SWARNIM STARTUP & INNOVATION UNIVERSITY
WHERE IDEAS COME ALIVE

SCHOOL OF MANAGEMENT COMMERCE AND LIBERAL ARTS

PROGRAMME NAME – BBA

BBA 1ST SEMESTER

SUBJECT NAME- Principles of Management

SUBJECT CODE- BBA230101

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Understanding the concept and nature of Management and recognize various perspectives on Management.
2. Identify the steps involved in the process of management.
3. Design plans and take business decisions by using the apt tools and techniques.
4. Create organization charts, establish authority responsibility relationship, create departments and perform other functions of organization.
5. Identify the need for Staffing, Motivation & Leadership for adopt the best methods & Theories, styles.

SUBJECT NAME- Financial Accounting

SUBJECT CODE- BBA230102

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Acquiring the knowledge of different accounting concepts, methods and statements.
2. Ability to prepare financial statements in accordance with appropriate standards.
3. Creating critical thinking skills for analysis of financial data of an organization.
4. Ability to interpret different financial statements.
5. To make aware about accounting of Non-profit making organization

Swarnim Startup & Innovation University Bhoyan Rathod, Gandhinagar

SUBJECT NAME- Marketing Management

SUBJECT CODE- BBA230103

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Understanding of the basic terms used in marketing and the differences between them.
2. Ability to apply the concepts, principles of marketing to improve marketplace performance
3. Understanding of Product Management Concepts
4. Ability to identify what drives customer value and importance of buying behaviour
5. Critically analyse an organization's Distribution system and branding strategies.

SUBJECT NAME- Office Automation

SUBJECT CODE- BBA230104

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. The understanding of the basic nature & scope of computer usage
2. The identification of various peripheral devices, internet environment, word processing, spread sheets and presentation in computer related terminology.
3. The knowledge about different computer concepts such as internet environment.
4. Ability to use digital resources at workplace for effective organization.
5. To equip students with practical knowledge of MS office

SUBJECT NAME- Communication Skills

SUBJECT CODE- AEC230101

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Inculcation of different skills will be added in a student's career.
2. Students' employability skills will be enhanced.
3. Ability to speak in English will be improved through practice.
4. Self-Analysis tool will help the students to identify their strengths and weaknesses to work upon.

SUBJECT NAME- Foundation of Entrepreneurship

SUBJECT CODE- SEC230101

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. To know various theories of entrepreneurship and trends.
2. To identify various issues and challenges in starting a new venture.
3. To understand innovation and its implications
4. To create entrepreneurial mindset through understanding entrepreneurial personality

SUBJECT NAME- Indian Economy & Business Model

SUBJECT CODE- IKS230101

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1.Enlightening the students about the ancient fundamentals about Indian economics which will frame out a basic land of understanding the modern trends.

2. Understanding the Indian economic models during ancient India.

3. Enhancing the knowledge of Indian business models (pre – post independence) in comparison of world business models

BBA 2ND SEMESTER

SUBJECT NAME- Organisational Behaviour

SUBJECT CODE- BBA230201

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. To familiarize with the concept of individual, group and organisation behaviour at work.
2. To understand individual behavior in organizations due to diversity, attitudes, job satisfaction, emotions, personality, perception, motivation that influence the decision making and work.
3. To familiarize with concept of leadership and theories of motivation.
4. To explain how power and culture affect working relationships within organizations.
5. To ability to adapt the organizational change.
6. To understand the concept of stress and methods of managing the stress to improve the organizational performance.

SUBJECT NAME- Fundamentals of Economics

SUBJECT CODE- BBA230202

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. The understanding of the basic nature & scope of economics.
2. The identification of various economic variables in general business atmosphere.
3. The knowledge about different micro economic concepts such as demand & supply.
4. Ability to forecast future demand for business.
5. Understanding various macro-economic indicators.
6. Understanding different aspects of monetary policy and fiscal policy of a nation.

SUBJECT NAME- Financial Management

SUBJECT CODE- BBA230203

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. The understanding of how the Indian financial system works.
2. The knowledge of different avenues of raising and investing funds to establish and run the business.
3. The ability to apply time value of money in taking financial investment decision
4. Enhancing the ability to understand operating cycle
5. Enabling students to know how to manage working capital finance

SUBJECT NAME- Foundation in Statistical Method

SUBJECT CODE- BBA230204

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. The understanding of the basic Mathematical Concepts.
2. The identification of structured Business Problems in a mathematical form.
3. Application of the mathematical concepts learnt to business courses.
4. Ability to test the hypothesis relating to economics, business and finance.
5. Analyzing business data using time series technique.

SUBJECT NAME- Logical and Critical Thinking

SUBJECT CODE- AEC230202

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Ability to understand the basic concept of Logical and Critical Thinking and are able to solve problems
2. Increasing the analytical ability.
3. Helping students in employability in service based company, government sector, PSU and in pursuing for higher studies also.

SUBJECT NAME- Identifying Entrepreneurial Opportunities

SUBJECT CODE- SEC230202

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Exploration of opportunities from the market
2. Check technical, market, financial and other types of Feasibility of a business idea.
3. Develop business model to describe the rationale of how an organization creates, delivers, and captures value

SUBJECT NAME- Environmental Studies

SUBJECT CODE- VAC230201

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Enabling students to understand and realize the multi- disciplinary nature of the environment, its components, and inter-relationship between man and environment.
2. Understanding the relevance and importance of natural resources in the sustenance of life on earth and living standard. the importance of ecosystem, biodiversity, and nature.
3. Correlating the human population growth and its trend to the environmental degradation and developing the awareness about his/her role towards environmental protection. Identifying different types of environmental pollution and control measures.

BBA 3RD SEMESTER

SUBJECT NAME- Financial Statement Analysis

SUBJECT CODE- 14020301

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Learn the structure and content of financial statements, including the balance sheet, income statement, cash flow statement, and statement of shareholders' equity.
2. Develop skills to assess the financial health of a company through ratio analysis, trend analysis, and comparative financial analysis.
3. Evaluate profitability, liquidity, solvency, and operational efficiency to understand a company's strengths and weaknesses.
4. Understand the regulatory environment and accounting standards that impact financial reporting and analysis.

SUBJECT NAME- Business Statistics

SUBJECT CODE- 14020302

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Understand fundamental statistical concepts and tools such as mean, median, mode, variance, and standard deviation, and apply them to business data for informed decision-making.

1. **2**.Analyze business problems using probability theory, enabling students to assess risk and uncertainty in various business scenarios.
2. Apply correlation and regression techniques to evaluate relationships between different business variables and make predictions.

SUBJECT NAME- Employee Behavior & Relationship Management

SUBJECT CODE- 14020303

COURSE OUTCOMES (COs)-

1. At the end of the course the student will be able to:
2. Provide students with insights into individual and group behavior in organizational settings, including theories of motivation, personality traits, perception, and attitudes.
3. Explore factors influencing employee engagement and satisfaction, including job design, work-life balance, compensation, recognition, and organizational culture.
4. Equip students with skills in conflict resolution, negotiation techniques, and mediation strategies to manage interpersonal conflicts and promote constructive dialogue in the workplace.
5. Trace the historical development of industrial relations, including the evolution of labor movements, trade unions, and legislative frameworks governing employment relationships.

SUBJECT NAME- Advertisement & Sales

SUBJECT CODE- 14020304

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. **Clear direction**: An objective provides a clear direction for the advertisement and sales efforts, ensuring that everyone is working towards the same goal.2
2. **Focus**: An objective helps to focus efforts on the most important aspects of advertisement and sales, reducing waste and increasing efficiency.
3. **Measurable progress**: An objective provides a benchmark for measuring progress, allowing for adjustments to be made as needed.
4. **Resource allocation**: An objective helps to allocate resources effectively, ensuring that the right amount of time, money, and effort is invested in the advertisement and sales efforts.

SUBJECT NAME- Environment law

SUBJECT CODE- 14020305

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. 1 Understand the concept of environmental law and its importance in protecting the environment.
2. 2 Identify the key environmental issues and challenges, such as climate change, biodiversity loss, and pollution.
3. 3 Recognize the key principles and concepts of environmental law, such as sustainable development, precautionary principle, and polluter pays principle.

SUBJECT NAME- Family Business Management

SUBJECT CODE- 14020306

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Understand the concept and significance of family businesses in the global and Indian context.
2. Identify and evaluate the challenges faced by family businesses in India.
3. Develop governance structures such as Family Constitutions to ensure sustainable family business operations.

SUBJECT NAME- Intellectual Property Rights

SUBJECT CODE- 12300011

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. To introduce fundamental aspects of Intellectual property Rights to students who are going to play a major role in development and management of innovative projects in industries.
2. To disseminate knowledge on patents, patent regime in India and registration aspects.
3. To disseminate knowledge on copyrights and its related rights and registration aspects.
4. To disseminate knowledge on trademarks and registration aspects.
5. To disseminate knowledge on Design, Geographical Indication (GI), Plant Variety and Layout Design Protection and their registration aspects.
6. To make them aware about current trends in IPR and Govt. steps in fostering IPR.

BBA 4TH SEMESTER

SUBJECT NAME- Introduction to Business Law

SUBJECT CODE- 14020401

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. To make students understand the concept, theories and application of business Law for the Development of the Society.
2. Develop the ability to analyze, draft, and interpret contracts, including understanding contract formation, terms, performance, breach, and remedies.
3. Familiarize students with different types of negotiable instruments governed by the Act, such as promissory notes, bills of exchange, and cheques, including their definitions, characteristics, and legal implications.
4. Educate students on the essentials of a valid contract of sale, including the definition of goods, conditions and warranties, transfer of property, and the distinction between sale and agreement to sell.

SUBJECT NAME- Global marketing Management

SUBJECT CODE- 14020402

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Gain a comprehensive understanding of the global economic, political, and cultural environment in which businesses operate
2. Develop skills to manage and lead diverse teams across different cultural contexts.
3. Understand the principles of international trade, including trade theories, policies, and practices.

SUBJECT NAME- Business Research Methods

SUBJECT CODE- 14020403

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. 1 To enable students to analyze and interpret data using various statistical tools.
2. 2 Introduce basic concepts of Research design and Research methodology aimed at solving business problems.
3. 3 To familiarize students with the types of problems often faced by Business Organizations.

SUBJECT NAME- Financial Management

SUBJECT CODE- 14020404

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. To demonstrate the sound understanding of the concept, functions and importance of financial management for a business firm.
2. Student will be able to calculate, working capital and its finance and demonstrate the working capital decisions and inventory management
3. Students will be able to analyze the convolutions associated with leverage and risk mitigation
4. To Demonstrate the ability to assess and manage financial risks and recommend an optimum capital budgeting for a firm.

SUBJECT NAME- Human Resource Management

SUBJECT CODE- 14020405

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. This subject is designed to provide a basic understanding of the subject of Human Resource management to the students.
2. To provide conceptual understanding of Human Resource Planning and the importance of Training and Development.
3. To study about various promotion schemes and Industrial Relations along with Remuneration policy under various labour laws
4. To understand the Employee welfare, Trade union and Dispute resolution mechanism

SUBJECT NAME- Supply Chain Management

SUBJECT CODE- 14020406

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Understand the concept of supply chain management and its importance in modern business.
2. Identify the key components of a supply chain (e.g., suppliers, manufacturers, distributors, retailers, customers).
3. Recognize the importance of collaboration and integration in supply chain management.
4. Understand the role of technology in supply chain management (e.g., ERP, SCM software).

SUBJECT NAME- Intermediate Program in Entrepreneurship

SUBJECT CODE- 12300012

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Apply the basic principles of entrepreneurial finance.
2. Understanding the importance of industrial collaboration and triple helix model for industrial Innovation.
3. Understand various market funds for start-ups.
4. Register any one form of business.

BBA 5TH SEMESTER

SUBJECT NAME- Company Law

SUBJECT CODE- 14020501

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. To impart expert knowledge of the various provisions of Companies Act
2. To understand about the Prospectus and Procedure of Winding up of the company.
3. To be aware of students' knowledge of the Appointments process of companies.
4. General procedure of Company management as per company law

SUBJECT NAME- Negotiation Skill

SUBJECT CODE- 14020502

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Understand the importance of negotiation in both professional and personal contexts.
2. Learn active listening techniques to better understand the other party's needs and perspectives.
3. Understand the importance of building trust and rapport in negotiations.
4. Understand the importance of setting clear goals and priorities before entering a negotiation.

SUBJECT NAME- Management outcomes with the Shrimad Bhagwat Geeta

SUBJECT CODE- 14020503

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Students will identify some of the commonly felt problems that individuals, organizations and the society faces.
2. Students will illustrate the usefulness of Gita in addressing some of these problems.
3. It will help to demonstrate how alternative world`s views and paradigms of management could be developed with knowledge of Ancient Indian wisdom such as Gita.

SUBJECT NAME- Industrial Relation

SUBJECT CODE- 14020504

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Advanced understanding of industrial relations theories: Analyze and apply theoretical frameworks to understand the complex dynamics of industrial relations.
2. In-depth analysis of labor laws and regulations: Examine the implications of labor laws and regulations on industrial relations, including employment contracts, collective bargaining agreements, and labor disputes.
3. Effective conflict resolution and negotiation: Apply advanced conflict resolution and negotiation techniques to resolve industrial relations disputes.

SUBJECT NAME- Recruitment and Selection

SUBJECT CODE- 14020505

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Learners will be able to perform Job Analysis
2. Learners will develop clear distinction between the various types of recruitment
3. Learners will be able to develop and execute the selection process of any organization

SUBJECT NAME- Advance Financial Management

SUBJECT CODE- 14020508

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. The understanding of capital budgeting decisions and its understanding.
2. The knowledge of working capital management with reference to theory and numericals.
3. The ability to capital structure theories in taking financial investment decision
4. Enhancing the ability to understand corporate finance and restructuring

SUBJECT NAME- Banking Finance Institute

SUBJECT CODE- 14020509

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. The learners will understand the financial intermediaries and various types of banks in detail
2. The learners will be able to learn Various types of interest rates and MIBOR, LIBOR, MIBID meaning
3. Learners will be able to understand Monetary and fiscal policy in detail and able to understand the meaning of E Banking and Mobile Banking
4. Learner will able to understand thorough knowledge of NBFCs and regulatory reforms

SUBJECT NAME- Project Management

SUBJECT CODE- 14020510

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Understand how to identify, assess, and mitigate risks, as well as ensure the quality and performance of project deliverables through quality assurance and control processes.
2. Develop strong communication and leadership skills to manage teams, handle stakeholders, and lead projects to successful completion while ensuring collaboration and motivation within teams.
3. Learn techniques for estimating costs, managing budgets, and controlling expenses throughout the project life cycle to meet financial constraints and goals.

SUBJECT NAME- Advanced Program in Entrepreneurship

SUBJECT CODE- 12300013

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Apply the basic principles of star-up scalability.
2. Understanding various individual attributes of strategic business plan development.
3. Develop strategies for start-up growth.
4. Experience real-world financial modelling and valuation through IPO.

BBA 6TH SEMESTER

SUBJECT NAME- Industry Law

SUBJECT CODE- 14020601

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Provide students with a foundational understanding of industrial law, its historical development, and its importance in regulating labor relations and protecting workers' rights.
2. Familiarize students with key labor laws and statutes governing employment relationships, including provisions related to wages, working conditions, hours of work, occupational safety and health, and social security.
3. Address legal provisions for protecting workers' rights, including laws against discrimination, harassment, unfair dismissal, and measures for promoting workplace safety, health, and welfare.

1. 4.Educate students on legal standards and compliance requirements for employers, including minimum wage laws, benefits, leave entitlements, and employment equity regulations.

SUBJECT NAME- Business plan

SUBJECT CODE- 14020602

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Students can learn how to construct a business plan, including financial components, customer profiles, and competitive analyses
2. Students can learn to evaluate the nature and consequences of business risk
3. Students can learn to analyze and evaluate the processes used to develop a business
4. Students can learn to analyze and evaluate the relationship between the functional areas of a business

SUBJECT NAME- Business Ethics

SUBJECT CODE- 14020603

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Provide students with a foundational understanding of ethics and its relevance to business, including ethical theories, principles, and frameworks applicable to organizational decision-making.
2. Explore the application of ethical principles and values to various aspects of business operations, including marketing, finance, human resources, supply chain management, and corporate governance
3. Discuss the concept of CSR and its importance in promoting ethical behavior, sustainability, stakeholder engagement, and the ethical responsibilities of businesses towards society and the environment.
4. Examine the relationship between ethics and legal compliance, understanding that ethical behavior often goes beyond legal requirements and involves moral considerations and corporate governance principles.

SUBJECT NAME- International HRM

SUBJECT CODE- 14020604

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. The main study objective is to learn how to conduct strategic human resource management in an international setting
2. The course aims at equipping the students of business management with concepts, processes and practical techniques of Managing people in cross cultural context
3. To create awareness about the cross cultural issues
4. To provide a theoretical background for supplementing the· understanding the issues of Managing people in globalized working environment

SUBJECT NAME- Human value & training & development

SUBJECT CODE- 14020605

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Learners will get conceptual knowledge of Training and development
2. Learners will be able to apply various training methods based on theory
3. Learners will be able to understand apply the concept of career planning

SUBJECT NAME- Security Analysis

SUBJECT CODE- 14020608

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. The learners will understand the investment risk and investment environment with reference to Indian security market
2. The learners will be able to learn security analysis practical and theory aspects
3. Learners will be able to understand basics and advance of efficient market hypothesis and Dow Theory
4. Learner will able to understand thorough knowledge of evaluating shares of investment in stock market

SUBJECT NAME- Portfolio Management

SUBJECT CODE- 14020609

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Learn the basic concepts, principles, and objectives of portfolio management.
2. Study various methods for analyzing and valuing different types of securities, including stocks, bonds, and derivatives.
3. Study the principles of portfolio construction, including the selection and weighting of assets.
4. Learn how to use performance metrics, such as the Sharpe ratio, Treynor ratio, and Jensen's alpha, to assess portfolio performance.

SUBJECT NAME- Start-Up Project

SUBJECT CODE- 12300014

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Initiate a start-up in team.
2. Register it as any form of business.
3. 3.Develop a team to run the venture.
4. 4.Collaborate with government and industry fraternity.
5. 5.Generate revenue for them and contribute to society with their problem solving product.

SCHOOL OF MANAGEMENT COMMERCE AND LIBERAL ARTS

PROGRAMME NAME – MBA

MBA 1ST SEMESTER

SUBJECT NAME- MANAGERIAL ECONOMICS

SUBJECT CODE-MBA101MAE

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. To equip the students of management with techniques of managerial economics to enable them its relevance decision making.
2. Analyze the demand and supply conditions and assess the position of a company
3. To understand the production and cost function using curves and theories.
4. Design competition strategies, including costing, pricing, product differentiation, according to the natures of products and the structures of the markets.
5. To understand the Concept of National Income, Fiscal and Monetary Policies and Macro Environment in business decisions

SUBJECT NAME- PRINCIPLES & PRACTICES OF MANAGEMENT

SUBJECT CODE-MBA102PPM

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Understanding the concept and nature of Management and recognize various perspectives on management.
2. To develop strategic planning and summarize the concept and complete the process of organizing.
3. To develop an understanding of staffing, Directing and Controlling
4. To develop an understanding of leadership and Styles
5. To develop strategic decision-making strategies in an organization.

SUBJECT NAME- MARKETING MANAGEMENT

SUBJECT CODE-MBA103MAM

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. To familiarize with the basic concept and techniques of marketing management, marketing mix and influence of environment on the marketing decisions.
2. To understand various concepts of product and role and importance of various pricing methods on marketing decisions.
3. To create awareness about channel intermediaries and various elements of promotion mix.
4. To analyze the marketing research and various steps involved in marketing research process.
5. Highlighting the ethical issues and developments in marketing along with understanding the current trends in marketing environment.

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SUBJECT NAME- ORGANIZATION BEHAVIOUR

SUBJECT CODE-MBA104ORB

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Learners will be able to understand and apply the concept of individual, group and organization behavior at work.
2. To demonstrate the understanding of individual behavior in organizations due to diversity, attitudes, job satisfaction, emotions, personality, perception, motivation that influence the decision making and work.
3. To with concept of leadership and power.
4. Explain how organizational change and culture affect working relationships within

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SUBJECT NAME- PRODUCTION AND OPERATION MANAGEMENT

SUBJECT CODE-MBA105POM

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1 Apply the skills which are necessary to analyze and synthesize the inter relationships inherent Operation and production system.

2. To understand the evolution of MRPII and enterprise resource planning used in managing operations.

3. To develop the knowledge of Quality Circles and Quality Control in business operations.

4. To enhance the skills of inventory management and inventory control like ABC, VED, FNSD analyses and value analysis

SUBJECT NAME- ACCOUNTING FOR MANAGERS

SUBJECT CODE-MBA106AFM

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. To communicate the major management accounting concepts related to planning, directing, controlling and decision making.
2. To make the students aware about using management accounting tools for pricing and budgetary control.
3. To understand the concept of responsibility accounting and the role of a manager in the process of responsibility accounting.
4. Analyze cost-volume-profit techniques to determine optimal managerial decisions.
5. Enable the students to determine standard prices of materials, labour and overheads as well as to analyze the difference between standard and actual prices through variance analysis.

SUBJECT NAME- ENTREPRENEURSHIP AND START-UP

SUBJECT CODE-MBA107EAS

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. To know various theories of entrepreneurship and trends.
2. To identify various issues and challenges in starting a new venture.
3. To understand innovation and its implications
4. To create entrepreneurial mind-set and to know how to start a startup with practical

MBA SEMESTER 2ND SEMESTER

SUBJECT NAME- BUSINESS STATISTICS

SUBJECT CODE-MBA201BUS

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. To understand the basic Statistics Concepts.
2. To identify structure and Business Problems in a mathematical form.
3. Apply the Statistical concepts to other business courses.
4. Validate Statistical statements relating to economics, business and finance.
5. Discuss data analysis by using measures of central tendency and demonstrate dispersion in data.

SUBJECT NAME- HUMAN RESOURCE MANAGEMENT

SUBJECT CODE-MBA202HRM

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. To understand basic of Human Resource Management
2. To understand importance of Human Resource Planning & Recruitment and Selection
3. To understand induction and Training and Development
4. To have glance to Performance Appraisal, Job analysis and Job
5. To understand basic of Compensation, Grievance and Employee Welfare Management

SUBJECT NAME- INFORMATION TECHNOLOGY FOR MANAGERS

SUBJECT CODE-MBA203ITM

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Learner should be able to perform editing, formatting functions on text, pictures and table, and producing a mail merge
2. Learners should be able to demonstrate the use and utility of functions, formulas, organizing and displaying large amounts and complex data.
3. Learners should understand basic use of Enterprise software, and its role in integrating business functions
4. Learners will understand the scope of e-business platforms and related technology for offering better service to customers.

SUBJECT NAME- FINANCIAL MANAGEMENT

SUBJECT CODE-MBA204FIM

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. The understanding of how the Indian financial system works.

2. The students have foundation of financial principles like concepts of time value of money & present value

3. Enhancing the financial analytical skills which helps in taking investment decisions

4. The knowledge of managing working capital finance

5. Increase capability to use financial concepts leverage and capital structure in business organisation.

SUBJECT NAME- PROFESSIONAL SKILLS AND ETIQUETTES

SUBJECT CODE-MBA205PSE

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. 1 Demonstrate an understanding of professionalism in terms of workplace behaviors and Business meetings.
2. Adopt attitudes and behaviors consistent with standard workplace expectations.
3. Presenting oneself with finesse and making others comfortable in a business setting & developing basic etiquettes in order to succeed in corporate culture and multi culture challenges.

SUBJECT NAME- BUSINESS RESEARCH METHODS

SUBJECT CODE-MBA206BRM

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Understanding the basic nature and purpose of Research and its advantages to business
2. Ability to know & classify between various Primary and Secondary sources of data
3. Knowledge of Sampling Techniques used to draw sample in research
4. Ability to design questionnaire – a structured way to collect primary data which is helpful in business research
5. Learn how to write a Research Report, research paper/ research article

MBA 3RD SEMESTER

SUBJECT NAME- NEW ENTERPRISE AND INNOVATION IN MANAGEMENT

SUBJECT CODE-16040301

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to

1. Develop an understanding of best techniques for idea generation, opportunities exploration, and market research.
2. Check technical, market, financial and other types of Feasibility of their business idea.
3. Develop business model to describe the rationale of how an organization creates, delivers, and captures value
4. Conduct the customer's survey to know the need of their business idea.

SUBJECT NAME- BUSINESS LAW

SUBJECT CODE-16040302

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to

1. To make students understand the concept, theories and application of business Law for the Development of the Society.

2. Develop the ability to analyze, draft, and interpret contracts, including understanding contract formation, terms, performance, breach, and remedies.

3. Familiarize students with different types of negotiable instruments governed by the Act, such as promissory notes, bills of exchange, and cheques, including their definitions, characteristics, and legal implications.

4. Educate students on the essentials of a valid contract of sale, including the definition of goods, conditions and warranties, transfer of property, and the distinction between sale and agreement to sell.

SUBJECT NAME- BUSINESS STRATEGY

SUBJECT CODE-16040303

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to

1. To know core concepts of Strategy and Strategic Management and its scope.

2. To know various external factors and its effect business policy or business strategy

3. To know and execute the process of internal analysis of any business unit of Industry.

4. To understand various steps of formulation and implementation of various business

SUBJECT NAME- DIGITAL MARKETING

SUBJECT CODE-16050301

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Understand the concepts and applications of digital marketing and its real-world iterations.

2. Articulate innovative insights of digital marketing enabling a competitive edge.

3. Understand how to create and run digital media based campaigns

4. Identify and utilize various tools such as social media etc.

SUBJECT NAME- INTEGRATED MARKETING COMMUNICATION

SUBJECT CODE-16050302

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. Apply the key terms, definitions, and concepts used in integrated marketing communications.

2. Examine how integrated marketing communications help to build brand identity and brand relationship and create brand equity through brand synergy.

3. Choose a marketing communication mix to achieve the communications and behavioural objectives of the IMC campaign plan.

4. Structure an integrated marketing communications IMC campaign plan based on the application of marketing concepts, principles, IMC tools and practices within an organization.

SUBJECT NAME- STRATEGIC HUMAN RESOURCE MANAGEMENT

SUBJECT CODE-16070301

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to:

1. The learners will understand the strategic Role of HRM,

2. The learners will be able to learn the a clear distinction between Performance Appraisal and Performance Management

3. Learners will be able to plan how strategic pay plans and employee benefits are determined.

SUBJECT NAME- MANAGEMENT OF FINANCIAL SERVICES

SUBJECT CODE-16060301

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to

1. The learners will understand the Indian Financial system, Financial instruments and regulatory system

2. The learners will be able to learn factoring and forfaiting, stock broking, credit rating, custodial and depository services

3. Learners will be able to understand basics of insurance services and other financial services

4. Learner will able to understand thorough knowledge of mutual funds and crowdfunding

SUBJECT NAME- SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT

SUBJECT CODE-16060302

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to

1. The learners will understand the investment risk and investment environment with reference to Indian security market

2. The learners will be able to learn security analysis practical and theory aspects

3. Learners will be able to understand basics and advance of portfolio management

4. Learner will able to understand thorough knowledge of evaluating shares of investment in stock market

MBA 4TH SEMESTER

SUBJECT NAME- LEGAL ASPECTS OF BUSINESS

SUBJECT CODE-16040401

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to

1. Equipped with fundamental and contemporary knowledge of the most prevalent form of business organization at global level.
2. Familiarized with legal aspects of starting a new business in the form of a company
3. Prepared with fundamental and contemporary knowledge about the main source of business finance- Share Capital 4. Aware about their rights as an investor in share market

SUBJECT NAME- GLOBAL MARKETING MANAGEMENT

SUBJECT CODE-16040402

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to

1. Understand the key characteristics of important country markets in different regions of the world and learn how to develop marketing plans for these diverse country markets.
2. Learn to gather, categorize, analyze, interpret, and evaluate relevant information about markets in different countries around the world. To assess the social/cultural, economic/financial, political/regulatory, and technological/infrastructure environments of different countries and how to adjust a company's marketing practices based on these factors.
3. Learn how to develop product/service/branding policies, pricing practices, and distribution approaches internationally and globally.
4. Develop the ability to think critically about different perspectives on global marketing

SUBJECT NAME- PRODUCT AND BRAND MANAGEMENT

SUBJECT CODE-16050401

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to

1. Understand the key characteristics of important country markets in different regions of the world and learn how to develop marketing plans for these diverse country markets.
2. Learn to gather, categorize, analyze, interpret, and evaluate relevant information about markets in different countries around the world. To assess the social/cultural, economic/financial, political/regulatory, and technological/infrastructure environments of different countries and how to adjust a company's marketing practices based on these factors.
3. Learn how to develop product/service/branding policies, pricing practices, and distribution approaches internationally and globally.
4. Develop the ability to think critically about different perspectives on global marketing.

SUBJECT NAME- SERVICE AND RELATIONSHIP MARKETING

SUBJECT CODE-16050402

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to

1. Analyze the unique challenges involved in the provision of service.
2. Apply the relevant service marketing theories, concepts and frameworks to solve service related problems and evaluate current business practices.
3. Evaluate the process of value co-creation for enhanced customer experiences
4. Critique commonly used service metrics such as perceived service quality, customer satisfaction and net promoter score

SUBJECT NAME- INTERNATIONAL HUMAN RESOURCE MANAGEMENT

SUBJECT CODE-16070401

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to

1. Understand issues, opportunities and challenges pertaining to international HRM;

2. Develop competency in dealing with cross cultural situations.

3. Understand the strategic and functional roles of HRM in various international contexts, specially in areas such as recruitment and selection, performance management, training, learning and development, career management, compensation, motivation and repatriation.

