Biobeneficiation of gold ores. Microbially enhanced oil recovery. Biodesulfurization of coal: Removal of organic and inorganic sulphur from coal. Microbial Insecticides: Bacterial, fungal and viral	10



	insecticides in pest management. Biofertilizers: Nitrogen fixing and phosphate solubilizing biofertilizers.	
		40

Learning Outcomes:

- At the end of the course the student would have basic knowledge of microbiology techniques and bacteria.
- Students will get the basic knowledge how to prepare and perform sampling and microbial analyses to determine the abundance, growth rate and microbial community composition together with the basic environmental parameters.
- The knowledge can be used to prevent infections and to protect human and environmental health.
- Students will get basic knowledge to determine the role of microbes:
 - in different habitats,
 - in different biogeochemical cycles,
 - to determine their role in nutrient cycling
 - to determine water quality,
 - in degradation of natural organic compounds and selected pollutants in the environment.

Teaching & Learning Methodology

We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
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- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module




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or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

- . Environmental Microbiology –RM Maier, IL Pepper & GP Gerba
- Comprehensive Biotechnology- Vol 4, Murray Moo Young
- Biotechnology – Rehm and Reid
- Environmental Science O BJ Nebel and RT Wright
- Environmental Biotechnology –HJ Jordening & Josef Winter




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SWARNIM SCIENCE COLLEGE
SWARNIM STARTUP & INNOVATION UNIVERSITY
BHOYAN RATHOD, KALOL, GANDHINAGAR.

SWARNIM STARTUP & INNOVATION UNIVERSITY

SWARNIM SCIENCE COLLEGE

DEPARTMENT OF MICROBIOLOGY

r-DNA Technology

Subject Code: 56030402

M.SC. Semester -4

Teaching & Evaluation Scheme

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	P	Total		Internal		External		Total
					Th	Pr	Th	Pr	
4	-	2	6	8	30	50	70	-	150

Objectives

- To provide students the basic knowledge of R-DNA technology (Recombinant DNA technology).
- The purpose of the course is to give student to introduction of Recombinant DNA technology and its cover up scope of genetic engineering, Cloning, Recombinant, and PCR.
- To provide an understanding of Scope of genetic engineering, concept & important of genetic engineering, chemical synthesis of gene cloning & expression vectors, and PCR techniques.

Prerequisites

Student must have studied M.Sc. with microbiology as a major subject and knowledge of basic microbiology/Life science.




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Course outline

Sr. No.	Course Contents	Teaching hours
1.	Scope of Genetic Engineering, Concept and importance of Genetic Engineering; General strategies and Steps involved in gene cloning; Extraction and purification of DNA from bacteria, plant and animal cells; Restriction enzymes, DNA lipase and other enzymes involved in gene cloning; mRNA and cDNA preparation.	06
2.	Chemical synthesis of gene/DNA Cloning and expression vectors- Plasmids, λ -bacteriophages, M-13 based vectors, Phagemids, Cosmids, YAC, BAC, HAC/MAC, etc. Expression of cloned gene in heterologous host Introduction of DNA into different host systems.	06
3.	Recombinant selection and screening Southern blotting & hybridization, Northern analysis, Western blot analysis, Agarose gel electrophoresis, Pulse Field Gel Electrophoresis, Rotating Gel. Electrophoresis (RGE), Mapping Regulatory Sequences by in vivo expression assay Mapping of Protein Binding Site by DNase I Protection, Mobility Gel Shift Assay Protein Activity Assay – Yeast-one hybrid, Yeast-two hybrid and Yeast-three hybrid system. Phage display, Subtractive hybridization and cloning, HRT/HART, Chromosomal Walk. Characterization of Cloned genes .Restriction map, S1 mapping, Denaturation mapping, Heterogonous mapping DNA sequencing, Nucleic Acid Microarray, Metagenomics, Metabolism, gene therapy.	10
4	Polymerase chain reaction Molecular markers Linkage mapping using meiotic recombination frequencies Genomic mapping using radiation induced Chromosome rearrangement Genomic mapping using DNA sequence polymorphism as genetic marker In vitro Mutagenesis Metagenomics Metabolic engineering Gene therapy Recombinant products- recombinant hormones, recombinant DNA vaccines, Transgenic plants, Transgenic animals, Genetic Engineering Guidelines, Levels of Physical containment, Levels of Biological Containment, The Indian Guidelines.	10




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Learning Outcomes

- The students will be able to understand the Knowledge of r-DNA technology to understand concept of various fields like research, gene manipulation, genetic engineering, gene cloning, fermentation industries, etc.
- Student should be able to understand basic concepts of recombination, methods of genetic engineering, screening methods, enzymes involved in r-DNA technology, DNA sequencing, vectors, gene markers, transgenic plants and animals as well as gene therapy.
- Access information on a topic from a variety of sources, and be able to learn new things on one's own.
- Communicate verbally, graphically and/or in writing the theoretical data clearly and concisely that incorporates the stylistic conventions used by microbiologists, biotechnologists, researchers and scientist worldwide.

Teaching & Learning Methodology

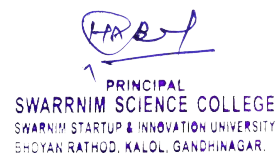
We should aim to provide a range of modes of learning, including, for example, individual work, group work and opportunities for off-campus learning through visit to various research institutions across India or collaborative arrangements.

The following are some examples of learning and teaching strategies and methods which you may wish to develop for use in your subject area:

- Work with students at an early stage of the program/module, to identify cultural differences in their previous educational experience, their individual learning approaches and needs
- Draw upon the knowledge and understanding brought by students from different backgrounds, by encouraging them to share and discuss personal knowledge and experience of an issue in tutorial/seminar groups
- Use teaching formats such as discussion groups that encourage the participation of all students and help identify areas where students are having difficulties
- Provide learning materials in different formats (written, online, audio, video podcast etc) to support key concepts/knowledge. Particularly at the start of a program/module or for key areas, providing online or hard copy notes before classes can aid comprehension and accessibility.

Books Recommended

1. Genomes TA Brown 3rd Edition
- Principles of Genetic Manipulation- Old & Primrose
- Genetic Engineering – Rastogi & Pathak
- Recombinant DNA technology by keya chaudhari



E-Resources

- <https://www.slideshare.net/mobile/SECBIO/genetic-engineering-13933607>
- <https://www.slideshare.net/mobile/ImdadTakkar/artificial-gene-synthesis>
- <https://www.slideshare.net/mobile/FarazaJaved/pcr-76618045>
- <https://www.slideshare.net/mobile/fizz92fizzuo/vectors-49902617>




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