4. Understand external forces (e.g. globalisation, sociocultural changes, political and economic changes) that have the potential to shape international HRM

SUBJECT NAME- CHANGE MANAGEMENT AND ORGANIZATION DEVELOPMENT

SUBJECT CODE-16070402

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to

1. The learners will understand the concept of Organization Change and Development.

2. The learners will be able to learn to prepare strategies to deal with various types of change.

3. Learners will be able to plan for various development activities.

SUBJECT NAME- RISK MANAGEMENT

SUBJECT CODE-16060401

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to

1. Learn the basic concepts, principles, and terminology of risk management.

2. Identify different types of risks, including strategic, operational, financial, and compliance risks.

3. Evaluate the likelihood and impact of identified risks

4. Develop strategies to mitigate identified risks.

SUBJECT NAME- MERGER ACQUISITION

SUBJECT CODE-16060402

COURSE OUTCOMES (COs)-

At the end of the course the student will be able to

1. Learner will be able to understand the basics of mergers and acquisition with types, will impart the knowledge of strategic evaluation of merger and acquisitions and synergy and value creation in mergers.

2. Learner will be acquainted with knowledge of corporate restructuring with various regulations. Will able to understand various types of joint venture

3. Learner will be able to understand the descriptive meaning of international mergers and acquisitions and various types of takeover defense strategies

4. Learner will able to enhance the expertise knowledge of legal framework of mergers and acquisitions with Prominent Cases of Mergers and Acquisitions, examples of M & A in the Indian and international contexts

Swarrnim School of Computing and IT

PROGRAM NAME: BCA

Semester-3

Subject Name: Data and File Structure
Subject Code: 13030301
Course Outcomes (COs):

1. Understand the fundamental concepts of data structures, including data types, time and space complexity, and distinguish between linear and non-linear data structures.
2. Demonstrate the use of linear data structures like arrays, stacks, queues, and linked lists to solve computational problems effectively.
3. Apply non-linear data structures, such as trees and graphs, to develop algorithms for various computational problems, including tree traversals, graph operations, and balanced trees.
4. Implement and analyze various hashing techniques and their collision resolution methods to efficiently manage data.
5. Apply sorting and searching algorithms such as bubble sort, selection sort, quick sort, merge sort, sequential, and binary search to organize and retrieve data efficiently.
6. Design and implement data structures-based solutions in C programming for real-world applications.
7. Develop problem-solving and analytical skills for designing data structures to optimize the performance of software applications.

Subject Name: Relational Database Management System
Subject Code: 13030302
Course Outcomes (COs):

1. Understand the fundamental concepts of database systems, including data, information, and the role and advantages of Database Management Systems (DBMS).
2. Comprehend the architecture and components of Distributed Database Management Systems (DDBMS) and evaluate their advantages and challenges.
3. Analyze and differentiate between various database models, such as the relational model and E-R model, to effectively design database schemas.
4. Apply the principles of the relational database model, including keys, integrity rules, functional dependencies, and relational set operators, to manage data relationships.
5. Use the entity-relationship (E-R) modeling approach to represent entities, attributes, relationships, and their participation for database design.
6. Understand and apply normalization techniques to optimize database design and eliminate data redundancy.

7. Design, implement, and query relational databases using structured query language (SQL) for real-world applications.

Subject Name: Operating System
Subject Code: 13030303
Course Outcomes (COs):

1. Understand the basic concepts of operating systems, their evolution, and types, including the role of system calls and virtual machines.
2. Analyze the process management concepts, including process states, context switching, threads, and different scheduling algorithms.
3. Solve inter-process communication problems by applying concepts like race conditions, critical sections, semaphores, monitors, and classical IPC problems.
4. Comprehend the principles of deadlock in operating systems, including its characteristics, prevention, avoidance, detection, and recovery techniques.
5. Apply memory management techniques such as paging, segmentation, and virtual memory to optimize the allocation and utilization of memory.
6. Understand and compare various page replacement algorithms to enhance memory management in virtual memory systems.
7. Explore file system structures, including directory management and file handling, specifically in Unix/Linux and Windows operating systems.
8. Write and execute shell scripts in Linux/Unix environments to automate tasks and demonstrate an understanding of shell programming concepts.
9. Develop problem-solving skills by understanding the role and functionalities of operating system components for resource management in various types of computer systems.

Subject Name : Object Oriented Programming-I
Subject Code: 13030304
Course Outcomes (COs):

1. Understand the fundamental concepts and principles of Object-Oriented Programming (OOP), and compare it with procedural programming approaches.
2. Apply basic C++ programming constructs, such as variables, operators, control structures, and data types, to develop structured programs.
3. Utilize functions in C++, including inline functions, function overloading, default arguments, and friend functions, to enhance modularity and code efficiency.
4. Design and implement classes and objects in C++ to achieve data encapsulation, and manage object lifecycles using constructors and destructors.
5. Implement various types of inheritance (single, multilevel, multiple, hybrid) to create reusable and hierarchical class structures in C++.
6. Demonstrate polymorphism using concepts such as pointers to objects, virtual functions, and operator overloading for dynamic method dispatch and flexible program behavior.

7. Apply advanced features like templates, exception handling, and namespaces to create robust, reusable, and efficient C++ programs.
8. Develop object-oriented programs using C++ to solve real-world problems by effectively applying concepts of encapsulation, inheritance, polymorphism, and abstraction.

Subject Name : Software Engineering
Subject Code: 13030305
Course Outcomes (COs):

1. Understand the fundamental concepts of software engineering, including software processes, product development, and various software process models.
2. Apply project management principles, including planning, metrics, and scheduling, to manage software development efficiently.
3. Analyze and document software requirements by creating Software Requirements Specification (SRS) and understanding formal requirement specifications.
4. Design and model software solutions using appropriate analysis techniques, such as Data Flow Diagrams (DFDs), Entity-Relationship (E-R) diagrams, and Unified Modeling Language (UML) for object-oriented analysis and design.
5. Implement risk analysis and management strategies, including risk identification, mitigation, and management throughout the software development lifecycle.
6. Apply software testing techniques and strategies, including black-box and white-box testing, to ensure the quality and reliability of software products.
7. Demonstrate an understanding of software quality assurance, software configuration management, and the importance of maintaining standards in software development.

Subject Name: Intellectual Property Rights
Subject Code: 12300011
Course Outcomes (COs):

1. Understand the basic concepts and importance of Intellectual Property Rights (IPR) and their role in fostering innovation and creativity.
2. Differentiate between various types of intellectual property, including patents, trademarks, copyrights, and trade secrets, and understand their legal framework and protection mechanisms.
3. Analyze the process of acquiring intellectual property rights and understand the legal procedures involved in filing and defending patents, copyrights, and trademarks.
4. Examine the role of IPR in business strategy and commercialization, including licensing, technology transfer, and the economic impact of protecting intellectual property.
5. Evaluate the ethical and social considerations related to IPR, including issues of infringement, enforcement, and the balance between the rights of innovators and public interest.

Semester-4

Subject Name: Object Oriented Programming - II
Subject Code: 13030401
Course Outcomes (COs):

1. Understand and apply the principles of object-oriented programming, such as encapsulation, inheritance, polymorphism, and abstraction, in software development.
2. Implement advanced object-oriented programming concepts, including interfaces, abstract classes, and multiple inheritance, to enhance software reusability and modularity.
3. Develop robust and error-free software applications using exception handling and debugging techniques.
4. Apply file handling operations to read, write, and manipulate data efficiently in object-oriented programs.
5. Utilize generic programming concepts like templates to create flexible and reusable code structures.
6. Design and implement event-driven programming using advanced concepts like multithreading and concurrency to enhance application responsiveness.
7. Integrate standard libraries and frameworks to accelerate development and optimize the performance of object-oriented applications.
8. Design, implement, and debug software applications by using advanced object-oriented programming techniques and following industry best practices.

Subject Name: Open Source Technology
Subject Code: 13030402
Course Outcomes (COs):

1. Understand the fundamental concepts of open-source technologies and the difference between open-source and proprietary software.
2. Explore popular open-source software tools and platforms, including their installation, configuration, and usage for software development.
3. Apply scripting languages and open-source development environments to automate tasks and enhance software efficiency.
4. Demonstrate the ability to use open-source version control systems like Git for collaborative software development and project management.
5. Develop software solutions using open-source programming languages and frameworks, adhering to coding standards and best practices.
6. Evaluate the advantages, challenges, and business implications of adopting open-source technologies in software development and deployment.
7. Contribute to open-source communities by understanding the principles of collaboration, licensing, and the ethical use of open-source software.

Subject Name: Object Oriented Web Technology
Subject Code: 13030403
Course Outcomes (COs):

1. Understand the foundational principles of object-oriented web development and their application in modern web technologies.
2. Design and develop dynamic web applications using server-side programming concepts, including session management and data exchange.
3. Implement object-oriented programming techniques within web development environments to create efficient and modular code structures.
4. Utilize web technologies like HTML, CSS, JavaScript, and frameworks to build responsive and interactive web user interfaces.
5. Integrate database management systems with web applications for data storage, retrieval, and manipulation.
6. Apply security measures and best practices in web development to protect applications from common vulnerabilities and ensure data integrity.
7. Use web services and APIs for communication and data exchange between different web applications and platforms.
8. Design, implement, and deploy full-stack web applications following object-oriented principles and modern web development practices.

Subject Name: Data Communication and Network
Subject Code: 13030404
Course Outcomes (COs):

1. Understand the basic concepts of data communication, including network models, transmission media, and signal transmission.
2. Analyze various network protocols and architectures, such as OSI and TCP/IP models, and their role in data transfer.
3. Apply knowledge of error detection and correction techniques to enhance the reliability of data communication.
4. Explore different types of networking devices and their roles in establishing and managing networks.
5. Evaluate the functionalities of different network layers, including physical, data link, network, and transport layers.
6. Implement network configuration, addressing schemes, and routing techniques to enable efficient data communication.
7. Develop problem-solving skills by designing and simulating simple network environments and analyzing network performance and security.

Subject Name: Data Center Management
Subject Code: 13030405
Course Outcomes (COs):

1. Understand the fundamental concepts of data center infrastructure, including servers, storage, networking, and physical facilities.
2. Analyze the role of data centers in supporting business continuity and the need for disaster recovery mechanisms.
3. Explore the design and layout of data centers, focusing on aspects like power management, cooling systems, and energy efficiency.
4. Implement data center virtualization techniques for resource optimization and efficient workload management.
5. Apply monitoring and management tools to ensure effective data center operations and maintain high availability of resources.
6. Understand the principles of data center security, including physical and cyber security measures, to protect data integrity and privacy.
7. Evaluate different data center networking architectures and protocols for optimal data flow and connectivity.
8. Develop skills to plan, deploy, and maintain data center environments while considering scalability and compliance with standards.
9. Understand emerging trends and technologies in data center management, such as cloud computing, software-defined data centers, and green data centers.

Subject Name: Intermediate Program In Entrepreneurship
Subject Code: 12300012
Course Outcomes (COs):

1. Understand the fundamental concepts of entrepreneurship, including the qualities and mindset required to start and manage a business.
2. Analyze various business models, market trends, and strategies for identifying entrepreneurial opportunities.
3. Develop skills to create business plans, including aspects like marketing, finance, operations, and risk assessment.
4. Explore the role of innovation in entrepreneurship and apply creative problem-solving techniques to develop sustainable business solutions.
5. Understand the legal, financial, and ethical considerations in setting up and running a business, including business registrations, funding, and compliance.

Semester-5

Subject Name: Object Oriented Programming-III
Subject Code: 13030501
Course Outcomes (COs):

1. Understand and apply advanced concepts of object-oriented programming such as design patterns, frameworks, and component-based development.
2. Design and implement programs that use advanced data structures, such as collections and generics, to optimize code reusability and performance.
3. Explore graphical user interface (GUI) development using object-oriented principles to build user-friendly applications.
4. Apply event-driven programming concepts to handle user interactions effectively within applications.
5. Utilize advanced concepts of polymorphism and inheritance in designing scalable and maintainable software systems.
6. Implement serialization and deserialization mechanisms to enable data persistence in object-oriented applications.
7. Develop multithreaded applications for concurrent processing and better resource utilization.
8. Use modern object-oriented frameworks and libraries to accelerate software development and meet industry standards.

Subject Name: Object Oriented Design and Analyses
Subject Code: 13030502
Course Outcomes (COs):

1. Understand the principles and methodologies of object-oriented analysis and design (OOAD) and their importance in software development.
2. Use Unified Modeling Language (UML) to create various diagrams, including use case, class, sequence, and activity diagrams for software modeling.
3. Analyze system requirements and transform them into well-structured object-oriented software design.
4. Apply design principles like SOLID and design patterns to create modular, reusable, and maintainable software systems.
5. Evaluate different approaches to system design and select appropriate design strategies for specific project needs.
6. Use case study-based analysis to apply OOAD techniques to real-world software development scenarios.
7. Develop skills for validating and refining designs through iterative development, testing, and design improvement.

8. Collaborate effectively in teams to conduct object-oriented analysis and design, ensuring alignment with project requirements and goals.

Subject Name: Android Programming
Subject Code: 13030504
Course Outcomes (COs):

1. Understand the fundamentals of Android architecture, components, and the development environment.
2. Design and develop Android applications using core components like activities, fragments, and intents.
3. Utilize user interface (UI) components effectively to create responsive and user-friendly Android applications.
4. Implement data storage techniques, such as SQLite databases and shared preferences, for managing application data.
5. Use networking and web services in Android applications to connect with remote servers and exchange data.
6. Integrate device features like camera, sensors, and location services into Android applications for enhanced functionality.
7. Apply debugging and performance optimization techniques to ensure the stability and efficiency of Android applications.
8. Deploy Android applications to different devices and publish them on the Google Play Store.

Subject Name: Software Development Project-I
Subject Code: 13030503
Course Outcomes (COs):

1. Apply software development methodologies and project management techniques to plan and initiate a real-world software project.
2. Analyze user requirements and create a detailed Software Requirements Specification (SRS) document for the project.
3. Design software solutions using object-oriented principles, including system architecture, database design, and interface design.
4. Implement coding standards and best practices in developing software modules to ensure code quality and maintainability.
5. Integrate software modules effectively to ensure seamless functionality of the overall system.
6. Perform testing and debugging to identify and rectify errors, ensuring the software meets functional and non-functional requirements.
7. Document project development, including design choices, coding practices, testing strategies, and project outcomes.
8. Present and demonstrate the developed software project, highlighting its features, functionality, and problem-solving capabilities.

Subject Name: Advanced Program In Entrepreneurship
Subject Code: 12300013
Course Outcomes (COs):

1. Understand advanced concepts of entrepreneurship, including scaling strategies, business growth, and innovation management.
2. Develop skills to create and execute advanced business strategies in areas like finance, marketing, operations, and product development.
3. Analyze market opportunities, assess risks, and make informed decisions to drive business growth and competitiveness.
4. Understand and apply funding and investment strategies, including venture capital, angel investors, and crowdfunding, for business expansion.
5. Explore leadership and team-building skills necessary for managing business growth and scaling operations.
6. Examine the role of technology and digital tools in modern entrepreneurship and apply them for business efficiency and market advantage.
7. Implement business ethics and corporate social responsibility (CSR) in decision-making for sustainable and socially responsible business practices.
8. Develop skills to pitch a business idea effectively to stakeholders, investors, and potential partners for funding and support.

Semester-6

Subject Name: Cyber Security
Subject Code: 13030601
Course Outcomes (COs):

1. Understand the foundational concepts of cybersecurity, including threats, vulnerabilities, and risk management strategies.
2. Explore various cybersecurity mechanisms, such as cryptography, authentication, and access control, to protect data and systems.
3. Analyze network security concepts and apply techniques like firewalls, intrusion detection systems (IDS), and virtual private networks (VPNs) for securing network communications.
4. Understand and implement security policies, compliance standards, and best practices for maintaining information security in organizations.
5. Identify and respond to cybersecurity incidents by applying ethical hacking, digital forensics, and incident response strategies to detect, prevent, and mitigate cyber-attacks.

Subject Name: Cloud Computing
Subject Code: 13030602
Course Outcomes (COs):

1. Understand the core concepts of cloud computing, including cloud service models (IaaS, PaaS, SaaS) and deployment models (public, private, hybrid).
2. Analyze the advantages, challenges, and business implications of adopting cloud computing in various domains.
3. Explore virtualization technologies and their role in enabling cloud infrastructure and resource management.
4. Utilize cloud services and platforms for developing, deploying, and managing applications in a scalable and cost-effective manner.
5. Evaluate cloud security practices, data management policies, and compliance standards to ensure the secure and efficient use of cloud resources.

Subject Name: Data Warehousing and Data Mining
Subject Code: 13030605
Course Outcomes (COs):

1. Understand the concepts of data warehousing, including architecture, data modeling, and data integration for organizing and storing large datasets.
2. Explore data mining techniques for discovering patterns, correlations, and trends from large datasets to support decision-making.
3. Apply data pre-processing techniques, such as data cleaning, transformation, and reduction, to prepare data for analysis.
4. Use various data mining algorithms, such as classification, clustering, and association rule mining, for extracting actionable insights.
5. Evaluate the application of data warehousing and mining in real-world scenarios to solve business problems and drive data-driven decisions.

Subject Name: Software Development Project - II
Subject Code: 13030603
Course Outcomes (COs):

1. Apply advanced software development methodologies and project management techniques to build complex software systems.
2. Design and implement software solutions that address real-world problems by integrating user requirements, system design, and technology.
3. Utilize software engineering tools and frameworks to develop, test, and deploy reliable and efficient software applications.
4. Demonstrate proficiency in documenting the software development process, including coding practices, testing strategies, and maintenance plans.
5. Present and showcase the completed software project to stakeholders, highlighting its innovative features, technical specifications, and business impact.

Subject Name: Start-Up Project
Subject Code: 12300014
Course Outcomes (COs):

1) Understand the process of conceptualizing, planning, and developing a start-up idea into a viable business opportunity.
2) Conduct market research and analysis to identify customer needs, market trends, and potential competitors for the start-up.
3) Develop a comprehensive business plan, covering key aspects such as product development, marketing strategies, operations, and financial projections.
4) Explore funding options and investment strategies to secure financial resources for the start-up and ensure its sustainability and growth.
5) Implement strategies for scaling the start-up, managing operations, and adapting to market changes while maintaining a focus on innovation and customer satisfaction.

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PROGRAM NAME: BCA(HONOURS)

Semester-I

Subject Name: Fundamentals of Computers
Subject Code: BCA230101
Course Outcomes (COs):

1) Understand the basic concepts of computer hardware and software.
2) Demonstrate problem solving skills
3) Understand the structure of operating system, its applications and commands.
4) To be familiar with network tools, concepts of protocols and network interfaces.
5) Understands the concept of Computer's Input/output devices

Subject Name: PROGRAMMING IN C
Subject Code: BCA230102
Course Outcomes:

1) Analyze a given problem and develop an algorithm to solve the problem.
2) Design, develop and test programs written in 'C'.
3) Write, compile and debug programs in C language.
4) Use different data types in a computer program.
5) Design programs involving decision structures, loops and functions.

Subject Name: Web Development Using HTML, CSS & XML
Subject Code: BCA230103
Course Objectives:

1) Understand web concepts, protocols, and client-server computing principles.
2) Create structured web content using HTML, CSS, and apply formatting and styling techniques.
3) Apply CSS for designing layouts, navigation, forms, and enhance user experience.
4) Implement dynamic elements using JavaScript, VBScript, and enhance interactivity

5) Gain an introduction to XML, its manipulation, and basic server-side technologies for web applications.

Subject Name: Mathematical Foundation
Subject Code: BCA230104
Course Outcomes:

1) Understand sets and perform operations and algebra on sets.
2) Identify functions and determine their properties.
3) Develop basic knowledge of matrices and to solve equations using Cramer's rule.
4) Identify functions and determine their properties.
5) To develop the knowledge about derivatives and know various applications of differentiation.

Subject Name: Communication Skills
Subject Code: AEC230101
Course Outcomes:

1) Inculcation of different skills will be added in a student's career.
2) Students' employability skills will be enhanced.
3) Ability to speak in English will be improved through practice.
4) Self Analysis tool will help the students to identify their strengths and weaknesses to work upon.
5) Hesitation of speaking in public and in English will be reduced.

Subject Name: Foundation of Entrepreneurship
Subject Code: SEC230101
Course Outcomes:

1) To know various theories of entrepreneurship and trends.
2) To identify various issues and challenges in starting a new venture.
3) To understand innovation and its implications.
4) To create entrepreneurial mindset through understanding entrepreneurial personality.

Subject Name: Indian Science & Technology
Subject Code: IKS230101
Course Outcomes:

1) Gain an in-depth appreciation of India's technological heritage, including its contributions to metallurgy, textiles, ceramics, and more.
2) Understand the historical evolution of water management systems and transportation methods in India, and their impact on society.
3) Explore the intersection of mathematics and astronomy in India, from ancient mathematical texts to significant astronomical discoveries.
4) Examine India's ecological wisdom and environmental practices, including their applications in agriculture, architecture, and sustainable land management.
5) Recognize India's role in shaping global technology and knowledge dissemination through its historical connections and contributions to various fields..

Semester-II

Subject Name: Data Structure Using C
Subject Code: BCA230201
Course Outcomes (COs):

1) Apply arrays for varied applications, understand data structure classifications and operations.
2) Implement stacks and queues, perform infix-postfix conversion, and grasp recursion concepts.
3) Master linked lists, including insertion, deletion, sorting, and node counting.
4) Gain expertise in binary trees, traversals, and tree expression manipulation.
5) Proficiently use sorting (bubble, insertion, quick) and searching (sequential, binary) techniques.

Subject Name: Object Oriented Concepts using C++
Subject Code: BCA230202
Course Outcomes (COs):

1) Understand the fundamental concepts of Object-Oriented Programming (OOP) and grasp C++ basics, including operators, data types, and identifiers.
2) Master control flow structures like if-else, loops, and learn about classes, objects, encapsulation, constructors, and memory allocation.
3) Acquire proficiency in working with arrays, strings, functions (overloading, inline), and operator overloading.
4) Develop a solid understanding of pointers, inheritance, class hierarchy, and abstract classes.
5) Gain knowledge of file handling, exception handling, namespaces, and stream operations.

Subject Name: Core Java
Subject Code: BCA230203
Course Outcomes (COs):

1) Proficiently apply Java programming concepts including data types, control structures, arrays, strings, inheritance, packages, and exception handling.
2) Proficiently apply Java programming concepts of lasses and multithreading.
3) Design interactive Java applets using AWT controls, layout managers, and event listeners while mastering string handling.

4) Gain expertise in networking with datagram and TCP/IP server sockets, and learn to establish JDBC connections and utilize connection pooling.

Subject Name: Foundation in Statistical Methods
Subject Code: BCA230204
Course Outcomes (COs):

1) Develop proficiency in organizing data through tabulation, frequency distribution, and graphical representation.
2) Understand and compute measures like mean, median, mode, range, quartile deviation, mean deviation, and standard deviation for assessing data patterns.
3) The concept of skewness and apply Karl Pearson's Coefficients of Skewness in practical scenarios.
4) Gain insight into correlation types and methods, including Karl Pearson's correlation coefficient, to assess relationships between variables in datasets.

Subject Name: Identifying Entrepreneurial Opportunities
Subject Code: SEC230202
Course Outcomes (COs):

1) Exploration of opportunities from the market.
2) Check technical, market, financial and other types of Feasibility of a business idea.
3) Develop business model to describe the rationale of how an organization creates, delivers, and captures value.
4) Identification of various Business Opportunities from the market.

Subject Name: Logical and Critical Thinking
Subject Code: AEC230202
Course Outcomes (COs):

1) Students are able to understand the basic concept of Logical and Critical Thinking and are able to solve problems.
2) Student analytical ability increased.
3) Student can be placed in service based company, government sector, PSU and it will also help in higher study

Subject Name: Environmental Studies
Subject Code: VAC230201
Course Outcomes (COs):

1) Enabling students to understand and realize the multi- disciplinary nature of the environment, its components, and inter-relationship between man and environment.
2) Understanding the relevance and importance of natural resources in the sustenance of life on earth and living standard. the importance of ecosystem, biodiversity, and nature.
3) Correlating the human population growth and its trend to the environmental degradation and developing the awareness about his/her role towards environmental protection. Identifying different types of environmental pollution and control measures.

Swarrnim School of Computing and IT

PROGRAM NAME: Bsc(IT)

Semester-III

Subject Name: Software Quality Assurance and Testing
Subject Code: 16110301
Course Outcomes:

1. Understand the principles of software quality assurance (SQA) and its role in software development.
2. Analyze different types of software testing techniques, including black-box and white-box testing.
3. Apply verification and validation techniques to ensure software meets quality standards.
4. Utilize automated testing tools and understand their role in the software testing lifecycle.
5. Manage project economics and apply software project management techniques

Subject Name: C++ and Object-Oriented Programming
Subject Code: 16110302
Course Outcomes:

1. Understand the principles of object-oriented programming (OOP) and its advantages over procedural programming.
2. Apply the concepts of classes, objects, inheritance, and polymorphism in C++ programming.
3. Implement operator overloading and dynamic memory allocation using pointers in C++.
4. Explore advanced OOP concepts such as virtual functions, templates, and exception handling.
5. Design and develop programs in C++ using OOP concepts to solve real-world problems.

Subject Name: Relational Database Management System (RDBMS) Using Oracle
Subject Code: 16110303
Course Outcomes:

1. Understand the fundamentals of relational database management systems (RDBMS) and SQL.
2. Apply SQL queries to manage and manipulate database tables.
3. Explore advanced SQL features such as joins, subqueries, and transaction control.

4. Understand PL/SQL concepts and develop database procedures, functions, and triggers.
5. Implement database administration tasks such as backups, recovery, and user management in Oracle.

Subject Name: Content Management System (CMS) Using WordPress
Subject Code: 16110304
Course Outcomes:

1. Understand the concept of content management systems (CMS) and their significance in web development.
2. Develop and manage websites using WordPress, including theme and plugin management.
3. Apply customization techniques to design responsive and interactive web pages in WordPress.
4. Explore database handling in WordPress and perform content updates.
5. Understand the security aspects of WordPress and apply best practices for web security.

Subject Name: Intellectual Property Rights
Subject Code: 12300011
Course Outcomes:

1. Understand the basic concepts and importance of Intellectual Property Rights (IPR) and their role in fostering innovation and creativity.
2. Differentiate between various types of intellectual property, including patents, trademarks, copyrights, and trade secrets, and understand their legal framework and protection mechanisms.
3. Analyze the process of acquiring intellectual property rights and understand the legal procedures involved in filing and defending patents, copyrights, and trademarks.
4. Examine the role of IPR in business strategy and commercialization, including licensing, technology transfer, and the economic impact of protecting intellectual property.
5. Evaluate the ethical and social considerations related to IPR, including issues of infringement, enforcement, and the balance between the rights of innovators and public interest.

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Semester-IV

Subject Name: Programming with JAVA
Subject Code: 14360401
Course Outcomes:

1. Understand the fundamental concepts of object-oriented programming using Java.
2. Apply control statements, loops, and operators to solve problems in Java.
3. Develop Java applications using arrays, strings, and command-line arguments.
4. Implement inheritance, polymorphism, and interfaces in Java programs.
5. Work with Java I/O streams and handle exceptions effectively in Java programs.
6. Apply multithreading concepts and synchronization mechanisms in Java programs.

Subject Name: Network Technology and Administration
Subject Code:
Course Outcomes:

1. Understand the basic networking concepts, network models, and topologies.
2. Explore transmission media and switching techniques for efficient data communication.
3. Analyze various networking devices and protocols used for communication in networks.
4. Implement routing techniques and configure a Windows 2008 server.
5. Understand the fundamentals of network security, including encryption, authentication, and VPN.

Subject Name: -Operating Systems Concepts with Unix and Linux
Subject Code: 14360403
Course Outcomes:

1. Understand the basic concepts of operating systems and process management.
2. Explore memory management techniques, including paging and segmentation.
3. Apply Unix commands and manage file systems in Unix-based environments.
4. Develop shell scripts and manage processes in Unix/Linux.
5. Configure and manage the Linux operating system for both GUI and CUI environments

Subject Name: Programming with C#
Subject Code: 14360404
Course Outcomes:

1. Understand the .NET Framework and its components, including CLR, CTS, and FCL.

2. Apply object-oriented programming principles in C# to develop applications.
3. Develop Windows-based applications using various controls and forms.
4. Implement database programming using ADO.NET for connected and disconnected architecture.
5. Create user controls, generate reports using Crystal Reports, and develop setup projects for software deployment.

Subject Name: Intermediate Program in Entrepreneurship
Subject Code: 12300012
Course Outcomes:

1. Understand the fundamental concepts of entrepreneurship, including the qualities and mindset required to start and manage a business.
2. Analyze various business models, market trends, and strategies for identifying entrepreneurial opportunities.
3. Develop skills to create business plans, including aspects like marketing, finance, operations, and risk assessment.
4. Explore the role of innovation in entrepreneurship and apply creative problem-solving techniques to develop sustainable business solutions.
5. Understand the legal, financial, and ethical considerations in setting up and running a business, including business registrations, funding, and compliance.

Swarrnim School of Computing and IT

PROGRAM NAME: BSCIT(HONOURS)

Semester-I

Subject Name: Fundamentals of Computers
Subject Code: BSCIT230101
Course Outcomes (COs):

1) Understand the basic concepts of computer hardware and software.
2) Demonstrate problem solving skills
3) Understand the structure of operating system, its applications and commands.
4) To be familiar with network tools, concepts of protocols and network interfaces.
5) Understands the concept of Computer's Input/output devices

Subject Name: PROGRAMMING IN C
Subject Code: BSCIT230102
Course Outcomes:

1) Analyze a given problem and develop an algorithm to solve the problem.
2) Design, develop and test programs written in 'C'.
3) Write, compile and debug programs in C language.
4) Use different data types in a computer program.
5) Design programs involving decision structures, loops and functions.

Subject Name: Web Development Using HTML, CSS & XML
Subject Code: BSCIT230103
Course Objectives:

1) Understand web concepts, protocols, and client-server computing principles.
2) Create structured web content using HTML, CSS, and apply formatting and styling techniques.
3) Apply CSS for designing layouts, navigation, forms, and enhance user experience.
4) Implement dynamic elements using JavaScript, VBScript, and enhance interactivity
5) Gain an introduction to XML, its manipulation, and basic server-side technologies for web applications.

Subject Name: Mathematical Foundation
Subject Code: BSCIT230104
Course Outcomes:

1) Understand sets and perform operations and algebra on sets.
2) Identify functions and determine their properties.
3) Develop basic knowledge of matrices and to solve equations using Cramer's rule.
4) Identify functions and determine their properties.
5) To develop the knowledge about derivatives and know various applications of differentiation.

Subject Name: Communication Skills
Subject Code: AEC230101
Course Outcomes:

1) Inculcation of different skills will be added in a student's career.
2) Students' employability skills will be enhanced.
3) Ability to speak in English will be improved through practice.
4) Self Analysis tool will help the students to identify their strengths and weaknesses to work upon.
5) Hesitation of speaking in public and in English will be reduced.

Subject Name: Foundation of Entrepreneurship
Subject Code: SEC230101
Course Outcomes:

1) To know various theories of entrepreneurship and trends.
2) To identify various issues and challenges in starting a new venture.
3) To understand innovation and its implications.
4) To create entrepreneurial mindset through understanding entrepreneurial personality.

Subject Name: Indian Science & Technology

Subject Code: IKS230101
Course Outcomes:

1) Gain an in-depth appreciation of India's technological heritage, including its contributions to metallurgy, textiles, ceramics, and more.
2) Understand the historical evolution of water management systems and transportation methods in India, and their impact on society.
3) Explore the intersection of mathematics and astronomy in India, from ancient mathematical texts to significant astronomical discoveries.
4) Examine India's ecological wisdom and environmental practices, including their applications in agriculture, architecture, and sustainable land management.
5) Recognize India's role in shaping global technology and knowledge dissemination through its historical connections and contributions to various fields..

Semester-II

Subject Name: Data Structure Using C
Subject Code: BSCIT230201
Course Outcomes (COs):

1) Apply arrays for varied applications, understand data structure classifications and operations.
2) Implement stacks and queues, perform infix-postfix conversion, and grasp recursion concepts.
3) Master linked lists, including insertion, deletion, sorting, and node counting.
4) Gain expertise in binary trees, traversals, and tree expression manipulation.
5) Proficiently use sorting (bubble, insertion, quick) and searching (sequential, binary) techniques.

Subject Name: Object Oriented Concepts using C++
Subject Code: BSCIT230202
Course Outcomes (COs):

1) Understand the fundamental concepts of Object-Oriented Programming (OOP) and grasp C++ basics, including operators, data types, and identifiers.
2) Master control flow structures like if-else, loops, and learn about classes, objects, encapsulation, constructors, and memory allocation.
3) Acquire proficiency in working with arrays, strings, functions (overloading, inline), and operator overloading.
4) Develop a solid understanding of pointers, inheritance, class hierarchy, and abstract classes.
5) Gain knowledge of file handling, exception handling, namespaces, and stream operations.

Subject Name: Core Java
Subject Code: BSCIT230203
Course Outcomes (COs):

1) Proficiently apply Java programming concepts including data types, control structures, arrays, strings, inheritance, packages, and exception handling.
2) Proficiently apply Java programming concepts of lasses and multithreading.

3) Design interactive Java applets using AWT controls, layout managers, and event listeners while mastering string handling.
4) Gain expertise in networking with datagram and TCP/IP server sockets, and learn to establish JDBC connections and utilize connection pooling.

Subject Name: Foundation in Statistical Methods
Subject Code: BSCIT230204
Course Outcomes (COs):

1) Develop proficiency in organizing data through tabulation, frequency distribution, and graphical representation.
2) Understand and compute measures like mean, median, mode, range, quartile deviation, mean deviation, and standard deviation for assessing data patterns.
3) The concept of skewness and apply Karl Pearson's Coefficients of Skewness in practical scenarios.
4) Gain insight into correlation types and methods, including Karl Pearson's correlation coefficient, to assess relationships between variables in datasets.

Subject Name: Identifying Entrepreneurial Opportunities
Subject Code: SEC230202
Course Outcomes (COs):

1) Exploration of opportunities from the market.
2) Check technical, market, financial and other types of Feasibility of a business idea.
3) Develop business model to describe the rationale of how an organization creates, delivers, and captures value.
4) Identification of various Business Opportunities from the market.

Subject Name: Logical and Critical Thinking
Subject Code: AEC230202
Course Outcomes (COs):

1) Students are able to understand the basic concept of Logical and Critical Thinking and are able to solve problems.

2) Student analytical ability increased.
3) Student can be placed in service based company, government sector, PSU and it will also help in higher study

Subject Name: Environmental Studies
Subject Code: VAC230201
Course Outcomes (COs):

1) Enabling students to understand and realize the multi- disciplinary nature of the environment, its components, and inter-relationship between man and environment.
2) Understanding the relevance and importance of natural resources in the sustenance of life on earth and living standard. the importance of ecosystem, biodiversity, and nature.
3) Correlating the human population growth and its trend to the environmental degradation and developing the awareness about his/her role towards environmental protection. Identifying different types of environmental pollution and control measures.

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PROGRAM NAME: MCA

Semester-I

Subject Name: Basic Mathematics
Subject Code: 16110101
Course Outcomes (COs):

1. Understand the fundamental concepts of set theory, propositional logic, and predicate logic.
2. Apply the principles of recursion, natural numbers, and matrices in problem-solving.
3. Analyze relations and functions and their applications in various computational problems.
4. Explore the concepts of graph theory and trees, and apply them in resource allocation and deadlock detection.

Subject Name: Basic Computer Science – 1(Applications of Data Structures and Applications of SQL)
Subject Code: 16110102
Course Outcomes:

1) The Main objective of this course is to develop proficiency in the specification, representation, and implementation of Data Types and Data Structures.
2) Demonstrate a familiarity with the logic development algorithm.
3) Analyze various algorithms for space and time complexity
4) To compare various searching and sorting techniques
5) To apply appropriate data structures to solve different problems.
6) Design and implement SQL databases and Understand and use the Structured Query Language - DDL, DML and DCL.

Subject Name: Basic Computer Science – 2: Applications of Operating Systems and Applications of Systems Software
Subject Code: 16110103
Course Objectives:

1) Understand the fundamentals of system software, language processing activities, and the role of programming languages in system software.

2) Demonstrate knowledge of scanning and parsing techniques, including the application of programming language grammars and different parsing methodologies.
3) Gain proficiency in the concepts of assemblers, including assembly language processing, and the design and implementation of two-pass assemblers.
4) Analyze the concepts of compilers, including memory allocation, code optimization, and the process of compiling expressions using various techniques such as postfix notation.
5) Understand the core functionalities and objectives of operating systems, including process control, memory management, concurrency, and deadlock prevention mechanisms.
6) Apply scheduling algorithms, memory management techniques like paging and segmentation, and comprehend the importance of uni-processor scheduling in operating system design.

Subject Name : Programming in python
Subject Code: 16110106
Course Outcomes :

1) Understand the basic elements of Python and write simple programs using variables,
2) control structures, and functions.
3) Apply NumPy for efficient data manipulation and perform statistical operations.
4) Utilize Pandas for data analysis and manipulation in various data science applications.
5) Create visualizations using Matplotlib to present data insights and patterns.
6) Implement advanced data manipulation techniques using Pandas and NumPy for realworld problem-solving.

Subject Name : Information Security
Subject Code: 16110112
Course Outcomes :

1) Understand the fundamental principles of information security, including confidentiality, integrity, and availability.
2) Analyze various types of attacks, such as malware, phishing, and DDoS, and learn countermeasures to mitigate them.
3) Explore different cryptographic techniques such as encryption, hashing, and digital signatures.
4) Understand the importance of cybersecurity laws and regulations, including the IT Act, and their role in mitigating cybercrimes.
5) Apply concepts of security mechanisms, such as firewalls, intrusion detection systems, and network security, to protect information systems.

Semester-II

Subject Name: Basic Statistics
Subject Code: 16110201(BS)
Course Outcomes:

1) Understand fundamental concepts of descriptive statistics and visualize data using various graphical techniques.
2) Apply probability theory and distributions in real-world scenarios.
3) Analyze data using sampling techniques and understand estimation methods.
4) Perform hypothesis testing for single and multiple populations.
5) Conduct regression analysis and apply it to real-world forecasting and decision-making tasks.

Subject Name: Basic Computer Science 3 – Computer Networking
Subject Code: 16110202(BCS-3)
Course Outcomes :

1) Understand the fundamentals of computer networks, including OSI and TCP/IP models.
2) Analyze the physical layer's role in communication, including wired and wireless technologies.
3) Learn the data link layer's responsibilities, including error detection and correction techniques.
4) Explore medium access control protocols and their implementation in wired and wireless environments.
5) Understand the network layer, routing algorithms, and congestion control mechanisms.
6) Gain insights into transport and application layer protocols and their role in network communication.

Subject Name: Basic Computer Science 4 – Software Engineering
Subject Code: 16110203(BCS-4)
Course Outcomes:

1) Understand the principles of software engineering and process models, including Waterfall, Agile, and Spiral models.
2) Gain knowledge of requirements engineering and create Software Requirement Specifications (SRS).
3) Apply design concepts in software development and create architectural and interface designs.
4) Explore software testing strategies, including white-box, black-box, and system testing.

5) Understand software project management principles, including estimation and scheduling.
6) Develop UML diagrams, including use case, activity, sequence, and class diagrams for software systems.

Subject Name: Network Security
Subject Code: 16110204(NS)
Course Outcomes :

1) Understand the principles of OSI security architecture and analyze security attacks and mechanisms.
2) Apply symmetric and asymmetric encryption algorithms in securing data.
3) Explore the concepts of hashing, digital signatures, and message authentication codes.
4) Analyze key distribution mechanisms and implement network security protocols.
5) Understand wireless network security protocols and evaluate threats and countermeasures.
6) Design and implement firewalls and intrusion detection systems for enhanced network security.

Subject Name: Android Programming
Subject Code: 16110213
Course Outcomes :

1) Understand the basic concepts of Android development and Android SDK.
2) Design user interfaces using Android layout elements and create interactive apps.
3) Implement persistent storage using SQLite databases in Android applications.
4) Utilize Android services for background processing and handle internet resources efficiently.
5) Enhance the user experience with animations, hardware sensors, and location-based services.
6) Develop media-rich Android apps that use audio, video, and camera functionality.

Semester-III

Subject Name: Design and Analysis of Algorithms (DAA)
Subject Code: 16110301(MCA DAA Syllabus)
Course Outcomes :

1) Analyze algorithms for time and space complexity and design algorithms for problem-solving.
2) Apply divide-and-conquer techniques to solve algorithmic problems like matrix multiplication and recursion.
3) Understand dynamic programming concepts and apply them to problems like optimal binary search trees and rod cutting.
4) Implement greedy algorithms and amortized analysis for solving optimization problems.
5) Design algorithms for minimum spanning trees and shortest paths using algorithms like Kruskal, Prim, and Dijkstra.

Subject Name: Artificial Intelligence (AI)
Subject Code: 16110302(AI)
Course Outcomes:

1) Understand state space search and apply various search algorithms like DFS and BFS to solve AI problems.
2) Explore heuristic search techniques such as A*, hill climbing, and genetic algorithms for optimization problems.
3) Apply planning techniques in AI, including state space planning and goal stack planning.
4) Develop reasoning systems using logic and inference, including propositional and first-order logic.
5) Analyze natural language processing (NLP) and machine learning algorithms for AI applications.

Subject Name: Digital Technology Trends (DTT)
Subject Code: 16110303(DTT)
Course Outcomes :

1) Understand the concept of digital business, its opportunities, and barriers to adoption.
2) Analyze blockchain technology and its applications in various industries like finance and supply chain management.

3) Explore the Internet of Things (IoT) and its applications in disaster management, smart cities, and healthcare.
4) Understand the security implications of backdoors in systems and the influence of social media on society.
5) Apply virtual reality (VR) and augmented reality (AR) technologies in industries such as gaming and entertainment.

Subject Name: Big Data Analytics (BDA)
Subject Code: 16110304
Course Outcomes :

1) Understand the fundamental concepts of big data, Hadoop, and NoSQL databases.
2) Apply MapReduce programming for solving big data problems.
3) Analyze different data mining techniques such as clustering, classification, and link analysis in large datasets.
4) Explore the concepts of data stream mining and its application in real-time data processing.
5) Implement recommendation systems and analyze social network graphs using big data techniques.
6) Use various big data tools to solve practical big data challenges.

Subject Name: Cloud Computing (CC)
Subject Code: 16110312(CC)
Course Outcomes:

1) Understand the principles of cloud computing, its architecture, and deployment models.
2) Explore virtualization technologies, including VM migration and management, and its role in
3) cloud computing.
4) Analyze the risks and costs associated with cloud computing and understand service-level agreements (SLA).
5) Design and develop cloud applications using client-server architecture and service-oriented architecture (SOA).
6) Implement cloud-based applications using platforms like Google App Engine and handle tasks such as data storage and query execution

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Semester-IV

Subject Name: Project
Subject Code: 16110401
Course Outcomes:

1) Develop and demonstrate proficiency in identifying real-world problems and formulating appropriate solutions using technology.
2) Design, develop, and implement a complete project, demonstrating an understanding of the software development life cycle (SDLC).
3) Utilize appropriate methodologies and tools for analysis, design, and implementation of software systems.
4) Effectively document all stages of the project, from requirement gathering to implementation and testing.
5) Demonstrate project management skills, including planning, execution, and monitoring
6) of the project within a set timeline.
7) Present and defend the project outcomes with clarity and professionalism in front of an audience.

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Swarrnim Institute of Design
Course Title Bachelor of Fashion Design
B. FD Semester I

COURSE NAME- DESIGN COMMUNICATION

COURSE CODE: 33000002

COURSE OUTCOMES (COS):

- **CO1: Ability to express design concepts effectively through various media.**
- **CO2: Understanding of visual communication principles in fashion.**
- **CO3: Proficiency in using software tools for design communication.**
- **CO4: Presentation of design ideas through sketches and digital tools.**
- **CO5: Collaboration and teamwork in fashion communication projects.**

COURSE NAME- DESIGN APPRECIATION

COURSE CODE: 33000003

COURSE OUTCOMES (COs):

- **CO1: Understanding the evolution of design movements and their influence on fashion.**
- **CO2: Ability to critically evaluate design aesthetics.**
- **CO3: Appreciation of design principles in various cultural contexts.**
- **CO4: Identifying the role of technology in design evolution.**
- **CO5: Understanding sustainability and ethics in design practices.**

COURSE NAME- INTRODUCTION TO ENTREPRENEURSHIP

COURSE CODE: 23000007

COURSE OUTCOMES (COs):

- **CO1: Understanding entrepreneurial concepts and theories.**
- **CO2: Identifying the challenges and opportunities in launching a new venture.**
- **CO3: Developing creative solutions for business problems through innovation.**
- **CO4: Nurturing an entrepreneurial mindset through leadership and decision-making skills.**
- **CO5: Recognizing the importance of ethical business practices and sustainability.**

COURSE NAME- ORIENTATION PROGRAM IN START-UP AND INTREPRENEURSHIP

COURSE CODE: 12300009

COURSE OUTCOMES (COS):

- **CO1: Introduction to entrepreneurial concepts and business ideation.**
- **CO2: Understanding the start-up ecosystem and identifying opportunities.**
- **CO3: Acquiring basic knowledge of business models and market analysis.**
- **CO4: Developing entrepreneurial skills through case studies and real-world examples.**
- **CO5: Recognizing the importance of innovation, creativity, and risk-taking in entrepreneurship.**

B. FD Semester II

COURSE NAME- FASHION DRAWING AND ILLUSTRATION - I

COURSE CODE: 33050201

COURSE OUTCOMES (COs):

- **CO1: Understanding the basic principles of fashion drawing and human anatomy.**
- **CO2: Developing skills in sketching different poses and body proportions.**
- **CO3: Gaining expertise in rendering fabrics and textures in fashion illustrations.**
- **CO4: Learning to illustrate fashion garments and accessories with attention to detail.**
- **CO5: Understanding the application of color theory in fashion illustration.**

COURSE NAME- PATTERN MAKING- I

COURSE CODE: 33050202

COURSE OUTCOMES (COs):

- **CO1: Understanding the basic principles and techniques of pattern making.**
- **CO2: Developing the ability to draft basic blocks and patterns for garments.**
- **CO3: Learning to apply measurements and body proportions in pattern development.**
- **CO4: Gaining skills in altering and grading patterns for different sizes.**
- **CO5: Understanding the importance of precision and accuracy in pattern making for garment construction.**

COURSE NAME- DRAPING -I

COURSE CODE: 33050203

COURSE OUTCOMES (COs):

- **CO1: Understanding the basic principles of fabric draping on dress forms.**
- **CO2: Developing the ability to create garment designs through draping techniques.**
- **CO3: Gaining skills in manipulating fabric to achieve desired silhouettes and styles.**
- **CO4: Learning to create garment patterns through draping techniques for different body types.**
- **CO5: Understanding the importance of fabric behavior in draping for garment construction.**

COURSE NAME- GARMENT CONSTRUCTION - I

COURSE CODE: 33050204

COURSE OUTCOMES (COs):

- **CO1: Understanding the basic techniques and processes in garment construction.**
- **CO2: Developing skills in sewing, stitching, and finishing garments.**
- **CO3: Learning how to use different types of machines and tools in garment construction.**
- **CO4: Acquiring knowledge in constructing basic garments like skirts, blouses, and dresses.**
- **CO5: Understanding quality control measures and the importance of precision in garment production.**

COURSE NAME- SURFACE TECHNIQUES - I

COURSE CODE: 33050205

COURSE OUTCOMES (COS):

- **CO1: Understanding various surface ornamentation techniques such as embroidery, block printing, and fabric painting.**
- **CO2: Developing skills in embellishing fabrics with different textures and patterns.**
- **CO3: Learning to combine traditional and contemporary surface techniques in fabric design.**
- **CO4: Gaining knowledge in using surface techniques to enhance the aesthetic appeal**

of garments.

- **CO5: Understanding surface ornamentation's cultural significance and history in fashion.**

COURSE NAME- FABRIC STUDY

COURSE CODE: 33050206

COURSE OUTCOMES (COs):

- **CO1: Understanding the properties and characteristics of various fabrics.**
- **CO2: Developing knowledge of the classification of textiles based on fiber type, weave, and finish.**
- **CO3: Learning the process of fabric production, from fiber to finished textile.**
- **CO4: Gaining the ability to select appropriate fabrics for different garment types.**
- **CO5: Understanding the impact of fabric quality on garment construction and design.**

COURSE NAME- HISTORY OF DESIGN - I

COURSE CODE: 33050207

COURSE OUTCOMES (COs):

- **CO1: Understanding the evolution of design and its significance through different historical periods.**
- **CO2: Developing knowledge of various design movements and their impact on fashion and society.**
- **CO3: Analyzing the cultural, social, and technological influences on design history.**
- **CO4: Gaining insight into iconic designers and their contributions to the field of fashion design.**
- **CO5: Learning to apply historical design concepts to contemporary fashion design practices.**

COURSE NAME- PREPARING WIDER HORIZON FOR ENTREPRENEURSHIP

COURSE CODE: 23000013

COURSE OUTCOMES (COS):

CO1: Understand the fundamental concepts of entrepreneurship and the

entrepreneurial mindset in the fashion industry.

- **CO2: Analyze the process of identifying and evaluating new business opportunities in fashion design.**
- **CO3: Develop a comprehensive business plan tailored for a fashion start-up, including market research and financial planning.**
- **CO4: Demonstrate knowledge of legal, financial, and marketing aspects of running a fashion business.**
- **CO5: Cultivate leadership and management skills for entrepreneurship in fashion, focusing on innovation and sustainability.**
- **CO6: Evaluate global and local trends impacting fashion entrepreneurship and how to adapt to them.**

COURSE NAME- BASIC PROGRAM IN ENTREPRENEURSHIP

COURSE CODE: 12300010

COURSE OUTCOMES (COs):

- **CO1: Understand the essential principles of entrepreneurship and the stages of starting a fashion business.**
- **CO2: Learn the importance of creativity, innovation, and market research in developing a successful fashion brand.**
- **CO3: Apply entrepreneurial strategies to identify business opportunities and assess risks in the fashion industry.**
- **CO4: Develop the ability to create and present a basic business model for a fashion start-up.**
- **CO5: Gain knowledge of financial management, resource allocation, and budgeting for a fashion enterprise.**
- **CO6: Demonstrate understanding of legal requirements, intellectual property, and ethical considerations in fashion entrepreneurship.**

COURSE NAME- INTRODUCTION TO DESIGN (DCC)

COURSE CODE: 23000007

COURSE OUTCOMES (COs):

- **CO1: Understand the foundational concepts of design and their application in fashion.**
- **CO2: Learn to apply design principles such as balance, proportion, rhythm, and harmony in creating fashion pieces.**

- **CO3: Develop skills in sketching and visualizing fashion concepts using manual and digital techniques.**
- **CO4: Analyze the relationship between materials, textures, and color in fashion design.**
- **CO5: Gain an understanding of how cultural, historical, and social contexts influence fashion design.**
- **CO6: Apply creative problem-solving techniques to design projects, reflecting innovation in fashion concepts.**

B. FD Semester III

COURSE NAME- FASHION DRAWING AND ILLUSTRATION - II

COURSE CODE: 33050302

COURSE OUTCOMES (COS):

- **CO1: Develop advanced fashion drawing techniques to depict garments and accessories with accurate proportions and detailing.**
- **CO2: Illustrate fashion figures with an emphasis on posture, movement, and fabric draping.**
- **CO3: Apply color theory and rendering techniques to create realistic and stylized fashion illustrations.**
- **CO4: Create digital illustrations using industry-standard software to produce high-quality fashion presentations.**
- **CO5: Understand and incorporate diverse cultural influences in fashion illustration to reflect global fashion trends.**

COURSE NAME- GARMENT CONSTRUCTION - II

COURSE CODE: 33050303

COURSE OUTCOMES (COs):

- **CO1: Apply advanced garment construction techniques to precisely produce tailored garments.**
- **CO2: Understand the technical aspects of different fabric types and how they influence garment construction.**
- **CO3: Construct complex garment components such as collars, cuffs, and tailored sleeves.**

- **CO4: Utilize industry-standard tools and equipment to ensure accurate garment fitting and finishing.**
- **CO5: Analyze and troubleshoot construction issues to improve garment quality and durability.**

COURSE NAME- PATTERN MAKING - II

COURSE CODE: 33050304

COURSE OUTCOMES (COs):

- **CO1: Develop advanced pattern-making techniques for creating complex garment structures.**
- **CO2: Understand the technical aspects of draping, flat pattern-making, and drafting for diverse body types.**
- **CO3: Create patterns for tailored garments, including jackets, blazers, and outerwear.**
- **CO4: Apply industry-standard tools and techniques to ensure precision in pattern grading and cutting.**
- **CO5: Analyze fit issues and make pattern adjustments to ensure proper garment fitting.**

COURSE NAME- DRAPING - II

COURSE CODE: 33050305

COURSE OUTCOMES (COS):

- **CO1: Develop advanced draping techniques for complex garment designs, including asymmetrical and sculptural shapes.**
- **CO2: Understand fabric behavior and how different textiles affect draping outcomes and garment structure.**
- **CO3: Apply precision in draping tailored garments such as jackets, coats, and structured dresses.**
- **CO4: Utilize advanced draping tools and equipment to create professional-quality garments.**
- **CO5: Troubleshoot and refine draped designs to achieve optimal fit, balance, and silhouette.**

COURSE NAME- SURFACE TECHNIQUES - II

COURSE CODE: 33050306

COURSE OUTCOMES (COs):

- **CO1: Develop advanced draping techniques for complex garment designs, including asymmetrical and sculptural shapes.**
- **CO2: Understand fabric behavior and how different textiles affect draping outcomes and garment structure.**
- **CO3: Apply precision in draping tailored garments such as jackets, coats, and structured dresses.**
- **CO4: Utilize advanced draping tools and equipment to create professional-quality garments.**
- **CO5: Troubleshoot and refine draped designs to achieve optimal fit, balance, and silhouette.**

COURSE NAME- FASHION THEORY AND OVERVIEW (LOOKS AND STYLING)

COURSE CODE: 33050307

COURSE OUTCOMES (COs):

- **CO1: Understand the key theories of fashion, including the history and evolution of styles, trends, and cultural influences.**
- **CO2: Analyze fashion movements and how social, political, and economic factors shape fashion trends and styling choices.**
- **CO3: Develop the ability to create fashion looks by integrating various elements such as clothing, accessories, and hairstyles for different occasions and purposes.**
- **CO4: Apply contemporary styling techniques to create visual fashion stories for editorial, commercial, or personal styling purposes.**
- **CO5: Evaluate the impact of sustainability and ethical considerations in styling and fashion presentation.**

COURSE NAME- INTELLECTUAL PROPERTY RIGHTS

COURSE CODE: 12300011

COURSE OUTCOMES (COS):

- **CO1: Understand the fundamental concepts of intellectual property rights (IPR) and their significance in the fashion industry.**
- **CO2: Analyze the various forms of intellectual property, including trademarks, copyrights, patents, and trade secrets, and their application in fashion.**
- **CO3: Evaluate case studies related to intellectual property disputes in the fashion industry and learn how to avoid infringement issues.**
- **CO4: Apply knowledge of IPR laws to protect original designs, branding, and other creative works in fashion.**
- **CO5: Understand the ethical implications of intellectual property rights and the importance of sustainability in protecting creative resources.**

B. FD Semester IV

COURSE NAME- ENTERPRENEURIAL MOTIVATION

COURSE CODE: 23000014

COURSE OUTCOMES (COs):

- **CO1: Understand the principles of entrepreneurship and the motivational factors behind starting and running a fashion business.**
- **CO2: Analyze the role of creativity, innovation, and risk-taking in entrepreneurial ventures within the fashion industry.**
- **CO3: Develop personal entrepreneurial skills, including leadership, decision-making, and strategic thinking.**
- **CO4: Apply knowledge of market research, business planning, and financial management to create a viable fashion business model.**
- **CO5: Evaluate real-world case studies of successful fashion entrepreneurs and identify key strategies for growth and sustainability.**

COURSE NAME- FASHION DRAWING AND ILLUSTRATION - III

COURSE CODE: 33050401

COURSE OUTCOMES (COs):

- **CO1: Master advanced techniques in fashion illustration, including the use of digital tools for rendering detailed designs.**

- **CO2: Develop the ability to illustrate complex garments and accessories, including layering, textures, and intricate detailing.**
- **CO3: Demonstrate proficiency in creating technical drawings and flat sketches for garment production.**
- **CO4: Apply knowledge of figure drawing and proportions to depict a wide range of body types and poses in fashion illustration.**
- **CO5: Integrate creativity and personal style in illustrations while adhering to industry standards and specifications.**

COURSE NAME- PATTERN MAKING - III

COURSE CODE: 33050402

COURSE OUTCOMES (COS):

- **CO1: Master advanced pattern-making techniques for complex garment structures, such as asymmetrical designs and unconventional silhouettes.**
- **CO2: Develop the ability to draft patterns for tailored garments, including jackets, blazers, and suits with precision.**
- **CO3: Apply knowledge of fabric behavior to create patterns that ensure proper fit, structure, and drape.**
- **CO4: Demonstrate proficiency in grading patterns for different sizes while maintaining design integrity.**
- **CO5: Integrate digital pattern-making tools to enhance accuracy and efficiency in pattern development.**

COURSE NAME- DRAPING - III

COURSE CODE: 33050403

COURSE OUTCOMES (COs):

- **CO1: Master advanced draping techniques for complex garment designs, including asymmetrical, structured, and layered silhouettes.**
- **CO2: Develop proficiency in draping various fabric types to create garments with proper fit, flow, and balance.**
- **CO3: Apply creative draping methods to translate design concepts into three-**

dimensional garments.

- **CO4: Demonstrate the ability to create draped garments for different body types and occasions, focusing on both aesthetics and functionality.**
- **CO5: Integrate digital tools and contemporary techniques to enhance the precision and efficiency of the draping process.**

COURSE NAME- GARMENT CONSTRUCTION - III

COURSE CODE: 33050404

COURSE OUTCOMES (COs):

- **CO1: Master advanced garment construction techniques, focusing on structured and tailored garments such as jackets, blazers, and coats.**
- **CO2: Develop proficiency in working with diverse fabrics and materials, ensuring high-quality finishes and durability.**
- **CO3: Demonstrate the ability to construct garments with complex design elements, including linings, pockets, and collars.**
- **CO4: Apply knowledge of garment construction to create designs that balance aesthetics with functionality and fit.**
- **CO5: Integrate digital tools and modern construction techniques to enhance garment production processes.**

COURSE NAME- SURFACE TECHNIQUES - III

COURSE CODE: 33050405

COURSE OUTCOMES (COS):

- **CO1: Master advanced surface embellishment techniques, including embroidery, printing, and fabric manipulation, for fashion textiles.**
- **CO2: Develop proficiency in combining multiple surface techniques to create unique, intricate designs for fashion garments.**
- **CO3: Apply knowledge of materials and surface design techniques to enhance the aesthetic and tactile quality of fabrics.**
- **CO4: Experiment with innovative surface design methods to create contemporary and avant-garde fashion statements.**
- **CO5: Integrate sustainable and ethical practices in surface design by using eco-**

friendly materials and reducing waste.

COURSE NAME- DESIGN PROCESS - I

COURSE CODE: 33050406

COURSE OUTCOMES (COs):

- **CO1: Understand the fundamental stages of the design process, including research, ideation, and conceptualization for fashion collections.**
- **CO2: Develop the ability to create mood boards, inspiration boards, and concept sheets to effectively communicate design ideas.**
- **CO3: Apply design thinking to solve complex problems related to fashion design and translate them into innovative design solutions.**
- **CO4: Demonstrate proficiency in developing a cohesive design collection from concept to final designs, considering trends and market needs.**
- **CO5: Incorporate sustainable and ethical design practices throughout the design process, from ideation to production planning.**

COURSE NAME- History of Design - II

COURSE CODE: 33050407

COURSE OUTCOMES (COs):

- **CO1: Understand the evolution of design through various historical periods and its cultural significance.**
- **CO2: Analyze the influence of historical designs on contemporary fashion trends.**
- **CO3: Critically evaluate the impact of socio-political and technological changes on design movements.**
- **CO4: Apply knowledge of historical design trends to inspire and inform creative design solutions.**
- **CO5: Demonstrate an understanding of the relationship between art, design, and fashion throughout history.**

COURSE NAME- DIGITAL DESIGN - I

COURSE CODE: 33050408

COURSE OUTCOMES (COs):

- **CO1: Understand the fundamentals of digital design tools and software used in the fashion industry.**
- **CO2: Develop proficiency in creating digital illustrations, patterns, and layouts.**
- **CO3: Apply digital techniques to translate design concepts into virtual representations.**
- **CO4: Integrate technical skills in digital design with creative fashion design practices.**
- **CO5: Produce professional digital presentations and portfolios for fashion design projects.**

COURSE NAME- PROJECT FEASIBILITY AND MARKETING SKILLS

COURSE CODE: 23000017

COURSE OUTCOMES (COS):

- **CO1: Understand the principles of project feasibility analysis in the context of fashion design.**
- **CO2: Conduct market research to assess the viability of fashion projects.**
- **CO3: Develop marketing strategies tailored to fashion industry needs and trends.**
- **CO4: Apply financial and operational planning to evaluate project feasibility.**
- **CO5: Demonstrate skills in presenting project proposals and marketing plans effectively.**

COURSE NAME- INTERMEDIATE PROGRAM IN ENTREPRENEURSHIP

COURSE CODE: 12300012

COURSE OUTCOMES (COs):

- **CO1: Understand the key concepts and challenges of entrepreneurship in the fashion industry.**

- **CO2: Analyze the role of innovation and creativity in developing a successful fashion business.**
- **CO3: Develop a business plan, including financial projections and operational strategies.**
- **CO4: Apply entrepreneurial skills to identify opportunities and solve problems in the fashion sector.**
- **CO5: Demonstrate the ability to pitch business ideas effectively to potential investors and stakeholders.**

COURSE NAME- FASHION DRAWING AND ILLUSTRATION - IV

COURSE CODE: 33050501

COURSE OUTCOMES (COs):

- **CO1: Master advanced techniques in fashion drawing and illustration, focusing on precision and detail.**
- **CO2: Create dynamic fashion illustrations that effectively communicate design concepts and garment details.**
- **CO3: Explore a variety of illustration styles and mediums to enhance visual storytelling in fashion design.**
- **CO4: Apply digital tools to produce professional-quality fashion illustrations.**
- **CO5: Demonstrate the ability to present a cohesive portfolio of fashion illustrations for a collection.**

B. FD Semester V

COURSE NAME- PATTERN MAKING - IV

COURSE CODE: 33050502

COURSE OUTCOMES (COs):

CO1: Master advanced techniques in pattern making for complex garment structures.
CO2: Develop patterns for garments with intricate design details, focusing on

precision and fit.

- **CO3: Understand the relationship between fabric behavior and pattern construction for various textiles.**
- **CO4: Apply digital tools and software in the pattern-making process to enhance accuracy and efficiency.**
- **CO5: Demonstrate the ability to create patterns for a cohesive fashion collection.**

COURSE NAME- DRAPING - IV

COURSE CODE: 33050503

COURSE OUTCOMES (COS):

- **CO1: Master advanced draping techniques to create complex and innovative garment designs.**
- **CO2: Analyze fabric behavior and its impact on the draping process for various garment styles.**
- **CO3: Develop draped garments with intricate design elements, focusing on precision and fit.**
- **CO4: Integrate creative design concepts with technical draping methods for diverse textiles.**
- **CO5: Demonstrate the ability to present a collection of draped garments with professional finishing.**

COURSE NAME- GARMENT CONSTRUCTION - IV

COURSE CODE: 33050504

COURSE OUTCOMES (COs):

- **CO1: Master advanced garment construction techniques for complex garments.**
- **CO2: Apply precision in stitching, seam finishes, and garment detailing.**
- **CO3: Understand the impact of fabric properties on garment construction and finishing techniques.**
- **CO4: Integrate creative design concepts into practical garment construction with**

high-quality standards.

- **CO5: Demonstrate the ability to construct garments for a cohesive fashion collection, ensuring professional-level finishing and fit.**

COURSE NAME- SURFACE TECHNIQUES - IV

COURSE CODE: 33050505

COURSE OUTCOMES (COs):

- **CO1: Master advanced surface techniques for enhancing garment aesthetics, such as embroidery, printing, and embellishments.**
- **CO2: Explore and experiment with innovative materials and techniques to create unique surface designs.**
- **CO3: Understand the relationship between fabric structure and surface treatment for optimal design outcomes.**
- **CO4: Apply surface techniques to design garments with a strong visual identity and creativity.**
- **CO5: Demonstrate the ability to incorporate surface techniques into a cohesive fashion collection.**

COURSE NAME- DESIGN PROCESS - II

COURSE CODE: 33050506

COURSE OUTCOMES (COs):

- **CO1: Develop an advanced understanding of the design process from concept to realization.**
- **CO2: Apply research and analysis to create design concepts based on fashion trends, history, and cultural influences.**
- **CO3: Integrate creative problem-solving methods into the design development process.**
- **CO4: Translate design concepts into functional and aesthetically pleasing garment collections.**
- **CO5: Demonstrate the ability to present and communicate design projects professionally.**

COURSE NAME- HISTORY OF DESIGN - III

COURSE CODE: 33050507

COURSE OUTCOMES (COS):

- **CO1: Analyze significant movements in fashion history and their impact on contemporary design.**
- **CO2: Identify key designers and their contributions to fashion evolution through different periods.**
- **CO3: Evaluate the socio-cultural influences on design trends and aesthetics throughout history.**
- **CO4: Research and present findings on historical design practices and their relevance to modern fashion.**
- **CO5: Develop a critical understanding of how historical context informs current design philosophies.**

COURSE NAME- DIGITAL DESIGN – II

COURSE CODE: 33050508

COURSE OUTCOMES (COs):

- **CO1: Master advanced digital tools and software for fashion design and development.**
- **CO2: Create digital fashion illustrations, technical flats, and specifications using professional software.**
- **CO3: Apply digital techniques to explore creative design solutions and garment construction.**
- **CO4: Integrate 3D digital tools into the design process for visualization and virtual prototyping.**
- **CO5: Present professional digital portfolios showcasing fashion design projects.**

COURSE NAME ADVANCED PROGRAM IN ENTREPRENEURSHIP

COURSE CODE: 12300013

COURSE OUTCOMES (COs):

- **CO1: Demonstrate a deep understanding of advanced entrepreneurial concepts, including business models, funding, and market analysis.**
- **CO2: Apply innovative problem-solving strategies to create scalable fashion business solutions.**
- **CO3: Develop a comprehensive business plan that includes financial projections, marketing strategies, and operational models.**
- **CO4: Evaluate various funding options and investment opportunities relevant to the fashion industry.**
- **CO5: Assess and mitigate risks associated with starting and scaling a fashion business in a competitive market.**
- **CO6: Exhibit leadership and managerial skills in organizing and executing entrepreneurial projects within the fashion domain.**

COURSE NAME- SCALING UP THE VENTURE

COURSE CODE: 23000020

COURSE OUTCOMES (COs):

- **CO1: Analyze the key factors contributing to the successful scaling of fashion ventures, including market dynamics, operational efficiency, and resource management.**
- **CO2: Develop strategies for scaling a fashion business by expanding product lines, entering new markets, and optimizing distribution channels.**
- **CO3: Apply financial management techniques to manage cash flow, investment, and profitability during the growth phase.**
- **CO4: Assess organizational structures and leadership models that support business scaling and team growth.**
- **CO5: Identify risks and challenges associated with scaling and devise mitigation strategies.**
- **CO6: Evaluate the impact of digital transformation and technology adoption on scaling up a fashion venture.**

B. FD Semester VI

COURSE NAME- FASHION DRAWING AND ILLUSTRATION - V

COURSE CODE: 33050601

COURSE OUTCOMES (COS):

- **CO1: Demonstrate advanced techniques in fashion illustration with a focus on complex garment structures and fabric rendering.**
- **CO2: Create visually compelling fashion illustrations that communicate design concepts effectively.**
- **CO3: Apply a variety of media and digital tools to enhance illustration quality and innovation.**
- **CO4: Analyze and interpret fashion trends and translate them into original illustrations.**
- **CO5: Develop a portfolio of advanced fashion drawings showcasing creativity, technical skills, and a deep understanding of fashion aesthetics.**
- **CO6: Critically evaluate the role of illustration in fashion presentations and branding**

COURSE NAME- PATTERN MAKING - V

COURSE CODE: 33050602

COURSE OUTCOMES (COs):

- **CO1: Apply advanced pattern-making techniques to create complex garment designs, including draping and tailored pieces.**
- **CO2: Utilize digital tools for precision and efficiency in pattern drafting and development.**
- **CO3: Analyze and solve fit issues through advanced pattern manipulation techniques.**
- **CO4: Develop patterns for non-conventional materials and innovative garment structures.**
- **CO5: Demonstrate an understanding of industrial standards for pattern making and**

garment construction.

- **CO6: Create a comprehensive portfolio showcasing advanced pattern-making skills with detailed documentation.**

COURSE NAME- DRAPING - V

COURSE CODE: 33050603

COURSE OUTCOMES (COs):

- **CO1: Master advanced draping techniques to create complex silhouettes and innovative garment designs.**
- **CO2: Apply knowledge of fabric behavior to develop draped garments with precision and creativity.**
- **CO3: Solve design challenges through advanced draping on dress forms and live models.**
- **CO4: Utilize digital tools for pattern generation from draped garments and ensure precision in replication.**
- **CO5: Experiment with non-traditional materials and shapes in draping to push the boundaries of fashion design.**
- **CO6: Compile a professional portfolio that showcases advanced draping techniques, from conceptual design to final execution.**

COURSE NAME- GARMENT CONSTRUCTION - V

COURSE CODE: 33050604

COURSE OUTCOMES (COs):

- **CO1: Master advanced garment construction techniques, including couture finishing and detailed tailoring.**
- **CO2: Apply knowledge of fabric properties to construct garments with precision and high quality.**
- **CO3: Solve complex construction challenges through innovative approaches to**

garment assembly.

- **CO4: Utilize advanced machinery and digital tools to enhance efficiency and precision in garment construction.**
- **CO5: Develop garments with a focus on sustainability and ethical manufacturing practices.**
- **CO6: Compile a professional portfolio showcasing advanced garment construction skills and a range of garment types.**

COURSE NAME- SURFACE TECHNIQUES - V

COURSE CODE: 33050605

COURSE OUTCOMES (COS):

- **CO1: Master advanced surface embellishment techniques, including embroidery, fabric manipulation, and textile art forms.**
- **CO2: Experiment with diverse materials and techniques to create innovative surface designs for garments and accessories.**
- **CO3: Apply digital tools and technology to enhance surface design processes and outcomes.**
- **CO4: Analyze global trends in surface techniques and integrate them into contemporary fashion design.**
- **CO5: Develop a collection of textiles showcasing advanced surface techniques with a focus on sustainability.**

COURSE NAME- DESIGN PROCESS - III

COURSE CODE: 33050606

COURSE OUTCOMES (COs):

- **CO1: Master the complete fashion design process, from research and concept development to final garment creation.**
- **CO2: Conduct thorough market and trend research to inform innovative design**

solutions.

- **CO3: Apply advanced design techniques and creative problem-solving to develop original fashion collections.**
- **CO4: Utilize digital tools for fashion illustration, pattern making, and presentation of design concepts.**
- **CO5: Integrate sustainability and ethical considerations into the design process.**
- **CO6: Present a professional design portfolio that reflects both creative and technical proficiency.**

COURSE NAME- HISTORY OF DESIGN - IV

COURSE CODE: 33050607

COURSE OUTCOMES (COs):

- **CO1: Analyze significant design movements and their impact on contemporary fashion and design.**
- **CO2: Investigate the evolution of fashion design through various historical periods and cultural contexts.**
- **CO3: Assess the role of key designers and innovators in shaping design principles and practices.**
- **CO4: Develop critical thinking and research skills through the analysis of historical design texts and artifacts.**
- **CO5: Create presentations and written reports that effectively communicate historical design knowledge and insights.**
- **CO6: Relate historical design influences to current trends in fashion and design, fostering a deeper understanding of the design continuum.**

COURSE NAME- DIGITAL DESIGN - III

COURSE CODE: 33050608

COURSE OUTCOMES (COs):

CO1: Develop advanced digital design skills using industry-standard software for fashion design and illustration.

- **CO2: Create and manipulate digital patterns and textiles for various applications in fashion design.**
- **CO3: Integrate 3D modeling and rendering techniques into the fashion design process to visualize designs effectively.**
- **CO4: Implement digital tools for technical drawings and specifications essential for garment production.**
- **CO5: Explore and apply innovative digital design techniques that enhance creative expression in fashion.**
- **CO6: Build a professional digital portfolio showcasing a range of digital design projects and techniques.**

COURSE NAME- IDEA TO MINIMUM VIABLE PRODUCT

COURSE CODE: 23000021
COURSE OUTCOMES (COS):

- **CO1: Master advanced surface embellishment techniques, including embroidery, printing, and fabric manipulation, for fashion textiles.**
- **CO2: Develop proficiency in combining multiple surface techniques to create unique, intricate designs for fashion garments.**
- **CO3: Apply knowledge of materials and surface design techniques to enhance the aesthetic and tactile quality of fabrics.**
- **CO4: Experiment with innovative surface design methods to create contemporary and avant-garde fashion statements.**
- **CO5: Integrate sustainable and ethical practices in surface design by using eco-friendly materials and reducing waste.**

B. FD Semester VII

COURSENAME- Industry Work Culture

COURSE CODE- 33050701

COURSEOUTCOMES(CO)-

Atthe endofBHMSIIcourse,HomoeopathicMateriaMedicathestudentsshouldbeable to

1) Definescience andphilosophyofHomoeopathic MateriaMedica.
2) Explaindifferentwaysof studyingHomoeopathicMateriaMedica.
3) Comparativestudy ofsymptoms, drugpictureanddrug relationship.
4) Discoverthescopeand limitationsofHomoeopathicMateria Medica.
5) Examineacuteandchroniccases,caseprocessingincludingtotalityofsymptoms, selection of potency and repetition of dose.
6) Theoryofbiochemicalsystem ofmedicineandindividualizing symptoms.

COURSENAME- JEANS

CULTURE

COURSE CODE: 33050702

COURSEOUTCOMES(CO):

- CO1: Analyze the historical evolution of jeans and their cultural significance in fashion and society.
- CO2: Explore various styles, fits, and fabrics of jeans, understanding their impact on contemporary fashion trends.
- CO3: Evaluate the processes involved in denim production, including sourcing, manufacturing, and sustainability practices.
- CO4: Design and develop innovative denim garments, integrating creative techniques and current market trends.
- CO5: Assess the role of branding and marketing strategies in promoting jeans as a lifestyle choice.
- CO6: Conduct research on consumer behavior regarding jeans and its implications for future trends in the fashion industry.

COURSENAME- DENIM WEAR

COURS CODE- 33050703

COURSEOUTCOMES(CO)-.

- CO1: Understand the characteristics of denim fabric, its construction, and its application in fashion design.
- CO2: Explore the evolution of denim wear, including key styles, trends, and their influence on contemporary fashion.
- CO3: Apply innovative techniques in designing and constructing denim garments, considering fabric behavior and functionality.

- CO4: Analyze the environmental impact of denim production and explore sustainable practices in denim fashion.
- CO5: Develop denim-based fashion collections that reflect current market demands and creative trends.
- CO6: Conduct research on consumer preferences for denim products and utilize the insights for design and branding.

COURSENAME- ADVANCE PATTERN MAKING

COURSE CODE- 33050704

COURSEOUTCOMES(CO)-

- CO1: Master advanced techniques in pattern-making for complex garment structures.
- CO2: Understand the relationship between fabric properties and pattern design to achieve desired garment fit and aesthetics.
- CO3: Develop proficiency in drafting and modifying patterns for innovative and creative garment designs.
- CO4: Apply digital tools and software for pattern creation and adjustments, enhancing precision and efficiency.
- CO5: Solve fitting issues through advanced pattern manipulation techniques for both traditional and experimental designs.
- CO6: Create detailed technical specifications and patterns for production-ready garments.

COURSENAME- NEW-AGE ILLUSTRATION (DIGITAL)
COURSE CODE-33050705
COURSEOUTCOMES(CO)-

Course Outcomes (COs)

- CO1: Understand the fundamentals of digital illustration tools and techniques specific to fashion design.
- CO2: Apply advanced digital illustration techniques to create professional-quality fashion sketches and renderings.

- CO3: Explore the use of various software and digital platforms to enhance creativity in fashion illustration.
- CO4: Integrate digital tools with traditional illustration methods to develop unique and innovative design concepts.
- CO5: Create detailed, production-ready digital illustrations for fashion collections, including garment details, textures, and accessories.
- CO6: Present digital fashion illustrations effectively, showcasing design ideas, color palettes, and technical specifications.

COURSENAME- FASHION SUSTAINABILITY

COURSE CODE-33050706

COURSEOUTCOMES(CO)-

- CO1: Understand the principles of sustainability and their relevance to the fashion industry.
- CO2: Analyze the environmental and social impacts of fashion production and consumption.
- CO3: Explore sustainable practices in fabric sourcing, manufacturing, and garment design.
- CO4: Investigate the role of circular fashion, recycling, and upcycling in promoting sustainability.
- CO5: Develop strategies to integrate sustainability into fashion design processes, including lifecycle analysis and waste reduction.
- CO6: Present sustainable fashion projects that balance creativity, functionality, and ethical considerations.

COURSENAME- MANAGING INNOVATION & IPR FOR

ENTREPRENEURS

COURSE CODE-23000022

COURSEOUTCOMES(CO)-

- CO1: Understand the fundamentals of innovation management and its application in the fashion industry.
- CO2: Analyze the role of intellectual property rights (IPR) in protecting innovations and creative designs in fashion.
- CO3: Explore strategies to foster innovation within entrepreneurial ventures in the fashion sector.
- CO4: Develop an understanding of patent, copyright, and trademark processes relevant to fashion entrepreneurs.
- CO5: Formulate approaches to safeguard fashion designs and products through effective IPR management.
- CO6: Apply innovation and IPR knowledge to real-world scenarios, promoting creativity while ensuring legal protection.

B. FD Semester VIII

COURSE NAME: GRADUATION PROJECT (INTERNSHIP)
COURSE CODE: 33050801
COURSEOUTCOMES(CO):

- CO1: Apply theoretical knowledge and practical skills to real-world entrepreneurial ventures in the fashion industry.
- CO2: Develop a comprehensive business plan for a fashion startup, including financial, operational, and marketing strategies.
- CO3: Analyze the challenges and opportunities faced during the internship and propose innovative solutions.
- CO4: Demonstrate leadership, teamwork, and problem-solving skills in a professional entrepreneurial environment.
- CO5: Present a final project showcasing the outcomes of the internship, reflecting on personal growth and business insights.
- CO6: Evaluate the effectiveness of business strategies implemented during the internship and identify areas for improvement

Course: Foundation Studio-I

Program: Bachelor of Interior Design (Semester-I)

Course Code: 33000001

Course Outcomes (COs):

- CO1: Understanding the basic principles and elements of design.
- CO2: Developing skills in spatial composition and visual representation.
- CO3: Application of design fundamentals in creating functional spaces.
- CO4: Analyzing and interpreting spatial requirements.
- CO5: Creating innovative and sustainable interior solutions.

Course: Interior Material and Construction – I

Program: Bachelor of Interior Design (Semester-I)

Course Code: 33030101

Course Outcomes (COs):

1. **CO1**: Understanding the properties and applications of various construction materials.
2. **CO2**: Ability to identify and select appropriate materials for interior construction.
3. **CO3**: Developing skills in reading and interpreting construction drawings.
4. **CO4**: Application of basic construction techniques and methods in interior projects.
5. **CO5**: Evaluating the impact of materials on the functionality and aesthetics of interior spaces.

Course: Technical Representation of Drawings - I

Program: Bachelor of Interior Design (Semester-I)

Course Code: 33030102

Course Outcomes (COs):

- **CO1**: Understanding the properties and applications of various construction materials.
- **CO2**: Ability to identify and select appropriate materials for interior construction.
- **CO3**: Developing skills in reading and interpreting construction drawings.
- **CO4**: Application of basic construction techniques and methods in interior projects.
- **CO5**: Evaluating the impact of materials on the functionality and aesthetics of interior spaces.

Course: Humanities

Program: Bachelor of Interior Design (Semester-I)

Course Code: 33030103

Course Outcomes (COs):

- **CO1**: Understanding the role of humanities in the context of interior design.
- **CO2**: Analyzing historical, cultural, and social influences on design.
- **CO3**: Developing a critical approach towards human behavior and its impact on spatial design.
- **CO4**: Enhancing communication skills to effectively articulate design ideas.
- **CO5**: Applying ethical and cultural considerations in design solutions.

Course: Design Communication

Program: Bachelor of Interior Design (Semester-I)

Course Code: 33030103

Course Outcomes (COs):

- **CO1**: Understanding the fundamentals of visual communication and design elements.
- **CO2**: Developing proficiency in using various media and tools for visual representation.
- **CO3**: Ability to effectively communicate design concepts through sketches, drawings, and digital presentations.
- **CO4**: Enhancing skills in verbal and written communication to present design ideas clearly.
- **CO5**: Applying design communication skills to collaborate and work in a team setting.

Course: Design Communication

Program: Bachelor of Interior Design (Semester-II)

Course Code: 33030201

Course Outcomes (COs):

- **CO1**: Understanding the basic principles of spatial design and their application in interior spaces.
- **CO2**: Developing skills in conceptualizing and visualizing interior design projects.
- **CO3**: Applying design theories and techniques to create functional and aesthetically pleasing spaces.
- **CO4**: Enhancing problem-solving skills through design challenges and case studies.
- **CO5**: Communicating design concepts effectively through various presentation techniques and mediums.

Course: Interior Material and Constructions-II
Program: Bachelor of Interior Design (Semester-II)
Course Code: 33030202
Course Outcomes (COs):

- **CO1**: Understanding the advanced properties and applications of interior construction materials.
- **CO2**: Analyzing the structural behavior and performance of different materials in interior applications.
- **CO3**: Developing detailed construction drawings and specifications for interior projects.
- **CO4**: Applying construction techniques to complex interior design projects.
- **CO5**: Evaluating the environmental impact and sustainability of materials used in interior design.

Course: Technical Representation of Drawings-II
Program: Bachelor of Interior Design (Semester-II)
Course Code: 33030202
Course Outcomes (COs):

- CO1: Mastering the principles and techniques of technical drawing.
- CO2: Using advanced digital tools and software for drafting and visualizing interior spaces.
- CO3: Producing precise and detailed construction drawings for interior projects.
- CO4: Applying technical drawing skills to represent complex interior design solutions.
- CO5: Effectively communicating design ideas through visual and technical representation.

Course: Basics of Design
Program: Bachelor of Interior Design (Semester-II)
Course Code: 33030204
Course Outcomes (COs):

- **CO1:** Understanding the fundamental principles and elements of design.
- **CO2:** Developing skills in visualization and spatial design.
- **CO3:** Applying design principles to create functional spaces.
- **CO4:** Enhancing skills in technical drawing and model-making.
- **CO5:** Communicating design ideas effectively through various mediums.

Course: History of interior and furniture design-1
Program: Bachelor of Interior Design (Semester-II)
Course Code: 33030305
Course Outcomes (COs):

- CO1: Understanding the evolution of interior design and furniture styles from ancient to medieval periods.
- CO2: Analyzing the historical context and cultural influences on interior design and furniture styles.
- CO3: Developing the ability to identify key design characteristics from various historical periods.
- CO4: Applying knowledge of historical design trends to modern interior design projects.
- CO5: Evaluating the impact of past interior and furniture design on contemporary practices.

Course: Design studio-II
Program: Bachelor of Interior Design (Semester-III)
Course Code: 33030301
Course Outcomes (COs):

- **CO1**: Understanding advanced spatial design concepts and their application in interior spaces.
- **CO2**: Developing skills in conceptualizing and visualizing complex interior design projects.
- **CO3**: Applying advanced design theories to create functional and aesthetically pleasing spaces.
- **CO4**: Enhancing critical thinking and problem-solving skills through design challenges and real-world case studies.
- **CO5**: Effectively communicating design ideas through professional presentation techniques and mediums.

Course: Interior Material and Construction-III
Program: Bachelor of Interior Design (Semester-III)
Course Code: 33030302
Course Outcomes (COs):

- **CO1**: Understanding advanced properties and applications of interior construction materials.
- **CO2**: Analyzing the structural performance of materials in complex interior design projects.
- **CO3**: Developing detailed construction drawings and specifications for interior design.
- **CO4**: Applying modern construction techniques to interior projects.
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- **CO5**: Evaluating the sustainability and environmental impact of materials used in interior design.

Course: Interior Services-I
Program: Bachelor of Interior Design (Semester-III)
Course Code: 33030303
Course Outcomes (COs):

- CO1: Understanding the basic concepts and importance of interior service systems like HVAC, plumbing, and electrical systems in interior design.
- CO2: Analyzing the integration of service systems with the overall interior layout for optimal performance and user comfort.
- CO3: Developing detailed technical drawings to represent the service systems within an interior design project.
- CO4: Applying principles of service system design to ensure functionality, safety, and compliance with regulations.
- CO5: Evaluating the sustainability and energy efficiency of different service systems

and their environmental impact.

Course: Structure-I
Program: Bachelor of Interior Design (Semester-III)
Course Code: 33030304
Course Outcomes (COs):

CO1: Understanding the fundamental concepts of structural systems used in interior design.
CO2: Analyzing the structural behavior of materials and components under different loads and conditions.
CO3: Developing the ability to integrate structural elements with aesthetic interior solutions.
CO4: Applying knowledge of construction techniques and materials to ensure structural stability and safety.
CO5: Evaluating the sustainability and environmental impact of different structural solutions.

Course: Lighting Design
Program: Bachelor of Interior Design (Semester-III)
Course Code: 33030304
Course Outcomes (COs):

- CO1: Understanding the principles of lighting design and the types of lighting systems used in interior spaces.
- CO2: Analyzing the effects of different lighting techniques on spatial aesthetics and functionality.
- CO3: Developing lighting layouts and detailed drawings for various interior settings.
- CO4: Applying lighting techniques to enhance the ambiance and functionality of interior spaces.
- CO5: Evaluating energy-efficient lighting solutions and their environmental impact.

Course: History of Interior and furniture design-II
Program: Bachelor of Interior Design (Semester-III)
Course Code: 33030304
Course Outcomes (COs):

- CO1: Understanding the evolution of interior design and furniture styles from the Renaissance to modern periods.
- CO2: Analyzing the cultural, social, and historical influences on interior and furniture design.
- CO3: Identifying key design characteristics from different historical periods and movements.
- CO4: Applying knowledge of historical trends to contemporary interior design projects.
- CO5: Evaluating the impact of historical furniture design on current design practices.

Course: Design Studio-III
Program: Bachelor of Interior Design (Semester-IV)
Course Code: 33030401
Course Outcomes (COs):

- CO1: Understanding advanced design principles and spatial planning.
- CO2: Developing skills in detailed conceptualization and design documentation.
- CO3: Applying complex design theories to solve real-world spatial problems.
- CO4: Enhancing problem-solving abilities through innovative design processes.
- CO5: Communicating design solutions effectively through professional presentations.

Course: Interior Material and Construction-IV
Program: Bachelor of Interior Design (Semester-IV)
Course Code: 33030402
Course Outcomes (COs):

- CO1: Understanding the properties and applications of advanced interior materials.
- CO2: Analyzing the structural behavior and performance of complex materials in interior design.
- CO3: Developing detailed technical drawings and specifications for materials in interior projects.
- CO4: Applying advanced construction techniques in interior projects.
- CO5: Evaluating the environmental impact and sustainability of materials used in complex interior projects.

Course: Interior Services-II
Program: Bachelor of Interior Design (Semester-IV)
Course Code: 33030403
Course Outcomes (COs):

- CO1: Understanding the importance of advanced interior service systems like HVAC, electrical, and plumbing in complex interior design projects.
- CO2: Analyzing the integration of service systems in the overall interior layout to ensure optimal functionality and performance.
- CO3: Developing detailed technical drawings that represent the integration of service systems in interior design projects.
- CO4: Applying principles of system design to ensure compliance with safety regulations and user comfort.
- CO5: Evaluating the sustainability and energy efficiency of service systems used in interior spaces.

Course: Furniture Design-I
Program: Bachelor of Interior Design (Semester-IV)
Course Code: 33030404
Course Outcomes (COs):

- CO1: Understanding the fundamentals of furniture design, including ergonomics and material use.
- CO2: Developing the ability to create functional and aesthetically pleasing furniture pieces.
- CO3: Applying knowledge of construction techniques and materials in furniture design.
- CO4: Exploring innovative designs while balancing functionality and sustainability.
- CO5: Communicating furniture design concepts effectively through drawings and models.

Course: History of Interior & Furniture Design - III
Program: Bachelor of Interior Design (Semester-IV)
Course Code: 33030405
Course Outcomes (COs):

- CO1: Understanding the evolution of interior and furniture design from the modern era to contemporary times.
- CO2: Analyzing the cultural, social, and technological influences on interior and furniture design in the 20th and 21st centuries.
- CO3: Identifying key characteristics and design movements in modern and contemporary interior and furniture design.
- CO4: Applying historical knowledge to the analysis and creation of modern and contemporary interior design projects.
- CO5: Evaluating the impact of historical trends on current interior and furniture design practices.

Course: History of Computer Application - I
Program: Bachelor of Interior Design (Semester-IV)
Course Code: 33030406
Course Outcomes (COs):

- CO1: Understanding the historical development of computer applications and their role in design practices.
- CO2: Analyzing the evolution of software tools used in interior design and architecture.
- CO3: Developing skills in using basic computer-aided design (CAD) software for interior design projects.
- CO4: Applying computer applications to enhance accuracy and efficiency in design documentation.
- CO5: Evaluating the impact of technology on modern interior design processes and practices.

Course: Design Studio-IV
Program: Bachelor of Interior Design (Semester-V)
Course Code: 33030501
Course Outcomes (COs):

- CO1: Understanding advanced interior design concepts and their application in complex spaces.
- CO2: Developing comprehensive design solutions for diverse spatial contexts.
- CO3: Applying innovative design approaches to create functional and aesthetically rich interiors.
- CO4: Enhancing technical skills in detailing, material selection, and construction methods.
- CO5: Communicating design solutions effectively through professional presentations and documentation.

Course: Interior Material and Construction-V
Program: Bachelor of Interior Design (Semester-V)
Course Code: 33030502
Course Outcomes (COs):

- CO1: Understanding the properties and applications of advanced construction materials in interior design.
- CO2: Analyzing the structural behavior and performance of complex materials in interior projects.
- CO3: Developing detailed technical drawings and specifications for advanced construction materials.
- CO4: Applying innovative construction techniques to interior design projects.
- CO5: Evaluating the sustainability and environmental impact of materials used in modern interior construction.

Course: Interior Services-III
Program: Bachelor of Interior Design (Semester-V)
Course Code: 33030503
Course Outcomes (COs):

- CO1: Understanding the advanced concepts of interior services such as HVAC, electrical, plumbing, and fire safety systems.
- CO2: Analyzing the integration of complex service systems with interior spaces for optimized performance.
- CO3: Developing technical drawings and specifications for advanced service systems in interior design.
- CO4: Applying service design principles to ensure functionality, safety, and regulatory compliance in interior spaces.
- CO5: Evaluating the sustainability and energy efficiency of service systems in modern interior projects.

Course: Furniture Design-II
Program: Bachelor of Interior Design (Semester-V)
Course Code: 33030504
Course Outcomes (COs):

- CO1: Understanding advanced principles of furniture design and ergonomics.
- CO2: Analyzing the relationship between furniture, space, and human interaction.
- CO3: Developing detailed furniture design solutions considering functionality, aesthetics, and sustainability.
- CO4: Applying innovative materials and construction techniques in furniture design.
- CO5: Communicating furniture design concepts effectively through technical drawings and 3D models.

Course: Landscape in Interior Design
Program: Bachelor of Interior Design (Semester-V)
Course Code: 33030505
Course Outcomes (COs):

- CO1: Understanding the principles of landscape design and their application in interior spaces.
- CO2: Analyzing the relationship between indoor and outdoor spaces in design projects.
- CO3: Developing skills in integrating natural elements like plants, water, and lighting into interior environments.
- CO4: Applying sustainable landscape solutions to enhance the functionality and aesthetics of interior spaces.
- CO5: Communicating landscape design concepts effectively through detailed drawings and presentations.

Course: Computer Application -2
Program: Bachelor of Interior Design (Semester-V)
Course Code: 33030506
Course Outcomes (COs):

- CO1: Understanding the principles of landscape design and their application in interior spaces.
- CO2: Analyzing the relationship between indoor and outdoor spaces in design projects.
- CO3: Developing skills in integrating natural elements like plants, water, and lighting into interior environments.
- CO4: Applying sustainable landscape solutions to enhance the functionality and aesthetics of interior spaces.
- CO5: Communicating landscape design concepts effectively through detailed drawings and presentations.

Course: Design studio – 5 (Working Drawing)
Program: Bachelor of Interior Design (Semester-VI)
Course Code: 33030601
Course Outcomes (COs):

- CO1: Understanding the principles of working drawings and their significance in interior design projects.
- CO2: Developing skills in creating detailed and accurate working drawings for execution.
- CO3: Applying technical drawing techniques to represent construction details and material specifications.
- CO4: Enhancing problem-solving abilities through the interpretation of design concepts into working drawings.
- CO5: Communicating design ideas effectively through comprehensive working drawings and specifications.

Course: Interior material and construction – 6
Program: Bachelor of Interior Design (Semester-VI)
Course Code: 33030602
Course Outcomes (COs):

- CO1: Understanding advanced materials and construction techniques used in interior design.
- CO2: Analyzing the structural behavior and performance of materials in complex interior projects.
- CO3: Developing detailed technical drawings and specifications for advanced interior materials and systems.
- CO4: Applying innovative and sustainable construction techniques in modern interior design.
- CO5: Evaluating the environmental impact and sustainability of materials used in interior construction.

Course: Interior Services - 4
Program: Bachelor of Interior Design (Semester-VI)
Course Code: 33030603
Course Outcomes (COs):

- CO1: Understanding advanced concepts of interior services such as HVAC, electrical, plumbing, and fire safety systems.
- CO2: Analyzing the integration of advanced service systems in interior spaces for optimized performance.
- CO3: Developing detailed technical drawings and specifications for advanced service systems.
- CO4: Applying service design principles to ensure functionality, safety, and compliance with regulations.
- CO5: Evaluating the sustainability and energy efficiency of service systems in modern interior design projects.

Course: Estimation and Costing
Program: Bachelor of Interior Design (Semester-VI)
Course Code: 33030604
Course Outcomes (COs):

- CO1: Understanding the principles of cost estimation in interior design projects.
- CO2: Analyzing material costs and labor costs for efficient budgeting in interior design.
- CO3: Developing skills in preparing detailed project cost estimates and tenders.
- CO4: Applying knowledge of cost management in design to optimize resources.
- CO5: Evaluating different project proposals and their financial feasibility.

Course: Computer Application -3
Program: Bachelor of Interior Design (Semester-VI)
Course Code: 33030605
Course Outcomes (COs):

- CO1: Understanding the advanced tools and techniques used in computer applications for interior design.
- CO2: Developing skills in using specialized software for 3D modeling and rendering.
- CO3: Creating detailed technical drawings and presentations using digital tools.
- CO4: Applying computer applications to enhance accuracy, efficiency, and creativity in interior design projects.
- CO5: Integrating digital technologies to communicate complex design concepts effectively.

Course: Research Methodology
Program: Bachelor of Interior Design (Semester-VI)
Course Code: 33030702
Course Outcomes (COs):

- CO1: Understand the significance of research in the context of interior design.
- CO2: Develop the ability to formulate research questions relevant to interior design.
- CO3: Apply various research methodologies to collect and analyze data for design projects.
- CO4: Critically evaluate design trends and evidence-based practices.
- CO5: Present research findings effectively through written reports and visual presentations.

Course: Interior contemporary practices
Program: Bachelor of Interior Design (Semester-VI)
Course Code: 33030703
Course Outcomes (COs):

- CO1: Understanding the evolution of contemporary interior design styles and practices.
- CO2: Analyzing the influence of global trends on modern interior design.
- CO3: Applying contemporary design techniques to create innovative interior spaces.
- CO4: Integrating sustainable practices into contemporary interior design solutions.
- CO5: Critically evaluating contemporary design through case studies and research.

Course: Final Project
Program: Bachelor of Interior Design (Semester-VII)
Course Code: 33030701
Course Outcomes (COs):

- CO1: Understanding and applying comprehensive design theories in real-world projects.
- CO2: Developing complex interior design solutions, considering both functionality and aesthetics.
- CO3: Critically evaluating design projects using research-based methodologies.
- CO4: Integrating sustainable and innovative approaches into large-scale interior design projects.
- CO5: Presenting and communicating design concepts effectively in a professional context.

Course: Internship/Office Training
Program: Bachelor of Interior Design (Semester-VII)
Course Code: 33030801
Course Outcomes (COs):

- CO1: Apply academic knowledge to real-world professional practices in the field of interior design.
- CO2: Develop professional skills through hands-on experience in interior projects.
- CO3: Understand the workflow and project management strategies in a design firm or office.
- CO4: Demonstrate the ability to collaborate in multidisciplinary teams effectively.
- CO5: Exhibit ethical and professional behavior in an office environment.

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester I

Course Title: Foundation Studio
Course Code 33000001

Course Outcomes (COs)

- CO1: Understand the basic architectural design principles, including form, space, and order.
- CO2: Develop freehand drawing and sketching skills to communicate design ideas effectively.
- CO3: Apply visual and spatial perception to design small-scale architectural projects.
- CO4: Use materials and model-making techniques to explore design ideas and concepts.
- CO5: Understand the relationship between human scale, ergonomics, and spatial design.
- CO6: Work collaboratively in teams to develop and present design projects.

Bachelor of Architecture

B.Arch Semester I

Course Title: Building Material and Construction –I
Course Code 33000002

Course Outcomes (COs)

- CO**1**: Understand the basic properties and classification of building materials (e.g., bricks, stone, cement, and timber).
- CO2: Analyze the application of different materials in construction techniques.
- CO**3**: Develop knowledge of traditional and modern construction methods.
- CO**4**: Evaluate the strength and durability of construction materials.
- CO**5**: Apply concepts of sustainable and eco-friendly building materials.
- CO**6**: Communicate construction details effectively through technical drawings and reports.

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Swarrnim Institute of Design

Bachelor of Architecture

B.Arch Semester I

Course Title: Technical Representation of Drawings – I
Course Code 3300000

Course Outcomes (COs)

- CO**1** : Understand basic architectural drawing principles, standards, and conventions.
- CO2 : Develop proficiency in freehand sketching and basic technical drawing techniques.
- CO**3** : Learn orthographic projections and isometric drawings for architectural representation.
- CO**4** : Apply proper dimensioning and scale in architectural drawings.
- CO**5** : Enhance spatial visualization skills to represent three-dimensional objects in two-dimensional formats.
- CO**6** : Communicate architectural ideas effectively through technical drawings and annotations.

Bachelor of Architecture

B.Arch Semester I

Course Title: Humanities
Course Code 33010103

Course Outcomes (COs)

- CO1: Understand the role of humanities in architecture and its influence on society, culture, and history.
- CO2: Analyze historical and social contexts to understand architectural evolution.
- CO3: Develop awareness of ethical, social, and cultural responsibilities in architectural practice.
- CO4: Critically engage with literature, art, and philosophy to inspire architectural design thinking.
- CO5: Communicate ideas effectively through essays, discussions, and presentations related to architecture and humanities.
- CO6: Work collaboratively to discuss and present views on human values, ethics, and societal issues impacting architecture.

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Swarrnim Institute of Design

Bachelor of Architecture

B.Arch Semester I

Course Title: Design Communication
Course Code 33000002

Course Outcomes (COs)

- **CO1**: Understand the basic principles and elements of design communication.
- **CO2**: Develop skills in visual representation, sketching, and graphic techniques.
- **CO3**: Apply digital tools and software for architectural communication.
- **CO4**: Create effective architectural presentations and visualizations.
- **CO5**: Communicate architectural ideas effectively through drawings, diagrams, and presentations.
- **CO6**: Explore creative approaches to represent space, form, and structure graphically.

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Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester I

Course Title: Introduction to Entrepreneurship
Course Code 23000007

Course Outcomes (COs)

- **CO1**: Understand the basic principles of entrepreneurship, including its definition, characteristics, and importance in architecture.
- **CO2**: Analyze the challenges and opportunities for entrepreneurship within the architectural industry.
- **CO3**: Develop innovative and entrepreneurial strategies to create sustainable architectural projects.
- **CO4**: Understand financial and legal aspects of starting and managing architectural firms or ventures.
- **CO5**: Cultivate leadership and team management skills applicable to architectural entrepreneurship.
- **CO6**: Develop innovative and entrepreneurial strategies to create sustainable architectural projects.

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Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester II

Course Title: Architecture Design – I
Course Code 33010201

Course Outcomes (COs)

- **CO1**: Understanding the relationship between space and structure.
- **CO2**: Developing skills in architectural representation through drawings and models.
- **CO3**: Applying sustainable design principles.
  CO4: Mastering fundamental design concepts related to form and function.
- **CO5**: Understanding the relationship between space and structure.
- **CO6**: Applying sustainable design principles.

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester II

Course Title: Building Material & Construction – II
Course Code 33010202

Course Outcomes (COs)

- **CO1**: Understanding the properties and uses of construction materials.
- **CO2**: Acquiring skills in construction techniques and methods.
- **CO3**: Understanding the principles of building construction systems.
- **CO4**: Applying construction techniques to small-scale projects.

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Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester II

Course Title: Technical Representation of Drawings – II
Course Code 33010102

Course Outcomes (COs)

- **CO1**: Understanding the principles of technical architectural drawing.
- **CO2**: Developing skills in drawing complex architectural forms and details.
- **CO3**: Learning to interpret and create architectural drawings with precision.
- **CO4**: Applying industry-standard drawing techniques to architectural projects.

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Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester II

Course Title: Structure – I
Course Code 33010204

Course Outcomes (COs)

- **CO1**: Understanding the basic principles of structural systems in architecture.
- **CO2**: Analyzing structural elements and their behavior under various loads.
- **CO3**: Applying knowledge of structural mechanics to small architectural projects.
- **CO4**: Identifying appropriate construction techniques for different structural systems.

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Swarrnim Institute of Design

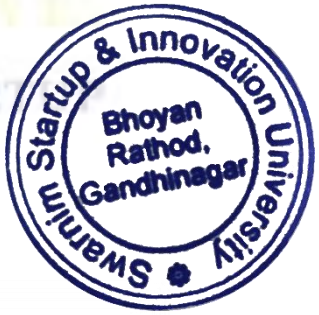
Bachelor of Architecture

B. Arch Semester II

Course Title: Basics of Design
Course Code 33010205

Course Outcomes (COs):

- **CO1**: Understanding the fundamentals of design principles and elements.
- **CO2**: Developing spatial design thinking and creativity.
- **CO3**: Applying basic concepts of form, color, and texture in design.
- **CO4**: Mastering the representation of design ideas through sketches and models.



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Bachelor of Architecture

B. Arch Semester II

Course Title: History of Architecture – I
Course Code 33010206

Course Outcomes (COs)

- **CO1**: Understanding the historical evolution of architectural styles and movements.
- **CO2**: Analyzing the cultural, social, and environmental factors influencing historical architecture.
- **CO3**: Identifying key architectural developments in ancient and medieval periods.
- **CO4**: Critically examining the impact of historical architecture on contemporary design practices.

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Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester III

Course Title: Architecture Design – II
Course Code 33010301

Course Outcomes (COs)

- **CO1:** Develop design skills and apply design principles in architectural projects.
- **CO2:** Analyze and synthesize spatial organization and form.
- **CO3:** Explore and apply various materials and construction techniques in design.
- **CO4:** Integrate sustainability principles into architectural design.
- **CO5: Communicate architectural ideas effectively through sketches, models, and presentations.**

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Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester III

Course Title: Building Material & Construction – III
Course Code 33010302

Course Outcomes (COs)

- **CO1:** Understand and apply principles of structural systems and their components.
- **CO2:** Analyze different building materials and their properties for construction.
- **CO3:** Evaluate construction techniques and methodologies relevant to various materials.
- **CO4:** Design details for construction that ensure safety, stability, and functionality.
- **CO5:** Integrate sustainable practices and innovative materials into construction design.

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Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester III

Course Title: Structure – II
Course Code 33010303

Course Outcomes (COs)

- CO1: Understand the fundamental principles of structural mechanics and their applications in architecture.
- CO2: Analyze and design different types of structural systems, including beams, columns, and frames.
- CO3: Evaluate the behavior of materials under various loads and conditions.
- CO4: Apply knowledge of structural systems in the context of architectural design and integration.
- CO5: Communicate structural concepts effectively through drawings and presentations

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Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester III

Course Title: Environment Science & Services – I
Course Code 33010304

Course Outcomes (COs)

- **CO1:** Understand the basic principles of environmental science and its relevance to architecture.
- **CO2:** Analyze the impact of built environments on natural ecosystems and human health.
- **CO3:** Apply sustainable practices in the design and management of architectural projects.
- **CO4:** Evaluate various environmental policies and regulations that affect architecture and urban planning.
- **CO5:** Conduct assessments of environmental conditions and propose mitigation strategies.

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester III

Course Title: History of Architecture – II
Course Code 33010305

Course Outcomes (COs)

- **CO1:** Analyze and interpret the major architectural movements and styles from various historical periods.
- **CO2:** Evaluate the influence of socio-political and cultural factors on architectural developments.
- **CO3:** Compare and contrast different architectural styles and their impacts on contemporary architecture.
- **CO4:** Conduct research on specific architectural works and their historical significance.
- **CO5:** Apply historical knowledge to inform design decisions in contemporary architectural practice.

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Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester III

Course Title: Computer Applications – I
Course Code 33010306

Course Outcomes (COs)

- **CO1:** Understand the basic principles of computer applications in architecture, including software tools and technologies.
- **CO2:** Apply 2D drafting techniques to create architectural drawings and technical documentation.
- **CO3:** Utilize 3D modeling software to develop architectural designs and visualizations.
- **CO4:** Analyze and present architectural information through effective use of graphic representations and presentations.
- **CO5:** Develop skills in utilizing digital tools for project management and collaboration in architectural practice.

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester IV

Course Title: Architecture Design – III
Course Code 33010401

Course Outcomes (COs)

- **CO1:** Develop a comprehensive understanding of architectural design principles and methodologies.
- **CO2:** Integrate contextual, environmental, and cultural considerations into design proposals.
- **CO3:** Utilize advanced design tools and techniques for architectural visualization and representation.
- **CO4:** Conduct a thorough analysis of user needs and site conditions to inform design decisions.
- **CO5:** Present architectural design projects effectively to diverse audiences through various mediums.

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Bachelor of Architecture

B. Arch Semester IV

Course Title: Building Material & Construction – IV

Course Code 33010402

Course Outcomes (Cos:)

- **CO1:** Understand the properties and applications of various building materials used in construction.
- **CO2:** Analyze the construction techniques and methods employed in building projects.
- **CO3:** Evaluate the performance and durability of building materials in different environmental conditions.
- **CO4:** Apply knowledge of materials and construction methods to design and detail building components.
- **CO5:** Develop skills in selecting appropriate materials and construction methods for architectural design projects.

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester IV

Course Title: Structure – III
Course Code 33010403

Course Outcomes (COs)

- **CO1:** Understand advanced structural analysis techniques for complex structures.
- **CO2:** Apply principles of mechanics to evaluate structural behavior under various loads.
- **CO3:** Design structural components using appropriate materials and methods.
- **CO4:** Analyze the effects of environmental factors on structural performance.
- **CO5:** Communicate structural design solutions effectively through drawings and reports.

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester IV

Course Title: Environment Science & Services – II

Course Code 33010404

Course Outcomes (COs)

- CO1: Understand the principles of environmental science and their relevance to architecture.
- CO2: Analyze the impact of buildings on the environment and explore sustainable practices.
- CO3: Evaluate the role of natural resources in architectural design and construction.
- CO4: Apply knowledge of environmental policies and regulations in architectural projects.
- CO5: Develop skills for assessing environmental performance in buildings.

SWARNIM STARTUP & INNOVATION UNIVERSITY
WHERE IDEAS COME ALIVE

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester IV

Course Title: History of Architecture – III
Course Code 33010405

Course Outcomes (COs)

- **CO1:** Understand the evolution of architectural styles and movements from various historical periods.
- **CO2:** Analyze significant architectural works and their cultural and historical contexts.
- **CO3:** Evaluate the influence of social, political, and technological factors on architecture.
- **CO4:** Apply knowledge of historical architecture to inform contemporary design practices.
- **CO5:** Develop critical thinking skills in assessing and interpreting architectural history.

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Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester III

Course Title: Computer Applications – II
Course Code 33010406

Course Outcomes (COs)

- **CO1:** Understand the principles of computer-aided design (CAD) software and its application in architecture.
- **CO2:** Develop skills in 3D modeling and visualization techniques using appropriate software tools.
- **CO3:** Apply digital tools for architectural documentation and presentation.
- **CO4:** Analyze the role of information technology in enhancing architectural design processes.
- **CO5:** Communicate design concepts effectively using digital media and presentations.

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Course Outcomes (COs)

- **CO1:** Understand the fundamentals of project feasibility analysis and its significance in architectural projects.
- **CO2:** Analyze market trends and demand for architectural services and projects.
- **CO3:** Evaluate the financial aspects of architectural projects, including budgeting and cost estimation.
- **CO4:** Apply marketing strategies to promote architectural services and projects effectively.
- **CO5:** Develop skills in presenting project proposals to clients and stakeholders.

SWARNIM STARTUP & INNOVATION UNIVERSITY
WHERE IDEAS COME ALIVE

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester V

Course Title: Architecture Design – IV
Course Code 33010501

Course Outcomes (COs)

- **CO1:** Develop advanced design skills to create complex architectural solutions.
- **CO2:** Analyze the relationship between built environments and human experiences.
- **CO3:** Incorporate sustainability and environmental considerations into architectural design.
- **CO4:** Utilize advanced tools and technologies for architectural design and presentation.
- **CO5:** Communicate design concepts effectively through various media, including drawings and models.

Swarnim Startup & Innovation University
Bhoyan Rathod, Gandhinagar

Bachelor of Architecture

B. Arch Semester V

Course Title: Building Material & Construction – V
Course Code 33010502

Course Outcomes (COs)

- **CO1:** Understand the properties and applications of advanced building materials in construction.
- **CO2:** Analyze construction techniques and methodologies for various types of buildings.
- **CO3:** Evaluate the environmental impact of building materials and construction practices.
- **CO4:** Apply knowledge of building codes and standards in the selection and use of materials.
- **CO5:** Develop skills for effective project management and site supervision during construction.

Bachelor of Architecture

B. Arch Semester V

Course Title: Structure – IV
Course Code 33010503

Course Outcomes (COs)

- **CO1:** Understand the principles of structural analysis and design for complex architectural systems.
- **CO2:** Analyze the behavior of various structural materials under different loads and conditions.
- **CO3:** Evaluate the application of advanced structural systems in architectural design.
- **CO4:** Apply knowledge of building codes and structural safety in design practice.
- **CO5:** Develop skills for effective communication of structural concepts through drawings and models.

SWARNIM STARTUP & INNOVATION UNIVERSITY
WHERE IDEAS COME ALIVE

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester V

Course Title: Environment Science & Services – III
Course Code 33010504

Course Outcomes (COs)

- **CO1:** Understand the principles of environmental science and its relevance to architecture.
- **CO2:** Analyze the impact of built environments on ecological systems and human health.
- **CO3:** Evaluate sustainable practices in building design and construction.
- **CO4:** Apply knowledge of environmental policies and regulations in architectural projects.
- **CO5:** Develop skills for effective communication of environmental concepts in design proposals.

Swarnim Startup & Innovation University
Bhoyan Rathod, Gandhinagar

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WHERE IDEAS COME ALIVE

Swarrnim Institute of Design

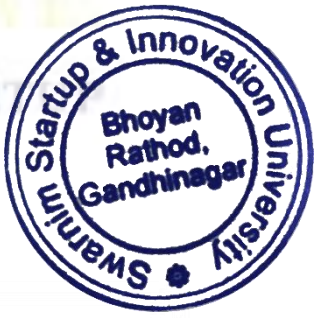
Bachelor of Architecture

B. Arch Semester V

Course Title: History of Architecture – IV
Course Code 33010505

Course Outcomes (COs)

- **CO1:** Understand the major architectural movements and styles from the modern era to the contemporary period.
- **CO2:** Analyze the socio-cultural, political, and economic influences on architectural development.
- **CO3:** Evaluate the impact of technology on architectural design and construction methods.
- **CO4:** Apply knowledge of historical context to contemporary architectural challenges.
- **CO5:** Communicate effectively through written and verbal presentations about historical architecture.



Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester V

Course Title: Computer Applications – III
Course Code 33010506

Course Outcomes (COs)

- **CO1:** Understand the fundamental principles of computer-aided design (CAD) software used in architecture.
- **CO2:** Create 2D and 3D architectural drawings using advanced CAD techniques.
- **CO3:** Analyze and apply computational methods for architectural design and visualization.
- **CO4:** Evaluate the integration of Building Information Modeling (BIM) in architectural practice.
- **CO5:** Develop skills to present architectural designs effectively through digital media.**:**

SWARNIM STARTUP & INNOVATION UNIVERSITY
WHERE IDEAS COME ALIVE

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester VI

Course Title: Architecture Design – V
Course Code 33010601

Course Outcomes (COs)

- **CO1:** Understand advanced architectural design principles, focusing on complex buildings and urban contexts.
- **CO2:** Analyze spatial, functional, and aesthetic requirements in architectural projects.
- **CO3:** Apply sustainability principles in the design of buildings and urban environments.
- **CO4:** Integrate structural, environmental, and services systems into architectural design.
- **CO5:** Develop skills for presenting architectural design concepts effectively through drawings, models, and digital media.

SWARNIM STARTUP & INNOVATION UNIVERSITY
WHERE IDEAS COME ALIVE

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester VI

Course Title: Building Material & Construction – VI

Course Code 33010602

Course Outcomes (COs)

- **CO1:** Understand the properties and applications of advanced building materials.
- **CO2:** Analyze construction techniques and their relevance to modern architectural design.
- **CO3:** Evaluate the sustainability of building materials and construction processes.
- **CO4:** Apply construction details and systems in complex building projects.
- **CO5:** Develop skills in preparing working drawings and construction documentation.

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester VI

Course Title: Structure – V
Course Code 33010603

Course Outcomes (COs)

- **CO1:** Understand the behavior of complex structural systems in buildings.
- **CO2:** Analyze various structural systems and their suitability for different architectural designs.
- **CO3:** Apply advanced principles of structural mechanics in the design of buildings.
- **CO4:** Evaluate the integration of structural systems with architectural design for safety and functionality.
- **CO5:** Develop skills to collaborate with structural engineers and communicate structural concepts effectively in architectural projects.

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester VI

Course Title: Environment Science & Services – IV
Course Code 33010604

Course Outcomes (COs)

- **CO1:** Understand the principles of environmental systems in the context of sustainable building design.
- **CO2:** Analyze advanced building services, including HVAC, lighting, and acoustics systems.
- **CO3:** Apply sustainable practices in the selection and design of building services.
- **CO4:** Integrate environmental systems with architectural design for improved efficiency and comfort.
- **CO5:** Communicate the importance of environmental systems and sustainable building practices in architectural projects.

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester VI

Course Title: History of Architecture – V
Course Code 33010605

Course Outcomes (COs)

- **CO1:** Understand the evolution of modern architecture and its movements from the 20th century to contemporary times.
- **CO2:** Analyze the impact of social, political, technological, and cultural factors on architectural styles and practices.
- **CO3:** Apply knowledge of architectural history to inform contemporary design practices.
- **CO4:** Evaluate the contributions of significant architects and movements to the development of modern architecture.
- **CO5:** Develop critical thinking and communication skills to discuss historical and contemporary architectural trends.

SWARNIM STARTUP & INNOVATION UNIVERSITY
WHERE IDEAS COME ALIVE

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester VI

Course Title: Computer Applications – IV
Course Code 33010606

Course Outcomes (COs)

- **CO1:** Understand advanced digital tools and software for architectural design and visualization.
- **CO2:** Analyze the role of computer applications in enhancing the accuracy and efficiency of architectural design processes.
- **CO3:** Apply computational techniques to create detailed architectural models and simulations.
- **CO4:** Integrate digital tools with architectural design for complex building projects.
- **CO5:** Develop skills in using advanced rendering, animation, and presentation tools to communicate design concepts effectively.

Swarnim Startup & Innovation University
Bhoyan Rathod, Gandhinagar

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester VII

Course Title: Architectural Design- VI

Course Code 33010701

Course Outcomes (COs)

- **CO1:** Understand advanced design methodologies and principles in architectural projects.
- **CO2:** Analyze complex architectural problems and generate creative and innovative design solutions.
- **CO3:** Apply knowledge of environmental, social, and cultural factors in architectural design.
- **CO4:** Integrate building systems, sustainability, and technology in design projects.
- **CO5:** Develop the ability to present, communicate, and defend design ideas effectively to diverse stakeholders

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester VII

Course Title: Theory of Architecture
Course Code 33010702

Course Outcomes (COs)

- CO1: Understand the fundamental principles of structural systems and their relevance in architectural design.
- CO2: Analyze various structural systems, including their load distribution and behavior under different conditions.
- CO3: Apply knowledge of materials and structural theory to solve architectural and engineering challenges.
- CO4: Integrate structural considerations with architectural design for efficient and innovative building solutions.
- CO5: Develop skills to communicate structural concepts and design decisions effectively to stakeholders, engineers, and clients.

SWARNIM STARTUP & INNOVATION UNIVERSITY
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Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester VII

Course Title: Site Planning

Course Code 33010703

Course Outcomes (COs)

- CO1: Understand the principles and methodologies of site planning and analysis in architectural design.
- CO2: Analyse site conditions, including environmental, social, and cultural factors that influence design decisions.
- CO3: Apply zoning regulations, building codes, and site development practices to create functional and sustainable site plans.
- CO4: Integrate landscape design and infrastructure planning into architectural projects for holistic development.
- CO5: Develop skills in presenting site planning proposals effectively to stakeholders and the community.

Bachelor of Architecture

B. Arch Semester VII

Course Title: Design Seminar-I
Course Code 33010704

Course Outcomes (COs)

- **CO1:** Understand contemporary architectural theories and practices through critical discussions and presentations.
- **CO2:** Analyze and critique various design projects and approaches presented by peers and guest speakers.
- **CO3:** Apply research methodologies to investigate current trends and issues in architecture and design.
- **CO4:** Integrate theoretical knowledge with practical design challenges through collaborative projects and presentations.
- **CO5:** Develop effective communication skills to present and defend design ideas and research findings.

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester VII

Course Title: Construction Management
Course Code 33010705

Course Outcomes (COs)

- CO1: Understand the fundamental principles and processes of construction management in architectural projects.
- CO2: Analyze project requirements and develop comprehensive project plans, including time and resource management.
- CO3: Apply knowledge of construction techniques, materials, and technologies to optimize project delivery.
- CO4: Integrate safety, quality control, and sustainability practices in construction management.
- CO5: Develop effective communication and leadership skills to manage construction teams and stakeholders.

Bachelor of Architecture

B. Arch Semester VIII

Course Title: Office Training

Course Code 33010801

Course Outcomes (COs)

- CO1: Understand the functioning and organizational structure of architectural firms and related offices.
- CO2: Apply practical skills learned in academic settings to real-world architectural projects and office environments.
- CO3: Analyze project workflows, including design, documentation, and project management processes.
- CO4: Develop effective communication and teamwork skills necessary for professional collaboration in an architectural setting.
- CO5: Reflect on personal learning experiences and professional development during the training period.

Bachelor of Architecture

B. Arch Semester IX

Course Title: Design Practice
Course Code 33010901

Course Outcomes (COs)

- **CO1:** Understand and apply advanced design theories and methodologies in architectural practice.
- **CO2:** Develop comprehensive architectural solutions that address complex design challenges and client needs.
- **CO3:** Analyze and synthesize information from various sources to inform design decisions and project development.
- **CO4:** Integrate sustainability, technology, and innovation into design proposals.
- **CO5:** Communicate architectural concepts effectively through various mediums, including drawings, models, and presentations.

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester IX

Course Title: Design Seminar-II
Course Code 33010902

Course Outcomes (COs)

- **CO1:** Critically evaluate contemporary architectural theories and practices through in-depth discussions and presentations.
- **CO2:** Analyze various architectural case studies and their impact on design philosophy and practice.
- **CO3:** Conduct independent research on current trends, technologies, and methodologies in architecture.
- **CO4:** Develop the ability to articulate and defend design ideas effectively in front of peers and faculty.
- **CO5:** Collaborate with peers to refine design concepts through constructive critique and feedback.

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester IX

Course Title: Architectural Research & Programming
Course Code 33010903

Course Outcomes (COs)

- **CO1:** Understand the principles and methodologies of architectural research, including qualitative and quantitative approaches.
- **CO2:** Develop skills in formulating research questions and hypotheses relevant to architectural practice.
- **CO3:** Analyze and synthesize information from diverse sources to inform design programming and decision-making.
- **CO4:** Apply research findings to address architectural challenges and contribute to innovative design solutions.
- **CO5:** Communicate research outcomes effectively through written reports and presentations to various stakeholders.

Swarrnim Institute of Design

Bachelor of Architecture

B. Arch Semester IX

Course Title: Urban Planning
Course Code 33010905

Course Outcomes (COs)

- **CO1:** Understand the fundamental principles and theories of urban planning and design.
- **CO2:** Analyze urban environments and assess their spatial, social, and economic dynamics.
- **CO3:** Develop comprehensive urban planning proposals that address community needs and sustainability.
- **CO4:** Apply zoning laws, regulations, and policies in urban design and planning processes.
- **CO5:** Communicate urban planning concepts effectively through various mediums, including presentations, reports, and visualizations.

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B. Arch Semester IX

Course Title: Elective - Computer Application'
Course Code 33010905

Course Outcomes (COs)

- **CO1:** Understand the role of computer applications in architectural design and documentation processes.
- **CO2:** Develop skills in using various software tools for architectural modeling, visualization, and presentation.
- **CO3:** Apply computational techniques to solve complex design problems and improve workflow efficiency.
- **CO4:** Integrate technology with design principles to enhance project outcomes.
- **CO5:** Communicate architectural ideas effectively using digital tools, including reports, presentations, and visual media.

Bachelor of Architecture

B. Arch Semester X

Course Title: Thesis
Course Code 331010001

Course Outcomes (COs)

- **CO1:** Formulate a comprehensive architectural thesis topic that demonstrates critical thinking and originality in design.
- **CO2:** Conduct thorough research using both primary and secondary sources to support the thesis topic.
- **CO3:** Develop a coherent thesis structure that integrates research findings with design proposals.
- **CO4:** Present the thesis effectively through written documentation and oral presentations, showcasing the design process and outcomes.
- **CO5:** Engage in critical analysis and feedback sessions to refine the thesis and enhance the quality of the final output.

Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester I

Course Title: Planning History and Theory

Course Code	Credit
34010101	2

Course Outcomes (COs)

- **CO1: Understand the evolution of planning theories and practices**
- **CO2: Analyze historical planning case studies.**
- **CO3: Evaluate the impact of historical events on modern planning**
- **CO4: Develop a comprehensive understanding of key planning milestones.**
- **CO5: Apply historical knowledge to contemporary planning issues**
- **CO6: Engage with primary and secondary sources in planning history.**
- **CO7: Communicate historical and theoretical concepts effectively.**

Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester I

Course Title: Socio-economic basis for Planning

Course Code	Credit
34010102	2

Course Outcomes (COs)

- **CO1**: Understand socio-economic theories and their application in planning.
- **CO2**: Analyze socio-economic data for planning purposes.
- **CO3**: Evaluate the impact of socio-economic factors on urban and regional planning.
- **CO4**: Develop strategies to address socio-economic issues in planning.
- **CO5**: Apply socio-economic principles to contemporary planning challenges.
- **CO6**: Engage with communities to understand socio-economic needs.
- **CO7**: Communicate socio-economic concepts effectively in planning contexts.

Swarnim Startup & Innovation University Bhoyan Rathod, Gandhinagar

Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester I

Course Title: Planning Techniques

Course Code	Credit
34010103	2

Course Outcomes (COs)

- **CO1**: Understand various planning techniques and their applications.
- **CO2**: Analyze spatial data using appropriate planning tools.
- **CO3**: Develop skills in quantitative and qualitative research methods.
- **CO4**: Apply planning techniques to real-world scenarios.
- **CO5**: Evaluate the effectiveness of different planning techniques.
- **CO6**: Communicate planning analyses and findings effectively.
- **CO7**: Integrate planning techniques into comprehensive planning processes.

Swarnim Startup & Innovation University Bhoyan Rathod, Gandhinagar

Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester I

Course Title: Infrastructure and Transport Planning

Course Code	Credit
34010104	2

Course Outcomes (COs)

- **CO1**: Understand the principles of infrastructure and transport planning.
- **CO2**: Analyze the impact of infrastructure on urban and regional development.
- **CO3**: Evaluate different transport planning models and techniques.
- **CO4**: Develop strategies for sustainable infrastructure and transport systems.
- **CO5**: Apply planning tools to real-world infrastructure and transport projects.
- **CO6**: Assess the socio-economic and environmental implications of infrastructure projects.
- **CO7**: Communicate infrastructure and transport planning concepts effectively.

Swarnim Startup & Innovation University Bhoyan Rathod, Gandhinagar

Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester I

Course Title: Housing and Environmental Planning

Course Code	Credit
34010105	2

Course Outcomes (COs)

- **CO1: Understand the principles of sustainable housing development.**
- **CO2: Analyze the environmental impacts of housing projects.**
- **CO3: Develop strategies for integrating environmental planning into housing policies.**
- **CO4: Evaluate the effectiveness of different housing policies in promoting environmental sustainability.**
- **CO5: Apply planning tools and techniques to real-world housing and environmental challenges.**

Swarrnim Startup & Innovation University Bhoyan Rathod, Gandhinagar

SWARNIM STARTUP & INNOVATION UNIVERSITY
WHERE IDEAS COME ALIVE

Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester I

Course Title: Studio course

Course Code	Credit
34010106	10

Course Outcomes (COs)

- **CO1:** Apply planning theories and techniques to practical urban and regional projects.
- **CO2**: Analyze real-world data to inform planning decisions.
- **CO3**: Develop integrated solutions that address social, economic, and environmental aspects of planning projects.
- **CO4**: Work collaboratively in teams to solve complex planning problems.
- **CO5**: Present and defend planning projects to stakeholders through effective communication tools.

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Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester II

Course Title: City and Metropolitan Planning

Course Code	Credit
34010201	**2**

Course Outcomes (COs):

- **CO1:** Understand the principles and theories related to city and metropolitan planning, focusing on urban growth and regional development.
- **CO2**: Analyze the dynamics of metropolitan regions, including economic, social, and environmental factors.
- **CO3:** Develop strategies for managing urban growth, infrastructure development, and service delivery in metropolitan areas.
- **CO4**: Evaluate policies and governance structures that influence metropolitan planning and management.
- **CO5**: Communicate metropolitan planning strategies effectively to stakeholders, including local governments, citizens, and private entities.

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WHERE IDEAS COME ALIVE

Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester II

Course Title: Infrastructure Planning

Course Code	Credit
34010202	**2**

Course Outcomes (COs)

- **CO1**: Understand the dynamics of urban growth and metropolitan development.
- **CO2**: Analyze the socio-economic and environmental impacts of metropolitan planning.
- **CO3**: Develop comprehensive metropolitan plans that integrate land use, transportation, and infrastructure.
- **CO4**: Evaluate policy frameworks and governance structures for metropolitan regions.
- **CO5**: Apply advanced planning tools and techniques to address metropolitan challenges.

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Master's in Planning

M. Plan

Semester II

Course Title: Urban Heritage Conservation

Course Code	Credit
34010203	**2**

Course Outcomes (COs)

- **CO1**: Understand the principles and practices of urban heritage conservation.
- **CO2**: Analyze the historical, cultural, and social significance of urban heritage sites.
- **CO3**: Develop strategies for the conservation and management of urban heritage.
- **CO4**: Evaluate the impact of urban development on heritage sites.
- **CO5**: Apply conservation techniques and tools to real-world heritage conservation projects.

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Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester II

Course Title: Advanced Planning Techniques

Course Code	Credit
34010204	**2**

Course Outcomes (COs)

- **CO1**: Master advanced quantitative and qualitative planning techniques.
- **CO2**: Apply advanced GIS and spatial analysis tools in planning.
- **CO3**: Develop comprehensive plans using advanced modeling techniques.
- **CO4**: Evaluate the effectiveness of various planning techniques in real-world scenarios.
- **CO5**: Communicate complex planning concepts and results effectively.

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Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester II

Course Title: Studio

Course Code	Credit
34010205	10

Course Outcomes (COs)

- **CO1**: Develop advanced practical skills in urban and regional planning.
- **CO2**: Apply theoretical knowledge to complex, real-world planning projects.
- **CO3**: Collaborate effectively in multidisciplinary teams to solve planning challenges.
- **CO4**: Utilize advanced planning tools and techniques in project development.
- **CO5**: Present planning proposals clearly and professionally to diverse stakeholders.

Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester II

Course Title: Inclusive Urban Planning (Elective – I)

Course Code	Credit
34010206	2

Course Outcomes (COs)

- CO1: Understand the concepts and principles of inclusive urban planning, focusing on equity, accessibility, and social justice.
- CO2: Analyze the spatial, social, and economic needs of marginalized and vulnerable groups in urban areas.
- CO3: Develop urban planning strategies that incorporate the principles of inclusivity and diversity in city development.
- CO4: Evaluate existing urban policies and programs from the perspective of inclusivity and suggest improvements.
- CO5: Communicate inclusive planning strategies effectively to stakeholders through reports, presentations, and visualizations.

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Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester II

Course Title: Planning for Tourism (Elective – I)

Course Code	Credit
34010206	2

Course Outcomes (COs)

- CO1: Understand the principles and concepts of tourism planning, with an emphasis on sustainable development.
- CO2: Analyze the socio-economic and environmental impacts of tourism on urban and rural areas.
- CO3: Develop tourism development plans that incorporate sustainability, community engagement, and cultural heritage conservation.
- CO4: Evaluate existing tourism policies and frameworks and recommend improvements for better planning and management.
- CO5: Communicate tourism planning strategies effectively through written reports, presentations, and visual tools to stakeholders, including government agencies and local communities.

Swarnim Startup & Innovation University Bhoyan Rathod, Gandhinagar

Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester III

Course Title: Urban Development Management

Course Code	Credit
34010301	2

Course Outcomes (COs)

- **CO1**: Understand the principles and practices of urban development management.
- **CO2**: Analyze the economic, social, and environmental impacts of urban development projects.
- **CO3**: Develop strategies for effective urban development and management.
- **CO4**: Evaluate policy frameworks and governance structures in urban development.
- **CO5**: Apply advanced management techniques to urban development projects.

Swarnim Startup & Innovation University Bhoyan Rathod, Gandhinagar

Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester III

Course Title: Project Planning and Management

Course Code	Credit
34010302	2

Course Outcomes (COs)

- **CO1:** Understand the principles and techniques of project planning, scheduling, and resource allocation.
- **CO2:** Analyze the financial, environmental, and social impacts of projects, and manage risk and uncertainties.
- **CO3:** Apply project management software tools for effective project tracking and control.
- **CO4:** Develop project proposals and feasibility studies, incorporating sustainability and strategic alignment.
- **CO5:** Understand contract management, stakeholder management, and legal frameworks in project execution.

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Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester III

Course Title: Urban Governance

Course Code	Credit
34010303	2

Course Outcomes (COs)

- **CO1**: Understand the principles and frameworks of urban governance.
- **CO2**: Analyze the roles and responsibilities of various stakeholders in urban governance.
- **CO3**: Evaluate policy and regulatory frameworks affecting urban governance.
- **CO4**: Develop strategies for effective governance in urban areas.
- **CO5**: Apply governance theories and practices to real-world urban issues.

Swarnim Startup & Innovation University Bhoyan Rathod, Gandhinagar

Swarrnim Institute of Design

Master's in Planning

M. Plan Semester

III

Course Title: Politics and Planning

Course Code	Credit
34010304	2

Course Outcomes (COs)

- **CO1**: Understand the role of politics in urban and regional planning.
- **CO2**: Analyze the impact of political decisions on planning processes and outcomes.
- **CO3**: Evaluate policy frameworks and their implications for urban development.
- **CO4**: Develop strategies to navigate political challenges in planning practice.
- **CO5**: Apply political theories and concepts to real-world planning scenarios.

Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester III

Course Title: Studio

Course Code	Credit
34010305	10

Course Outcomes (COs)

- **CO1:** Apply advanced analytical methods and tools for urban and regional planning.
- **CO2:** Integrate theoretical knowledge with practical design and planning solutions.
- **CO3:** Develop comprehensive planning proposals addressing real-world issues in urban development.
- **CO4:** Collaborate with multidisciplinary teams and effectively communicate planning solutions.
- **CO5:** Critically assess the social, economic, and environmental impacts of planning interventions.

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Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester III

Course Title: Environment, Development and Disaster Management (Elective – II)

Course Code	Credit
34010306	2

Course Outcomes (COs)

- **CO1**: Understand the interrelationship between environment, development, and disaster management in urban and regional contexts.
- **CO2**: Analyze the impacts of development activities on the environment and assess disaster risks.
- **CO3**: Formulate strategies for sustainable development, environmental protection, and disaster resilience.
- **CO4:** Evaluate existing policies and frameworks related to disaster management and environmental sustainability.
- **CO5**: Communicate and collaborate effectively with stakeholders in developing and implementing disaster management and sustainability plans.

Swarnim Startup & Innovation University Bhoyan Rathod, Gandhinagar

Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester III

Course Title: Energy, Climate Change and Urban Development (Elective – II)

Course Code	Credit
34010306	2

Course Outcomes (COs)

CO1: Analyze the impact of climate change on urban systems

CO2: Evaluate Sustainable energy solutions for urban environments

CO3: Develop urban planning strategies that integrate climate resilience

CO4 : Conduct assessments of energy policies in relation to urban development

CO5 : Communicate effectively the importance of sustainable practices in urban planning.

Swarnim Startup & Innovation University Bhoyan Rathod, Gandhinagar

Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester IV

Course Title: Development Finance

Course Code	Credit
34010401	2

Course Outcomes (COs)

- CO1: Understand the principles and theories of development finance in the context of urban planning.
- CO2: Analyze the role of public and private financing in infrastructure and urban development projects.
- CO3: Evaluate different financing mechanisms and instruments used in development projects.
- CO4: Formulate development finance strategies that promote sustainable and equitable urban growth.
- CO5: Assess the impact of financial policies and governance structures on urban development.

Swarnim Startup & Innovation University Bhoyan Rathod, Gandhinagar

Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester IV

Course Title: Legal Issues and Professional Practice

Course Code	Credit
34010402	**2**

Course Outcomes (COs)

- CO1: Understand the legal frameworks governing urban planning and development.
- CO2: Analyze the impact of laws and regulations on urban land use, zoning, and environmental management.
- CO3: Evaluate the role of ethics and professional standards in planning practice.
- CO4: Appy legal knowledge to resolve disputes and ensure compliance in planning projects.
- CO5: Develop skills for professional practice, including contract management, legal negotiations, and client relations.

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Swarrnim Institute of Design

Master's in Planning

M. Plan

Semester IV

Course Title: Thesis

Course Code	Credit
34010403	**16**

Course Outcomes (COs)

- CO1: Formulate a research question and develop a comprehensive research proposal relevant to urban and regional planning.
- CO2: Conduct thorough literature reviews and apply theoretical frameworks to analyze complex planning issues.
- CO3: Employ appropriate research methodologies, both qualitative and quantitative, in planning research.
- CO4: Synthesize data and findings to develop planning strategies, solutions, or recommendations.
- CO5: Effectively present research findings in written and oral formats, adhering to academic and professional standards.

Swarnim Startup & Innovation University Bhoyan Rathod, Gandhinagar

Course Outcome for B.Sc. Courses

Department of Biotechnology

B.Sc. Semester I

Course Title: **Introduction to Biotechnology**

Course Code: **253010101**

CO 1	Understand the historical development and interdisciplinary nature of biotechnology, and its branches.
CO 2	Explain the basic concepts of genes, and the chemical and physical nature of DNA and RNA.
CO 3	Describe the structure and organization of DNA in eukaryotes, including types of DNA and RNA.
CO 4	Understand the basic steps involved in genetic engineering and its significance in various fields.
CO 5	Analyze the applications of biotechnology in forensics, transgenic crops, and transgenic animals.
CO 6	Evaluate the role of biotechnology in healthcare diagnostics, treatment, and industrial processes.

Course Title: **Biotechnology Practicals**

Course Code: **253010102**

CO 1	Instrument Mastery: Proficiency in operating microscopes tailored for observing cell movement and motility-related instruments.
CO 2	pH Impact on Motility: Understand the direct influence of pH fluctuations on cell motility through controlled experiments.
CO 3	Staining Techniques for Motion: Apply stains to track and visualize cell movement patterns effectively under the microscope.
CO 4	Standard Solution Utilization: Prepare solutions known to affect cell motility, employing them in assays for quantification.
CO 5	Microscopic Analysis Skills: Acquire expertise in using microscopy to measure and analyze cell motility parameters like speed and direction.
CO 6	Experimental Design and Analysis: Design experiments examining factors affecting cell motility, collect data, and draw conclusions on their impact.

B.Sc. Semester II

Course Title: **Origin & Evolution of life**

Course Code: **253010201**

CO 1	Explain the origin and evolution of life, including major theories, Miller's experiments, and cell differentiation.
CO 2	Understand the evolution and structural differences between prokaryotes, eukaryotes, mitochondria, and chloroplasts, and discuss the quest for extra-terrestrial life.
CO 3	Describe the general characteristics, body organization, and adaptive features of plants, with an emphasis on the Plantae kingdom.
CO 4	Analyze the general features of animals, their evolutionary history, body organization, and adaptation to various environments, focusing on the Animalia kingdom.
CO 5	Illustrate the structure, reproduction, and classification of fungi, algae, protozoa, and discuss their economic importance.
CO 6	Understand the structure and replication of viruses, as well as the characteristics of prions, viroids, and virusoids, and their role in extreme environments.

Course Title: **Biotechnology Practicals**

Course Code: **253010202**

CO 1	Demonstrate proficiency in performing qualitative tests for the identification of various carbohydrates and interpreting the results effectively.
CO 2	Apply analytical techniques to detect and differentiate proteins in biological samples, enhancing understanding of protein structure and function.
CO 3	Develop the ability to perform lipid extraction and qualitative tests, fostering a deeper comprehension of lipid properties and their biological significance.
CO 4	Execute Cole's method for determining the viscosity of colloidal systems, gaining insight into molecular interactions in solutions.
CO 5	Investigate and evaluate different methods to observe and quantify cell motility, with an emphasis on understanding cellular dynamics and movement.
CO 6	Master various techniques for microbial culture preservation, ensuring the long-term viability and integrity of microorganisms for research and industrial applications.

B.Sc. Semester III

Course Title: **Cellular Biology**

Course Code: **253010301**

CO 1	Understand the chemistry and ultrastructure of various cell components, including cell walls, membranes, organelles (mitochondria, chloroplasts, Golgi bodies, etc.), and cytoskeletal structures, and analyze the cellular diversity among prokaryotes, archaea, and eukaryotes.
CO 2	Explain the fundamental concepts of cellular metabolism, including oxidation-reduction reactions, energy generation, ATP synthesis, and the various metabolic pathways such as anabolism, catabolism, and respiration.
CO 3	Discuss the properties and mechanisms of enzymes, including catalysis and allosteric regulation, and how these enzymes coordinate cellular metabolism.
CO 4	Describe the processes of cell division, including the phases of mitosis, cell cycle regulation, and the role of cell growth, tumor development, senescence, and apoptosis.
CO 5	Explain the central dogma of molecular biology, the concept of genes, and the processes of transcription, translation, and gene expression, along with the operon model.
CO 6	Analyze the mechanisms of cell communication, including the roles of signaling molecules, receptors, junctions, plasmodesmata, and cell signaling pathways.

Course Title: **Molecular Biology-I**

Course Code: **253010302**

CO 1	Understand the structure, properties, and features of prokaryotic DNA and explain the processes of unidirectional and bidirectional replication, including initiation, elongation, termination, the closed clamp, and rolling circle models.
CO 2	Analyze the mechanisms of DNA damage and the DNA repair systems in prokaryotes to understand how cells maintain genomic stability.
CO 3	Explain the process of prokaryotic transcription, including the roles of genes, promoters, and the stages of initiation, elongation, termination, and anti-termination, as well as post-transcriptional modifications.
CO 4	Understand the operon concept and describe the regulation of gene expression in prokaryotes through the Lac and Trp operons.
CO 5	Describe the genetic code, Wobble Hypothesis, and the steps of prokaryotic translation (initiation, elongation, termination), as well as the processes involved in post-translational modifications.
CO 6	Understand the Restriction-Modification system in prokaryotes, including the types, nomenclature, properties, and functions of restriction enzymes such as EcoRI, BamHI, and SmaI.

Course Title: **Biotechnology Practicals**

Course Code: **253010303**

CO 1	Perform various staining techniques to visualize bacterial flagella, endospores, and plant chloroplasts, enhancing the understanding of microbial structures and plant organelles.
CO 2	Identify and analyze the stages of mitosis through microscopy, developing proficiency in understanding cell division and structural organization within plant and microbial cells.
CO 3	Demonstrate skills in isolating and purifying DNA and RNA from plant tissues using appropriate techniques, contributing to molecular biology studies such as gene expression and plant genetics.
CO 4	Understand bacterial motility by performing flagella staining, linking cellular structures to function through laboratory observations.
CO 5	Investigate Lac mutants to comprehend the principles of bacterial gene regulation, particularly the lac operon, and its role in controlling metabolic pathways.
CO 6	Integrate various staining and isolation techniques to enhance understanding of both structural and functional aspects of cells and genetic material in microorganisms and plants.

B.Sc. Semester IV

Course Title: **Immunology-l**

Course Code: **253010401**

CO 1	Understand the structure and components of the immune system, including the process of hematopoiesis and the roles of key immune cells such as T cells, B cells, NK cells, and antigen-presenting cells (APCs).
CO 2	Differentiate between the types of immunity, including innate vs. acquired, active vs. passive, and humoral vs. cell-mediated immunity, and explain the concepts of primary and secondary immune responses.
CO 3	Define and classify antigens based on their properties, and understand the concepts of epitopes and haptens.
CO 4	Understand the structure, types, and functions of antibodies, including their role in blood typing and the ABO and Rh blood group systems.
CO 5	Explain the basic principles of antigen-antibody interactions, including the mechanisms of precipitation, agglutination, and cross-reactivity.
CO 6	Describe the techniques used to detect antigen-antibody interactions, including ELISA, RIA, and Western blotting, and understand their applications in immunological assays.

Course Title: **Bioinstrumentation**

Course Code: **253010402**

CO 1	Understand the principles, instrumentation, and applications of UV-Visible spectroscopy, Atomic Absorption Spectroscopy, Flame Photometry, Nephlometry, Infra-Red Spectroscopy, and Mass Spectroscopy for protein characterization and identification.
CO 2	Explain the principles and types of electrophoresis, including its applications in protein and nucleic acid separation techniques such as PAGE, SDS-PAGE, Agarose Gel Electrophoresis, and Isoelectric Focusing (IEF).
CO 3	Understand the basic principles of sedimentation, and the types and applications of density gradient centrifugation (Rate Zonal and Isopycnic) and ultracentrifugation in biological sample analysis.
CO 4	Understand the principles, types, and applications of various chromatographic techniques, including Paper Chromatography, Thin Layer Chromatography, Adsorption Chromatography, Ion Exchange Chromatography, Gas Liquid Chromatography, HPLC, and Affinity Chromatography.
CO 5	Understand the definition, branches, aims, and scope of bioinformatics, and its relevance in biological research.
CO 6	Understand the types of bioinformatics databases (primary, secondary, tertiary, and composite) and database retrieval systems, and apply basic bioinformatics tools such as BLAST, sequence alignment, protein structure analysis, and utilize resources like NCBI and EBI.

Course Title: **Biotechnology Practicals**

Course Code: **253010403**

CO 1	Understand the effects of heavy metals, temperature, pH, and osmotic pressure on bacterial growth, analyzing microbial adaptability and survival mechanisms under various stress conditions.
CO 2	Examine the metabolic activity of E. coli and other bacteria, evaluating how environmental factors such as nutrients and stress affect microbial metabolism and energy production.
CO 3	Assess the effectiveness of antibiotics against Gram-positive and Gram-negative bacteria, understanding antibiotic resistance and sensitivity patterns.
CO 4	Cultivate anaerobic bacteria using the candle jar method, exploring the growth conditions and metabolic processes of anaerobes in the absence of oxygen.
CO 5	Isolate, cultivate, and study moulds, understanding their growth patterns, morphological characteristics, and environmental significance.
CO 6	Master essential microbiological techniques for bacterial and fungal cultivation, including antibiotic sensitivity testing, anaerobic cultivation, and environmental impact studies on microbial growth.

B.Sc. Semester V

Course Title: **Fermentation Technology-l**

Course Code: **253010501**

CO 1	Understand the fundamental concepts of fermentation, the historical development of industrial microbiology, and the various components and range of fermentation processes.
CO 2	Describe the characteristics of industrially important microorganisms and apply techniques for primary and secondary screening for organic acid, antibiotic, enzyme, and growth factor producers.
CO 3	Understand the strategies for strain improvement, including the selection of induced mutants and recombinants, and apply preservation techniques and quality control for strain maintenance.
CO 4	Explain the design and functions of a stirred-tank bioreactor, including its structural components, and describe devices used for aeration, agitation, and monitoring of pH, temperature, foam, and dissolved oxygen.
CO 5	Differentiate between types of fermentation processes, including submerged (batch, fed-batch, continuous) and solid-state fermentation.
CO 6	Understand the principles of fermentation media formulation, including the role of media ingredients, and explain the methods of sterilization and the principles for developing inoculum for bacterial, yeast, and fungal processes.

Course Title: **Molecular Techniques**

Course Code: **253010502**

CO 1	Understand the concepts and applications of genomic and cDNA libraries, and explain the principles, types, and uses of PCR techniques, including basic PCR and RT-PCR.
CO 2	Explain various nucleic acid hybridization techniques, including colony and plaque hybridization, and techniques like Southern, Northern, and Western blotting, dot-blotting, and differential screening.
CO 3	Understand in situ hybridization and FISH, with both radioactive and non-radioactive detection methods, and the principles and applications of autoradiography.
CO 4	Describe molecular markers such as RFLP, RAPD, AFLP, SNP, and satellite DNA, and understand the DNA fingerprinting process and its applications.
CO 5	Explain the principles and methods of DNA sequencing, including chain termination, chemical cleavage, and automated sequencing techniques.
CO 6	Understand the process of DNA foot printing, in vitro transcription and translation systems, and their applications in molecular biology research.

Course Title: **Environmental Biotechnology**

Course Code: **253010503**

CO 1	Understand the principles, strategies, and techniques of bioremediation, including both in situ and ex situ approaches, and explain the role of GMOs in enhancing bioremediation processes.
CO 2	Explain the processes involved in the bioremediation of metals and the use of phytoremediation in environmental cleanup.
CO 3	Understand the principles and mechanisms of biodegradation and detoxification, and explain the biodegradation of detergents, pesticides, lignin, hydrocarbons, and dyes.
CO 4	Explain the principles, mechanisms, and methods used to assess biodeterioration, and discuss the prevention and control strategies for biodeterioration of selected materials.
CO 5	Understand the principles and applications of biosensors, including their types, limitations, and use in environmental monitoring.
CO 6	Explain the concepts and technology behind bioplastics and bio transducers, and discuss their applications in solving environmental problems.

Course Title: **Environmental Biotechnology**

Course Code: **253010504**

CO 1	Understand the characteristics of ideal vectors and explain the use of various vectors like plasmids (pBR322, pUC), bacteriophage lambda, and cosmids in recombinant DNA construction and transformation, including techniques such as antibiotic and blue-white selection.
CO 2	Explain the basic concepts of genetic engineering and describe the molecular tools used, including restriction endonucleases, DNA cutting and ligation techniques, and DNA modifying enzymes, as well as gene transfer methods.
CO 3	Understand the fundamentals of tissue culture, with a focus on plant tissue culture (PTC), its methods, significance, and various applications in biotechnology.
CO 4	Explain the principles of animal tissue culture, including the differences between primary cultures and established cell lines, and the importance of equipment and materials in animal cell technology.
CO 5	Describe the basic media formulations and techniques used in mammalian cell culture and their role in cell growth and maintenance.
CO 6	Understand the manipulation and practical applications of animal and plant tissue culture techniques in research and biotechnology, including their potential uses in genetic modification and therapeutic applications.

Course Title: **Biotechnology Practicals**

Course Code: **253010505**

CO 1	Understand the principles and techniques of alcohol estimation and production using baker's yeast, and their applications in industrial microbiology.
CO 2	Apply methods for the primary screening of microbial producers, including amylase enzymes, antibiotics, and organic acids, and understand their significance in biotechnology.
CO 3	Gain practical skills in utilizing bioinformatics databases like NCBI, DDBJ, and GenBank for sequence retrieval and analysis, and understand the basics of sequence alignment.
CO 4	Understand and demonstrate the principles and applications of advanced molecular techniques such as RT-PCR and primer designing from cDNA libraries.
CO 5	Analyze microbial biodeterioration and biodegradation processes, focusing on the breakdown of dyes by microorganisms and the impact of microorganisms on material degradation.
CO 6	Perform and understand environmental and plant tissue culture techniques, including the analysis of total solids (TS), total dissolved solids (TDS), total suspended solids (TSS), and callus culture in plant tissue culture.

B.Sc. Semester VI

Course Title: **Fermentation Technology-II**

Course Code: **253010601**

CO 1	Understand the principles of downstream processing, including methods for the removal of microbial cells and suspended solids such as foam separation, precipitation, filtration, and centrifugation, as well as cell disruption techniques.
CO 2	Explain the processes involved in product concentration, purification, and finishing stages like liquid-liquid extraction, membrane processes, drying, crystallization, and effluent treatment.
CO 3	Understand the methods for detecting and assaying fermentation products, including physical assays (titration, gravimetric analysis), chemical assays (chromatography, spectrophotometry), and biological assays (microbial assays).
CO 4	Explain the microbial quality assurance methods used in fermentation, including sterility testing, the Limulus Amebocyte Lysate (LAL) test, and fermentation economics.
CO 5	Understand the fermentation processes involved in the production of industrial products such as alcohol, cheese, baker's yeast, glutamic acid, and citric acid.
CO 6	Explain the fermentative production of pharmaceuticals and industrial enzymes, including penicillin (and its conversion to semisynthetic derivatives), cyanocobalamin, steroids, amylase, and carotenoids.

Course Title: **Enzymology**

Course Code: **253010602**

CO 1	Understand the general characteristics, classification, and terminology related to enzymes, including holoenzymes, coenzymes, apoenzymes, cofactors, activators, inhibitors, and isoenzymes, as well as the concepts of turnover number and specific activity.
CO 2	Explain the structure of enzyme active sites, the specificity of enzyme actions, and factors affecting enzyme activity, with a brief introduction to allosteric enzymes.
CO 3	Derive and explain the Michaelis-Menten equation and its modifications, including various graphical methods like Lineweaver-Burk, Eadie-Hofstee, and Hanes-Woolf plots.
CO 4	Understand the different types of enzyme inhibition, such as competitive, non-competitive, uncompetitive, mixed, and substrate inhibition, and their effects on enzyme kinetics.
CO 5	Describe the types, methods, applications, advantages, and limitations of enzyme immobilization, with an introduction to reverse micelles.
CO 6	Understand the sources and industrial applications of enzymes such as amylase, protease, and lipase in industries like detergent, leather, food, dairy, textile, and medical fields, including the industrial production of enzymes.

Course Title: **Molecular Biology-II**

Course Code: **253010603**

CO 1	Understand the organization of the eukaryotic genome, DNA packaging, and the problems associated with eukaryotic replication, and explain the roles of various enzymes and proteins involved in the replication process.
CO 2	Explain the central dogma of molecular biology, and describe the process of transcription in eukaryotes, including the roles of RNA polymerases, promoters, enhancers, and silencers in transcription initiation, elongation, and termination.
CO 3	Understand post-transcriptional modifications, including the types of introns, RNA splicing, and the modification of 5' and 3' ends of tRNA and rRNA.
CO 4	Explain the process of translation in eukaryotes, including the roles of ribosomes, initiation, elongation, termination, and the importance of post-translational modifications and protein targeting.
CO 5	Understand the different types of mutations (spontaneous and induced), and describe their effects on protein-coding genes, including forward, reverse, and suppressor mutations.
CO 6	Describe the various DNA repair mechanisms, including direct and indirect repair systems, SOS repair, and the structure and properties of transposable elements, as well as their application in transposon mutagenesis.

Course Title: **Biosafety, Bioethics & IPR**

Course Code: **253010604**

CO 1	Understand the fundamental concepts of biosafety, including standard laboratory practices, containment strategies, biosafety levels, biosafety guidelines in India, laboratory biosecurity, and risk assessment.
CO 2	Explain the principles of Good Laboratory Practices (GLP), Good Manufacturing Practices (GMP), and the basic concepts of Quality Control (QC) and Quality Assurance (QA), including guidelines for raw materials, sterilization, media, and product validation.
CO 3	Understand the role of culture collection centers, public health laboratories, and regulatory agencies in ensuring quality and safety in biological practices.
CO 4	Comprehend the basics and principles of bioethics, regulatory concerns, international codes and guidelines in India, and the role of non-governmental organizations (NGOs) in biological regulations.
CO 5	Understand the different types of intellectual property rights (IPR) and their management, including the benefits and challenges associated with IPR in biotechnology.
CO 6	Explain the patenting process, international harmonization of patent law, biotechnological process patents, and their protection, with a focus on the Indian scenario and case studies related to infringement.

Course Title: **Biotechnology Practicals**

Course Code: **253010605**

CO 1	Understand and apply sterility testing protocols for pharmaceutical products, ensuring compliance with safety and quality standards in microbiological assays.
CO 2	Demonstrate knowledge and skills in fermentation processes for the production of food products like cheese and sauerkraut, understanding the role of microbes in food biotechnology.
CO 3	Perform isolation and analysis of biomolecules such as chloroplasts and eukaryotic DNA, gaining proficiency in essential cell biology and molecular biology techniques.
CO 4	Apply immobilization techniques for cells and enzymes, including encapsulation, and understand their significance in industrial bioprocesses.
CO 5	Analyze and quantify biomolecules such as streptomycin and paracetamol using chemical methods like sodium nitroprusside and colorimetry, and employ chromatography for purification.
CO 6	Demonstrate the use of advanced molecular biology techniques, such as agarose gel electrophoresis and the study of yeast artificial chromosomes, for DNA analysis and qualification.

Department of Chemistry

B.Sc. Semester I

Course Title: **Basic Chemistry-I**

Course Code: **253020101**

CO 1	Identify the position of lanthanides and actinides in the periodic table and recall their electronic configurations.
CO 2	Describe the general mechanisms of organic reactions, including nucleophilic substitution, elimination, and addition reactions.
CO 3	Demonstrate the ability to write and balance chemical equations involving the combustion of alkanes
CO 4	Analyze experimental data to identify the presence and quantity of elements in a compound.
CO 5	Apply the rules of Markovnikov and anti-Markovnikov additions to predict the products of addition reactions involving alkenes and alkynes.
CO 6	Design an experiment to measure the rate of a reaction and interpret the data to determine the reaction order and rate constant.

Course Title: **Chemistry Practicals**

Course Code: **253020102**

CO 1	List the cations belonging to each analytical group and recall the reagents used for their separation.
CO 2	Describe the concept of titration and the role of indicators in acid-base volumetric analysis.
CO 3	Perform systematic qualitative analysis to identify two unknown cations/anions in a given inorganic salt sample.
CO 4	Carry out acid-base titrations accurately, using appropriate indicators to determine the concentration of unknown solutions.
CO 5	Differentiate between similar cations based on their unique chemical behavior during group separation and confirmatory tests.
CO 6	Design a flow chart for the systematic identification of two unknown radicals in an inorganic salt.

B.Sc. Semester II

Course Title: **Basic Chemistry-II**

Course Code: **253020201**

CO 1	Identify different types of chemical bonds (ionic, covalent, metallic, etc.) and recall the basic principles governing bond formation.
CO 2	Describe the basic principles of wave-particle duality and the Schrödinger equation in quantum chemistry.
CO 3	Apply crystal field theory and ligand field theory to predict the geometry and magnetic properties of complex compounds.
CO 4	Analyze the stability and reactivity of coordination complexes based on their ligand and metal center interactions.
CO 5	Compare the stability of different conformations of simple organic molecules (e.g., ethane, butane) using Newman projections.
CO 6	Evaluate the energy barriers for conformational changes and predict the most stable conformer.

Course Title: **Chemistry Practicals**

Course Code: **253020202**

CO 1	Identify common organic compounds based on their physical properties such as color, odor, and texture.
CO 2	Explain the role of indicators in acid-base titrations and the concept of end-point determination.
CO 3	Perform spot tests to identify the presence of specific functional groups in an unknown organic sample.
CO 4	Carry out accurate volumetric titrations to determine the concentration of unknown acid or base solutions.
CO 5	Evaluate the accuracy and reliability of different organic spotting techniques based on experimental outcomes.
CO 6	Develop a protocol for a new volumetric analysis experiment, including the preparation of reagents, execution, and calculation of results.

B.Sc. Semester III

Course Title: **Fundamentals of Organic chemistry**

Course Code: **253020301**

CO 1	Differentiate between various poly-nuclear hydrocarbons based on their chemical reactivity.
CO 2	Explain the atomicity and electronic properties of five- and six-membered hetero cycles.
CO 3	Evaluate the synthesis methods for hetero cyclic compounds and their practical applications.
CO 4	Design synthetic routes for complex hetero cyclic compounds used in pharmaceuticals.
CO 5	Analyze the reactivity of β–di carbonyl compounds in different chemical environments.
CO 6	Identify and classify acids and bases according to the Bronsted-Lowry and Lewis definitions.

Course Title: **Fundamentals of Analytic chemistry**

Course Code: **253020302**

CO 1	Explain the process of osazone formation and the role of carbohydrates in biological systems.
CO 2	Differentiate between different types of carbohydrates based on their structure and function.
CO 3	Describe the zwitter ionic nature of amino acids and explain the concept of the iso electric point.
CO 4	Predict the products of EAS reactions given different aromatic substrates and electrophiles.
CO 5	Analyze the reactivity of β–dicarbonyl compounds in different chemical environments
CO 6	Evaluate the synthesis methods for heterocyclic compounds and their practical applications.

Course Title: **Chemistry Practicals**

Course Code: **253020303**

CO 1	Explain the principles behind various organic separation techniques, such as distillation and extraction.
CO 2	Perform the separation and identification of compounds in an organic mixture using standard laboratory techniques.
CO 3	Interpret titration data to calculate the concentrations of calcium and magnesium ions in water.
CO 4	Analyze the factors affecting the completeness and accuracy of the precipitation reaction.
CO 5	Compare the results obtained from Mohr's and Volhard methods and discuss any discrepancies
CO 6	Describe the principles behind argentometric titration and the role of indicators in these methods.

CO-PO Mapping

B.Sc. Semester IV

Course Title: **Fundamentals of Inorganic chemistry**

Course Code: **253020401**

CO 1	Solve basic quantum mechanical problems using the Schrödinger equation for simple systems like the particle in a box.
CO 2	Analyze the behavior of quantum particles in different potential fields using wave mechanics.
CO 3	Predict the magnetic and spectral properties of coordination compounds using Crystal Field Theory.
CO 4	Evaluate the role of non-aqueous solvents in industrial applications, such as in organic synthesis and electrochemistry.
CO 5	Apply bonding theories to predict molecular geometries and physical properties of molecules.
CO 6	Evaluate the suitability of different bonding models for explaining the behavior of complex molecules.

Course Title: **Fundamentals of Physical chemistry**

Course Code: **253020402**

CO 1	Use qualitative and quantitative analysis methods to identify and quantify the components in various chemical samples.
CO 2	Analyze data from qualitative and quantitative analysis to interpret the composition and concentration of substances.
CO 3	Describe the process of redox titration, including the selection of appropriate indicators and the calculation of oxidation states.
CO 4	Analyze the environmental benefits and economic implications of adopting green chemistry practices in industrial and laboratory settings.
CO 5	Evaluate the suitability of precipitation titration and gravimetric analysis methods for different types of samples and compare their effectiveness with other quantitative analysis techniques.
CO 6	Conduct precipitation titrations and gravimetric analysis to quantitatively determine the concentration of analytes such as chloride or sulfate ions in a solution.

Course Title: **: Chemistry Practical**

Course Code: **253020403**

CO 1	Explain the principles behind the systematic separation and identification of ions in an inorganic mixture.
CO 2	Measure the viscosity of different liquids using an Ostwald viscometer and calculate the viscosity coefficient.
CO 3	Explain how the concentration of water and methanol in a mixture influences its viscosity and how this can be measured
CO 4	Analyze viscosity data to assess the proportional relationship between waterconcentration and the measured viscosity.
CO 5	Perform experiments to determine the reaction order for the hydrolysis of methyl acetate (first-order kinetics) and alkaline hydrolysis of ethyl acetate (second-order kinetics).
CO 6	Evaluate the advantages and limitations of conductometric titration compared to other titration methods, such as pH-based titration, in determining the concentration of strong acids and bases.

CO

B.Sc. Semester V

Course Title: **Organic chemistry - C- 1**
Course Code: **253020501**

CO 1	List the different classes of carbohydrates
CO 2	Explain the structural differences between glucose and fructose.
CO 3	Demonstrate the formation of glycosidic bonds in the synthesis of disaccharides.
CO 4	Compare the chemical reactivity of aldoses and ketoses in various organic reactions.
CO 5	Evaluate the role of carbohydrates in biological processes like energy storage and cell signaling.
CO 6	Synthesize a carbohydrate derivative with potential applications in drug development.

Course Title: **Inorganic chemistry - C- l**

Course Code: **253020502**

CO 1	Identify the different symmetry elements and symmetry operations in molecules.
CO 2	Explain the significance of molecular symmetry in determining the physical and chemical properties of molecules.
CO 3	Use symmetry elements to classify molecules into different point groups.
CO 4	Analyze the relationship between molecular symmetry and spectroscopic selection rules.
CO 5	Evaluate the role of symmetry in predicting molecular vibrations and their infrared/Raman activity.
CO 6	Design a molecule with specific symmetry properties that could serve as a model for studying symmetry-related phenomena.

Course Title: **Physical chemistry - C- l**

Course Code: **253020503**

CO 1	List the laws of thermodynamics and key thermodynamic terms
CO 2	Explain the concept of entropy and how it relates to the spontaneity of a process.
CO 3	Calculate the change in Gibbs free energy for a chemical reaction and predict whether it will occur spontaneously.
CO 4	Analyze a phase diagram to determine the conditions under which different phases of a substance exist.
CO 5	Evaluate the efficiency of a heat engine or refrigeration cycle using thermodynamic principles.
CO 6	Develop a new thermodynamic cycle that maximizes efficiency for a specific industrial process.

Course Title: **Analytical chemistry - C- l**

Course Code: **253020504**

CO 1	List the types of electronic transitions commonly observed in UV spectroscopy
CO 2	Explain how the Beer-Lambert Law relates absorbance to concentration and path length in UV spectroscopy.
CO 3	Use UV spectra to determine the concentration of a compound in solution by applying the Beer-Lambert Law
CO 4	Analyze the UV spectra of different conjugated systems to understand the effect of conjugation on absorption maxima.
CO 5	Evaluate the limitations of UV spectroscopy in determining the structure of complex molecules.
CO 6	Design an experiment using UV spectroscopy to monitor the progress of a photochemical reaction.

Course Title: **Chemistry Practicals**

Course Code: **253020505**

CO 1	Analyze kinetics data using various methods and interpret solubility equilibrium data to assess factors affecting solubility in inorganic compounds.
CO 2	Explain the impact of factors like temperature, catalysts, and concentration on reaction rates, and the role of solubility equilibria in solutions.
CO 3	Use integrated rate laws and solubility principles to solve problems involving reaction kinetics and solubility equilibria.
CO 4	Apply solubility rules, precipitation methods, and flame tests to distinguish between different cations and anions in inorganic mixtures.
CO 5	Analyze and interpret qualitative tests and separate ions based on chemical properties in complex inorganic mixtures.
CO 6	Recall principles of cation and anion analysis, along with reagents and general procedures in inorganic qualitative analysis.

B.Sc. Semester VI

Course Title: **Organic chemistry - C- lI**
Course Code: **253020601**

CO 1	Identify the key types of synthetic dyes
CO 2	Explain the chemical processes involved in dye synthesis and application.
CO 3	Demonstrate the process of dyeing a textile with a synthetic dye.
CO 4	Compare and contrast synthetic dyes with natural dyes in terms of environmental impact and colorfastness.
CO 5	Assess the environmental impact of synthetic dye production.
CO 6	Design a more sustainable synthetic dye with reduced toxicity.

Course Title: **Inorganic chemistry - C- II**

Course Code: **253020602**

CO 1	List the different types of chemical bonds
CO 2	Explain the concept of hybridization and how it influences molecular geometry.
CO 3	Predict the molecular structure and bond angles of a given molecule using VSEPR theory.
CO 4	Compare the strengths and properties of different types of bonds in various compounds.
CO 5	Assess the impact of chemical bonding on the physical and chemical properties of substances.
CO 6	Design a molecule with specific properties by manipulating chemical bonds

Course Title: **Physical chemistry - C- II**

Course Code: **253020603**

CO 1	List the laws of thermodynamics and key terms
CO 2	Explain how the first and second laws of thermodynamics govern energy changes in chemical reactions.
CO 3	Calculate the Gibbs free energy change for a chemical reaction under standard conditions.
CO 4	Compare endothermic and exothermic reactions in terms of enthalpy and entropy changes.
CO 5	Assess the spontaneity of a chemical reaction by evaluating the signs of enthalpy, entropy, and Gibbs free energy.
CO 6	Design an experiment to measure the heat capacity of a substance and interpret the results using thermodynamic principles.

Course Title: **Analytical chemistry - C- II**

Course Code: **253020604**

CO 1	List the different types of errors in analytical chemistry
CO 2	Explain the significance of accuracy, precision, and sensitivity in analytical measurements.
CO 3	Calculate the standard deviation and confidence interval for a set of analytical data.
CO 4	Analyze a data set to identify possible sources of error and suggest ways to minimize them.
CO 5	Evaluate the reliability and validity of analytical data by comparing it with known standards.
CO 6	Develop a protocol for the systematic treatment of errors in a new analytical method.

Course Title: **Chemistry Practicals**

Course Code: **253020605**

CO 1	Explain the steps involved in gravimetric analysis, including precipitation, filtration, drying, and weighing to determine the amount of radicals.
CO 2	Analyze the gravimetric data obtained during experiments and interpret the results to evaluate the concentration of radicals in the sample.
CO 3	Apply separation and identification techniques to organic mixtures such as acid-base, acid-phenol, and neutral-neutral using practical laboratory methods.
CO 4	Analyze titration curves and stoichiometric relationships to interpret the amount of analyte present in a solution based on volumetric data. |
CO 5	Evaluate the efficiency of separation and identification techniques by comparing the physical and chemical properties of the separated compounds with known standards.
CO 6	Explain the principles behind EDTA titrations and Mohr's method for the quantitative analysis of metal ions and chloride ions.

Department of Mathematics

B.Sc. Semester I

Course Title: **Calculus and Algebra**
Course Code: **253030101**

CO 1	Recall standard results for the nth derivative and Leibniz's Theorem. Define the limit of a sequence and understand the convergence and divergence of infinite series.
CO 2	State Rolle's Theorem, Lagrange's Mean Value Theorem, Cauchy's Mean Value Theorem, Taylor's and Maclaurin's Theorems.
CO 3	Analyze indeterminate forms and apply L'Hôpital's Rules to resolve them.
CO 4	Identify different types of matrices and recall basic operations and theorems related to matrices.
CO 5	Apply theorems and concepts of matrices to solve systems of simultaneous linear equations using Cramer's rule and matrix methods.
CO 6	Analyze the consistency of a system of simultaneous linear equations using relevant theorems.

Course Title: **Mathematics Practical**

Course Code: **253030102**

CO 1	Practicals based on Integral and successive differentiation.
CO 2	Practicals based on convergence of infinite series, Mean value theorems, Expansions of functions, and L'Hospital's Rule.
CO 3	Practicals based on Matrices and its applications.
CO 4	Practicals based on tracing of curves.
CO 5	Find some solutions using the Leibniz theorems
CO 6	Practicals based on integral and derivatives

B.Sc. Semester II

Course Title: **Differential Equation and Coordinate Geometry**

Course Code: **253030201**

CO 1	Determine the suitability of a particular method for solving a given differential equation of the first order and first degree.
CO 2	Assess the general and singular solutions of first-order higher-degree differential equations, including Clairaut's and Lagrange's differential equations.
CO 3	Identify and define linear differential equations of higher order and degree one with constant coefficients.
CO 4	Describe the Cartesian and general equations of a sphere, and the properties of tangency and normality in relation to spheres.
CO 5	Evaluate the conditions for orthogonality of spheres and the tangency of planes to spheres.
CO 6	Analyze the different types of cones and cylinders and their equations, particularly the right circular cone and cylinder.

Course Title: **Mathematics Practical**

Course Code: **253030202**

CO 1	**Apply the methods of solving first-order differential equations:** Students will be able to apply various techniques, including variable separation, integrating factors, and the Bernoulli method, to solve first-order differential equations effectively.
CO 2	**Solve higher-degree differential equations:** Students will develop the ability to solve first-order differential equations of higher degrees, including those solvable for y, x, or p, and apply methods to find both general and singular solutions for Clairaut's and Lagrange's differential equations.
CO 3	**Analyze and solve linear differential equations of higher order:** Students will gain proficiency in solving linear differential equations of higher order with constant and variable coefficients using methods such as complementary functions, inverse operators, and the Euler form.
CO 4	**Perform geometric operations in R3 involving spheres:** Students will be able to calculate the equations of spheres, including intersections with lines, planes, and other spheres, as well as determine tangent planes and normal lines to spheres.
CO 5	**Classify and analyze conicoids in R3**: Students will acquire the skills to classify various types of conicoids, understand their geometric properties, and solve related problems.
CO 6	**Convert and apply polar coordinates in R2 and R3:** Students will demonstrate the ability to convert between Cartesian and polar coordinates and solve problems involving cones and cylinders in R3, including right circular cones and cylinders.

B.Sc. Semester III

Course Title: **Linear Algebra**

Course Code: **253030301**

CO 1	Explain the concept of a limit and the process of differentiation, including the chain rule, derivatives of inverse functions, implicit functions, parametric functions, exponential, and logarithmic functions.
CO 2	Assess the correctness of derivative calculations for different functions, including implicit and parametric functions.
CO 3	Explain the process of integration and how it applies to various types of functions, including trigonometric substitutions.
CO 4	Calculate definite integrals using the fundamental theorem of calculus and apply it to solve real-world problems.
CO 5	Explain the concept of differential equations and the specific methods used to solve first-order and first-degree equations.
CO 6	Evaluate the solutions to differential equations, ensuring they meet the initial conditions and are mathematically sound.

Course Title: **Numerical Analysis**

Course Code: **253030302**

CO 1	Explain the concepts of repeated or iterated integrals and the transformation of double and triple integrals, including the introduction to the Jacobian.
CO 2	Evaluate the effectiveness of using multiple integrals in solving complex geometric and physical problems.
CO 3	Explain the properties of Beta and Gamma functions and how they can be used to evaluate definite integrals.
CO 4	Analyze complex vector fields using the integral theorems and apply them to solve real-world problems.
CO 5	Explain the concepts of complete and particular integrals in first-order PDEs and Lagrange's method for solving linear equations.
CO 6	Evaluate different solution methods for PDEs and assess their effectiveness in solving complex mathematical problems.

Course Title: **Mathematics Practical**

Course Code: **253030303**

CO 1	Apply the concept of limits to determine the continuity and behavior of polynomial, rational, and trigonometric functions.
CO 2	Solve integration problems using standard methods such as substitution, including trigonometric substitution, and integration by parts.
CO 3	Classify and solve first-order and first-degree differential equations using methods like variable separation and understand their applications in modeling real-world phenomena.
CO 4	Evaluate double and triple integrals and interpret their geometric significance, applying these concepts to solve practical problems in multiple dimensions.
CO 5	Utilize Beta and Gamma functions to evaluate definite integrals and understand their properties.
CO 6	Apply and verify Green's, Gauss's divergence, and Stokes's theorems to solve line, surface, and volume integrals, interpreting the physical implications of these results.

B.Sc. Semester IV

Course Title: **Advanced Calculus**

Course Code: **253030401**

CO 1	Apply numerical methods such as the Bisection Method, Iteration Method, Aitken's Δ^2 Process, and Method of False Position to find roots of algebraic and transcendental equations.
CO 2	Utilize the Newton-Raphson method to solve nonlinear equations and understand its application in various scientific and engineering problems.
CO 3	Perform interpolation using forward, central, and backward differences, and utilize symbolic relations of operators to detect and correct errors in difference tables.
CO 4	Compute differences of polynomials and apply Newton's forward and backward formulae for interpolation in uniformly spaced data.
CO 5	Use advanced interpolation techniques such as Gauss forward and backward formulae, Bessel's, Stirling's, and Everett's formulae to handle complex interpolation problems.
CO 6	Apply Lagrange's interpolation method to solve problems involving unequally spaced data points, and understand its significance in real-world applications where data may not be uniformly spaced.

Course Title: **Algebra and Statistical mathematics**

Course Code: **253030402**

CO 1	Students will be able to apply numerical methods such as Newton's forward and backward differences, Gauss's method, and determine the maximum and minimum values of a tabulated function.
CO 2	Students will be able to implement numerical integration techniques, including the Trapezoidal rule and Simpson's 1/3 and 3/8 rules, to approximate definite integrals.
CO 3	Students will be able to solve ordinary differential equations using methods such as Romberg integration, Taylor's series, Picard's method, Euler's method, modified Euler's method, and the Runge-Kutta method up to second order.
CO 4	Students will comprehend the definition and properties of linear transformations and apply them in various mathematical contexts.
CO 5	Students will be able to analyze the relationship between matrices and linear maps, including constructing matrices associated with linear maps and vice versa, through practical examples.

Course Title: **Mathematics Practical**

Course Code:**253030403**

CO 1	Students will be able to apply numerical differentiation methods such as Newton's forward and backward differences and Gauss's method, as well as numerical integration techniques like the Trapezoidal rule and Simpson's 1/3 and 3/8 rules.
CO 2	Students will be able to solve ordinary differential equations using Romberg integration, Taylor's series, Picard's method, Euler's method, Modified Euler's method, and the Runge-Kutta method up to the second order.
CO 3	Students will comprehend the definition and properties of linear transformations and apply them in various mathematical contexts.
CO 4	Students will be able to analyze the relationship between matrices and linear maps, including constructing matrices associated with linear maps and vice versa, through practical examples.
CO 5	Students will be able to apply the Newton-Raphson method for finding roots and perform interpolation using forward, central, and backward differences, while also understanding symbolic relations of operators and detecting errors using difference tables.
CO 6	Students will be able to perform interpolation with unequally spaced points using Lagrange's formula, divided differences, Newton's general formula, and solve problems using inverse interpolation and the method of successive approximations.

B.Sc. Semester V

Course Title: **Complex Analysis**

Course Code: **253030501**

CO 1	Understand and apply the basic properties of complex numbers, including their moduli, conjugates, and polar coordinates.
CO 2	Analyze and apply De Moivre's theorem to find the roots of complex numbers and perform operations in exponential form.
CO 3	Evaluate the convergence of sequences and series in the context of complex numbers, including trigonometric and hyperbolic functions.
CO 4	Apply theorems related to limits, continuity, and differentiation in complex functions, including the use of Cauchy-Riemann equations.
CO 5	Understand and analyze the concept of analytic and harmonic functions, and apply the principles of mapping and conformal mapping using elementary functions.
CO 6	Evaluate and compute line integrals in the complex plane, and apply Cauchy's integral formula and Liouville's theorem in practical contexts.

CO

Course Title: **Operation Research**

Course Code: **253030502**

CO 1	Understand the concepts of convex sets and linear programming problems, including the identification of extreme points, convex combinations, and theorems on convexity.
CO 2	Apply formulation techniques to linear programming (LP) problems and solve them using the Simplex method, Big-M (Penalty) method , and Two-Phase method.
CO 3	Analyze the duality concept in linear programming, including the formulation of dual problems, and evaluate the relationship between primal and dual solutions.
CO 4	Apply the dual simplex method to solve linear programming problems, including the mathematical procedure and interpretation of results.
CO 5	Understand and apply the concepts of transportation and assignment problems, including mathematical formulation, initial feasible solutions, and optimality tests using methods such as MODI and Hungarian Method.
CO 6	Solve unbalanced transportation and assignment problems using appropriate methods, and evaluate the efficiency of solutions.

Course Title: **Discrete Mathematics**

Course Code: **253030503**

CO 1	Identify relations and functions, including binary operations and their significance in algebraic structures.
CO 2	Illustrate the structure of different graphs (simple graphs, digraphs, etc.) and apply graph theory concepts such as paths, trails, walks, circuits, and cycles.
CO 3	Apply lattice theory to understand the meet and join operations, and explore concepts like sublattices, order-preserving functions, and isomorphisms.
CO 4	Explain the properties of Boolean algebra and its role in the analysis of switching circuits.
CO 5	Explore advanced topics like Boolean homomorphisms, isomorphisms, and the Stone Representation Theorem for practical and theoretical purposes.
CO 6	Construct and analyze subgraphs and multiple paths in practical scenarios.

Course Title: **Abstract Algebra**

Course Code: **253030504**

CO 1	Explain binary operations, the division algorithm, and congruence modulo relation in the set of integers.
CO 2	Analyze the structure and properties of subgroups, including normalizers, centralizers, cyclic groups, and lattice diagrams of finite groups.
CO 3	Apply Lagrange's theorem, Euler's theorem, and Fermat's theorem to solve problems related to group theory.
CO 4	Define and work with permutations, including cycles, transpositions, and the distinction between even and odd permutations.
CO 5	Understand the structure of symmetric and alternating groups, and analyze quotient groups and normal subgroups.
CO 6	Apply the concepts of isomorphism and homomorphism in groups, understanding their definitions and properties.

Course Title: **Mathematics Practical**

Course Code:**253030505**

CO 1	Solve Linear Programming Problems (LPP) using the Simplex, Big-M, and Two-Phase methods.
CO 2	Solve dual problems using the Dual Simplex method and interpret the relationship between primal and dual solutions.
CO 3	Solve balanced and unbalanced assignment problems using the Hungarian method.
CO 4	Perform operations such as sum, product, and roots of complex numbers in polar and exponential forms.
CO 5	Solve problems involving differentiability, continuity, and harmonic functions.
CO 6	Solve conformal mapping problems using elementary and Möbius transformations.

B.Sc. Semester VI

Course Title: **Analysis -II**

Course Code:**253030601**

CO 1	Formulate Linear Programming (LP) problems and recognize different problem-solving techniques, including the Simplex, Big-M, and Two-Phase methods.
CO 2	Solve LP problems using the Simplex method, Big-M (Penalty) method, and Two-Phase method.
CO 3	Compare and interpret the solutions of primal and dual problems, and solve them using the Dual Simplex method.
CO 4	Formulate and solve transportation problems using methods such as North-West Corner Rule, Least Cost Method, and Vogel's Approximation Method.
CO 5	Conduct an optimality test using the MODI method and address issues like degeneracy and unbalanced problems.
CO 6	Analyze simple game theory models and apply appropriate strategies for two-person zero-sum games.

Course Title: **Abstract Algebra -II**

Course Code: **253030602**

CO 1	Define and apply binary operations and algebraic structures, and understand their operations on functions.
CO 2	Define different types of graphs such as simple graphs, digraphs, and random graphs, and analyze their properties.
CO 3	Apply concepts such as paths, subgraphs, circuits, cycles, and equivalence relations in solving graph theory problems.
CO 4	Define and explore properties of relations, including reflexive, symmetric, antisymmetric, transitive, and equivalence relations.
CO 5	Analyze partially ordered sets (posets), Hasse diagrams, and lattice structures, including meet and join operations, lattice homomorphism, and isomorphism.
CO 6	Apply concepts such as sub-Boolean algebra, Boolean rings, homomorphism, isomorphism, and the Stone representation theorem in solving Boolean algebra problems.

Course Title: **Analysis-III**

Course Code: **253030603**

CO 1	Explain congruence modulo relation in integers and describe groups with examples.
CO 2	Distinguish between commutative and non-commutative groups and create group tables for finite groups.
CO 3	Apply Lagrange's theorem and Euler's theorem in solving group-related problems, and understand Fermat's theorem.
CO 4	Define and work with permutations, cycles, and transpositions, and differentiate between even and odd permutations.
CO 5	Calculate the order of a permutation and work with symmetric and alternating groups.
CO 6	Understand the kernel of a homomorphism and apply the fundamental theorem of homomorphisms.

Course Title: **Graph Theory**

Course Code: **253030604**

CO 1	Apply the Fundamental Theorem of Calculus, integration by parts, and change of variable in solving problems.
CO 2	Use advanced tests such as Condensation Test and Pringsheim's Test for series with positive terms.
CO 3	Analyze and apply the ratio and root tests using lim sup and lim inf for absolute convergence.
CO 4	Apply Merten's theorem in the context of series and study power series expansions.
CO 5	State and apply Taylor's theorem with Lagrange and Cauchy forms of the remainder.
CO 6	Expand functions like exponential, logarithmic, and trigonometric using Taylor and Binomial series.

Course Title: **Mathematics Practical**

Course Code: **253030605**

CO 1	Compute and interpret Riemann sums for various functions and intervals.
CO 2	Use comparison tests, condensation tests, and Pringsheim's test to analyze the convergence of series with positive terms.
CO 3	Understand and use advanced concepts such as Cauchy product and Merten's theorem in series analysis.
CO 4	Expand functions like exponential, logarithmic, and trigonometric functions into Taylor series.
CO 5	Simplify Boolean expressions and design switching circuits based on Boolean algebra principles.
CO 6	Solve problems involving permutations, normal subgroups, and homomorphisms using practical examples.

Department of Microbiology

B.Sc. Semester I

Course Title: **Introduction to Microbial world**

Course Code: **253040101**

CO 1	Explain the historical developments in microbiology, including the discovery of microbes, theory of biogenesis, and key advances in pure culture techniques, germ theory, and vaccination.
CO 2	Compare the characteristics and habitats of prokaryotic and eukaryotic organisms, and evaluate the significance and applications of microbiology in various fields.
CO 3	Demonstrate understanding of pure culture techniques, including methods of isolation, preservation, and the role of culture collections in microbiological research.
CO 4	Apply various microscopy techniques, such as light, dark field, phase contrast, fluorescence, and electron microscopy, to study microbial structures and characteristics.
CO 5	Analyze the chemistry and mechanism of dyes and stains, and their role in microbiological staining techniques for observing microorganisms.
CO 6	Evaluate the practical uses of microbiological techniques in applied microbiology, genetic engineering, and biotechnology.

Course Title: **Microbiology Practicals**

Course Code: **253040102**

CO 1	Demonstrate the correct use of microbiological instruments such as autoclave, laminar air flow, hot air oven, colony counter, and shaker in laboratory experiments.
CO 2	Perform proper cleaning and sterilization of glassware to ensure contamination-free experiments.
CO 3	Apply standard protocols for the safe disposal of laboratory waste and microbial cultures, maintaining biosafety standards.
CO 4	Develop basic microbial handling skills, including aseptic techniques and inoculation methods, to work safely with microorganisms.
CO 5	Prepare various types of microbiological media and broth, understanding their composition and role in microbial growth.
CO 6	Conduct negative staining techniques to observe microbial cell morphology and differentiate bacterial structures.

B.Sc. Semester II

Course Title: **Basic Bacteriology**

Course Code: **253040201**

CO 1	Explain the principles of bacterial taxonomy, including the binomial system of nomenclature and various classification systems for typical prokaryotes.
CO 2	Analyze the cellular organization of bacteria, including their size, shape, arrangement, and structures involved in spore formation, sporulation, and germination.
CO 3	Describe the structural components of a bacterial cell, including surface appendages (flagella, pili, fimbriae, prosthecae, and stalks), surface layers (capsule, slime layer, cell wall), and internal organelles (cytoplasmic membrane, ribosome, plasmids).
CO 4	Evaluate the nutritional requirements and diversities in bacteria, and explain the formulation, ingredients, and types of culture media used for bacterial cultivation.
CO 5	Identify and compare the various methods of microbial control, including the use of physical agents (heat, radiation, filtration) and chemical agents (phenols, halogens, surfactants, alcohols, heavy metals, and gaseous agents).
CO 6	Apply the principles of microbial control and understand the significance of killing, inhibition, and removal methods in preventing microbial growth.

Course Title: **Microbiology Practicals**

Course Code: **253040202**

CO 1	Explain the techniques of microbial staining, including fixation and smear preparation.
CO 2	Perform Gram staining to differentiate between Gram-positive and Gram-negative bacteria.
CO 3	Apply the streak plate method to isolate pure bacterial colonies.
CO 4	Utilize the spread plate technique for the enumeration of microbial cells.
CO 5	Implement the pour plate technique to culture and quantify microbial populations.
CO 6	Identify bacterial species based on staining and morphological characteristics.

CO

B.Sc. Semester III

Course Title: **MICROBIAL PHYSIOLOGY**

Course Code: **253040301**

CO 1	Describe the chemical structure, properties, classification, and biological significance of biomolecules including carbohydrates, proteins, lipids, and nucleic acids.
CO 2	Explain the structure, function, and classification of enzymes, including their physical and chemical properties, and mechanisms of enzyme action.
CO 3	Analyze the factors affecting enzyme activity and differentiate between competitive and non-competitive enzyme inhibition.
CO 4	Classify bacteria based on environmental growth requirements and compare different modes of nutrient uptake in bacteria.
CO 5	Explain the processes of microbial metabolism, including anabolism, catabolism, and the role of reducing power, precursor metabolites, and energy-rich compounds.
CO 6	Analyze bacterial growth, reproduction, and evaluate the effects of chemotherapeutic agents, including antibiotics, on bacterial growth and metabolism.

Course Title: **Soil & Water Microbiology**

Course Code: **253040302**

CO 1	Describe the physicochemical characteristics of soil, methods for studying soil microflora, and the microbial interactions in soil, including neutral, positive, and negative associations.
CO 2	Explain the role of microorganisms as biogeochemical agents, including their involvement in the nitrogen, sulfur, carbon, iron, and phosphorus cycles.
CO 3	Analyze the significance of the rhizosphere, mycorrhiza, and microbial interactions with plant roots in enhancing soil fertility and biofertilizer production.
CO 4	Evaluate the sources of contamination in natural water, microbial indicators of fecal pollution, and the methods used for bacteriological examination of drinking water.
CO 5	Interpret the microbiological and chemical characteristics of wastewater, including the role of BOD, COD, and TOD in assessing water quality.
CO 6	Apply methods of wastewater treatment, including primary, secondary, and advanced treatment processes, and explain the role of microorganisms in solid waste processing such as anaerobic sludge digestion and composting.

Course Title: **Microbiology Practicals**

Course Code: **253040303**

CO 1	Perform microbial diversity analysis in soil using the Winogradsky column and analyze the results to understand different microbial niches.
CO 2	Demonstrate the buried slide method to study soil microflora and interpret the microbial interactions and diversity present in the soil sample.
CO 3	Conduct microbiological analysis of soil and water, including Standard Plate Count (SPC) and Most Probable Number (MPN) methods, to evaluate bacterial abundance and quality.
CO 4	Measure the moisture content in soil samples and estimate macromolecules such as carbohydrates (using the DNSA method) and proteins (using the Folin-Lowry method) in biological samples.
CO 5	Analyze bacterial growth curves through laboratory experiments and interpret the effects of various factors on bacterial growth dynamics.
CO 6	Evaluate the effect of antibiotics on bacterial growth and assess their efficiency in inhibiting microbial proliferation by performing susceptibility tests.

CO-PO Mapping

B.Sc. Semester IV

Course Title: **Bacterial Diversity**

Course Code: **253040401**

CO 1	Explain the phylogeny and general properties of Archaebacteria, including their cell wall, cell membrane, chromosome, and ribosome structures. Describe the salient features of Methanogens, Halophiles, and Thermophilic S0 metabolizers.
CO 2	Identify and differentiate between photosynthetic and chemolithotrophic bacteria, including Oxygenic and Anoxygenic photosynthetic bacteria, and various types of Chemolithotrophic bacteria such as Nitrifying, Colorless Sulphur, Iron, Hydrogen, and Magnetotactic bacteria.
CO 3	Classify Gram-negative spiral and curved rods (Spirocheatales, Spiral bacteria, Curved rods), aerobic rods and cocci (Pseudomonadaceae, Neisseriaceae), and anaerobic and facultative rods and cocci (Enterobacteriaceae, Vibrionaceae, Veillonellaceae), along with obligatory parasites (Rickettsiaceae, Chlamydiaceae, Mollicutes). Analyze their distinguishing features and implications.
CO 4	Characterize Gram-positive rods and cocci, including Micrococcaceae, Deinococcaceae, Streptococcus, Leuconostoc, Peptococcus, endospore formers, and non-spore forming rods. Describe Gram-positive irregular rods, filamentous bacteria with complex morphology, and bacteria with unusual morphology such as prosthecate and nonprosthecate budding/non-budding bacteria.
CO 5	Compare and contrast different types of Gram-positive and Gram-negative bacteria based on their morphological and physiological characteristics. Assess their roles and significance in various environments and processes.
CO 6	Evaluate the diversity and functional roles of various bacterial types in ecological and industrial contexts. Apply knowledge of bacterial classification to analyze their applications and implications in biotechnology and environmental science.

CO-PO Mapping

Course Title: **Food & Dairy Microbiology**

Course Code: **253040402**

CO 1	Identify the microbial flora present in various food sources such as fruits, vegetables, meat, eggs, and milk, and explain how food serves as a substrate for microorganisms.
CO 2	Analyze the intrinsic and extrinsic factors that influence the types and numbers of microorganisms in food.
CO 3	Differentiate between foodborne infections caused by bacteria, viruses, and protozoa, and describe their sources, incubation periods, and clinical characteristics.
CO 4	Examine the role of microorganisms like Staphylococcus aureus, Clostridium botulinum, and Salmonella spp. in food poisoning, and discuss the role of molds in food toxicity, including agents like Aspergillus and *Claviceps purpurea*.
CO 5	Evaluate methods of microbial food spoilage and preservation, including pasteurization, sterilization, refrigeration, and the use of preservatives, assessing their effectiveness in preventing spoilage in various foods.
CO 6	Discuss the role of microbes in the production of fermented foods, probiotics, and prebiotics, and apply microbiological techniques to the examination and analysis of food and milk products, following food safety standards and certification practices in India.

Course Title: **Microbiology Practicals**

Course Code: **253040403**

CO 1	Isolate and identify fungi from environmental and clinical samples using appropriate techniques and demonstrate proficiency in fungal staining methods.
CO 2	Analyze the skin flora by isolating and identifying common microorganisms found on human skin and evaluate their significance in health and disease.
CO 3	Perform cell wall staining procedures to visualize and interpret the structural components of microbial cell walls.
CO 4	Apply acid-fast staining techniques to distinguish acid-fast bacteria from non-acid-fast organisms, and assess their role in microbial identification.
CO 5	Execute the Methylene Blue Reduction Test (MBRT) to determine the microbial quality and spoilage potential of milk samples.
CO 6	Conduct microbiological analysis of food and milk, including quantitative analysis using Standard Plate Count (SPC), and interpret results to assess food safety and quality.

CO 6	High	Medium	Medium	High	Medium	Medium	Low	High	Medium	High

B.Sc. Semester V

Course Title: **Fermentation technology-I**

Course Code: **253040501**

CO 1	Understand the fundamental concepts of fermentation, the historical development of industrial microbiology, and the various components and range of fermentation processes.
CO 2	Describe the characteristics of industrially important microorganisms and apply techniques for primary and secondary screening for organic acid, antibiotic, enzyme, and growth factor producers.
CO 3	Understand the strategies for strain improvement, including the selection of induced mutants and recombinants, and apply preservation techniques and quality control for strain maintenance.
CO 4	Explain the design and functions of a stirred-tank bioreactor, including its structural components, and describe devices used for aeration, agitation, and monitoring of pH, temperature, foam, and dissolved oxygen.
CO 5	Differentiate between types of fermentation processes, including submerged (batch, fed-batch, continuous) and solid-state fermentation.
CO 6	Understand the principles of fermentation media formulation, including the role of media ingredients, and explain the methods of sterilization and the principles for developing inoculum for bacterial, yeast, and fungal processes.

Course Title: **BACTERIAL METABOLISM**

Course Code: **253040502**

CO 1	Explain enzyme kinetics by applying the Michaelis-Menten equation and analyze the significance of the Lineweaver-Burk plot in determining enzyme activity parameters.
CO 2	Evaluate the types and significance of metabolic regulation, and assess the various modes of ATP generation in biological systems.
CO 3	Demonstrate the catabolism of glucose, fatty acids, and proteins, and explain the steps of the TCA cycle and its role in energy production.
CO 4	Differentiate between chemoheterotrophic, chemoautotrophic, and phototrophic metabolism, and illustrate the process of cyclic and non-cyclic photophosphorylation in ATP generation.
CO 5	Describe the Calvin-Benson cycle for CO2 fixation and explain how chemoautotrophs generate ATP and reducing power.
CO 6	Summarize the principles governing biosynthesis, and analyze the pathways involved in the biosynthesis of fatty acids, phospholipids, and the assimilation of nitrogen and sulfur compounds.

Course Title: **Enzymology**

Course Code: **253040503**

CO 1	Explain the general characteristics, classification, and terminology related to enzymes, including holoenzymes, coenzymes, apoenzymes, and inhibitors, and differentiate between first-order and zero-order reactions.
CO 2	Describe the structure and specificity of enzyme active sites, and analyze the factors affecting enzyme activity, including turnover number, specific activity, and allosteric regulation.
CO 3	Apply the Michaelis-Menten equation and its modifications (Lineweaver-Burk, Eadie-Hofstee, and Hanes-Woolf plots) to enzyme kinetics, and distinguish between types of enzyme inhibition (competitive, non-competitive, uncompetitive, mixed, and substrate inhibition).
CO 4	Evaluate different methods of enzyme immobilization, and assess their applications, advantages, and limitations in industrial and biochemical processes, including reverse micelles and whole-cell immobilization.
CO 5	Identify the industrial applications of key enzymes such as amylase, protease, and lipase in various sectors (detergent, leather, food, dairy, textile, and medical), and explain their roles in these industries.
CO 6	Demonstrate the methods for industrial production of enzymes and examine the relevance of enzyme sources in large-scale industrial applications.

Course Title: **BIOSAFETY, BIOETHICS & IPR**

Course Code: **253040504**

CO 1	Understand the fundamental concepts of biosafety, including standard laboratory practices, containment strategies, biosafety levels, biosafety guidelines in India, laboratory biosecurity, and risk assessment.
CO 2	Explain the principles of Good Laboratory Practices (GLP), Good Manufacturing Practices (GMP), and the basic concepts of Quality Control (QC) and Quality Assurance (QA), including guidelines for raw materials, sterilization, media, and product validation.
CO 3	Understand the role of culture collection centers, public health laboratories, and regulatory agencies in ensuring quality and safety in biological practices.
CO 4	Comprehend the basics and principles of bioethics, regulatory concerns, international codes and guidelines in India, and the role of non-governmental organizations (NGOs) in biological regulations.
CO 5	Understand the different types of intellectual property rights (IPR) and their management, including the benefits and challenges associated with IPR in biotechnology.
CO 6	Explain the patenting process, international harmonization of patent law, biotechnological process patents, and their protection, with a focus on the Indian scenario and case studies related to infringement.

Course Title: **Microbiology Practicals**

Course Code: **253040505**

CO 1	Demonstrate the process of alcohol production using baker's yeast and perform alcohol estimation through microbial fermentation techniques.
CO 2	Perform primary screening techniques for the identification of microbial producers of amylase, antibiotics, and organic acids, and evaluate their potential for industrial applications.
CO 3	Explain the structure and functionality of bioinformatics databases such as NCBI, DDBJ, and GenBank, and apply these tools for biological data retrieval and analysis.
CO 4	Conduct enzyme immobilization experiments and analyze the factors affecting enzyme activity, including temperature, pH, and substrate concentration, to determine optimal conditions for enzymatic reactions.
CO 5	Investigate the effect of temperature and pH on bacterial growth, and apply these concepts in microbial growth regulation for biotechnological processes.
CO 6	Evaluate the procedures for sterility testing in pharmaceutical products, and analyze case studies of patent law, including patent infringement and its implications in biotechnology.

B.Sc. Semester VI

Course Title: **Fermentation Technology-II**

Course Code: **253040601**

CO 1	Understand the principles of downstream processing, including methods for the removal of microbial cells and suspended solids such as foam separation, precipitation, filtration, and centrifugation, as well as cell disruption techniques.
CO 2	Explain the processes involved in product concentration, purification, and finishing stages like liquid-liquid extraction, membrane processes, drying, crystallization, and effluent treatment.
CO 3	Understand the methods for detecting and assaying fermentation products, including physical assays (titration, gravimetric analysis), chemical assays (chromatography, spectrophotometry), and biological assays (microbial assays).
CO 4	Explain the microbial quality assurance methods used in fermentation, including sterility testing, the Limulus Amebocyte Lysate (LAL) test, and fermentation economics.
CO 5	Understand the fermentation processes involved in the production of industrial products such as alcohol, cheese, baker's yeast, glutamic acid, and citric acid.
CO 6	Explain the fermentative production of pharmaceuticals and industrial enzymes, including penicillin (and its conversion to semisynthetic derivatives), cyanocobalamin, steroids, amylase, and carotenoids.

CO-PO Mapping

Course Title: **MEDICAL MICROBIOLOGY**

Course Code: **253040602**

CO 1	Describe the normal microflora of the human body, nosocomial infections, and the role of carriers, pathogenicity, and virulence factors in disease, and explain the concept of septicemia, septic shock, and biosafety levels in microbiological practices.
CO 2	Identify the morphology, pathogenesis, symptoms, and laboratory diagnosis of infections caused by gram-positive bacteria (e.g., S. aureus, S. pyogenes, B. anthracis, C. perfringens, C. tetani), and evaluate preventive measures and chemotherapy options for treatment.
CO 3	Explain the principles of bioethics and biosafety guidelines related to contamination, decontamination, disposal, and safety from infectious sources in clinical and laboratory settings.
CO 4	Analyze the morphology, pathogenesis, symptoms, and laboratory diagnosis of diseases caused by gram-negative bacteria (e.g., E. coli, N. gonorrhoeae, N. meningitidis, P. aeruginosa, S. typhi, S. dysenteriae, Y. pestis, B. abortus, H. influenzae, V. cholera), and propose effective preventive measures and chemotherapy treatments.
CO 5	Understand the properties of antigens and antibodies, including antigen processing, presentation, antigenicity, and recognition by MHC molecules, and apply knowledge of monoclonal antibodies and their clinical applications.
CO 6	Classify and explain the bacterial diseases affecting different systems of the body, such as the skin, eyes, digestive system, nervous system, and respiratory tract, and describe their respective diagnostic and treatment protocols.

Course Title: **IMMUNOLOGY-II**

Course Code: **253040603**

CO 1	Explain the key components of the innate immune system, including phagocytosis, the complement system, inflammation, cytokines, and acute phase proteins, and describe the cells, tissues, and organs involved in immune defense.
CO 2	Understand the role of antigens, haptens, and cluster of differentiation (CD) molecules in immune recognition and distinguish between humoral and cell-mediated immunity.
CO 3	Analyze the biology of T cells, including T cell receptors, types of T cells, and T cell activation, and evaluate their role in immune responses.
CO 4	Describe the structure, function, and classes of immunoglobulins (antibodies), and demonstrate the mechanisms and measurement of antigen-antibody reactions, including precipitation and agglutination tests.
CO 5	Understand immune disorders such as immunodeficiency, hypersensitivity, and autoimmune diseases, and analyze their mechanisms and clinical implications.
CO 6	Explain the immunological aspects of transplantation, including the classification of transplants, allograft rejection, graft survival, and the immunological responses to malignancy and graft-versus-host reactions.

Course Title: **Environmental Microbiology**

Course Code: **253040604**

CO 1	Explain the processes of symbiotic and asymbiotic nitrogen fixation, describe the structure and mechanism of nitrogenase, and understand the role of biofertilizers, including Azotobacter and Rhizobia, in agricultural practices.
CO 2	Describe the concept of biodeterioration, including the degradation of wood, paint, and metal, and explain the principles and applications of bioremediation, focusing on the treatment of petroleum hydrocarbons, chlorinated compounds, and microbial enhanced oil recovery.
CO 3	Understand the concept of xenobiotics and recalcitrance, analyze biomagnification, and evaluate the biodegradation of environmental pollutants such as ABS, chlorinated hydrocarbons, oil pollutants, and biodegradable polymers.
CO 4	Explain the importance of biofuels as renewable energy resources, describe various types of biofuels including biogas, hydrogen, and alcohol, and evaluate the advantages and disadvantages of biogas production, including its substrates and microorganisms.
CO 5	Understand the role of microbial insecticides in agriculture and pest control, analyze their mechanisms, and evaluate their effectiveness in reducing pest populations.
CO 6	Describe the general principles of bioremediation, demonstrate methods for the remediation of specific pollutants, and evaluate the effectiveness of bioremediation strategies in environmental clean-up.

Course Title: **Microbiology Practicals**

Course Code: **253040605**

CO 1	Demonstrate key laboratory techniques such as ammonium sulfate precipitation, Widal test, and RPR test for diagnostic and analytical purposes.
CO 2	Analyze sterility testing in pharmaceutical products and interpret results to ensure compliance with safety standards.
CO 3	Understand the microbial processes involved in the production of food products like cheese and sauerkraut, and their industrial significance.
CO 4	Perform agarose gel electrophoresis and evaluate nucleic acid separation techniques based on molecular weight.
CO 5	Isolate industrially important microorganisms like Bacillus thuringiensis from soil and assess their potential applications.
CO 6	Investigate microbial biodegradation, including dye decolorization and biodeterioration, and apply findings to environmental issues.

Department of Physics

B.Sc. Semester I

Course Title: **Basic Physics-I**
Course Code: **253050101**

CO 1	Analyze wave propagation in various media
CO 2	Perform vector algebra and analysis operations.
CO 3	Study optical phenomena using Fermat's principle and thin film interference.
CO 4	Evaluate ultrasonic wave generation, detection, and applications.
CO 5	Apply matrix methods to optics problems.
CO 6	Explain laser principles and their applications.

Course Title: **Physics Practicals**

Course Code: **253050102**

CO 1	Perform experimental procedures to measure and analyze physical quantities such aswavelength, capacitance, and inductance.
CO 2	Apply theoretical principles to verify experimental relationships and constants, such as P/Land T/l², in various practical setups.
CO 3	Utilize resonance and rectification techniques to determine frequencies, efficiencies, andload characteristics in electrical circuits.
CO 4	Conduct experiments to understand the behavior of materials under stress, including measuring Young's Modulus and analyzing transformer performance.
CO 5	Demonstrate proficiency in digital electronics by constructing and testing logic gates andinterpreting their truth tables and voltage levels.
CO 6	Analyze and determine the efficiency of solar cells and other electronic componentsthrough practical experiments and data analysis.

CO-PO Mapping

B.Sc. Semester II

Course Title: **Basic Physics-II**
Course Code: **253050201**

CO 1	Analyze and determine the electrostatic potential and field due to various charge distributions, including spherical shells and rings.
CO 2	Apply Gauss's law, Poisson's and Laplace's equations to solve electrostatic field and potential problems.
CO 3	Evaluate diode circuits, including rectifiers and filter circuits, using load line analysis and performance metrics.
CO 4	Understand and describe the characteristics, behaviors, and diagnostic methods of plasmas, including their applications and instabilities.
CO 5	Solve problems involving RL, RC, and L-C-R circuits in both DC and AC conditions, including bridge circuits.
CO 6	Apply radioactive decay laws and dating techniques to determine age, equilibrium states, and the characteristics of radioactive materials.

Course Title: **Physics Practicals**
Course Code: **253050202**

CO 1	Perform experimental procedures to measure and analyze physical quantities such as wavelength, capacitance, and inductance.
CO 2	Apply theoretical principles to verify experimental relationships and constants, such as P/L and T/l^2, in various practical setups.
CO 3	Utilize resonance and rectification techniques to determine frequencies, efficiencies, and load characteristics in electrical circuits.
CO 4	Conduct experiments to understand the behavior of materials under stress, including measuring Young's Modulus and analyzing transformer performance.
CO 5	Demonstrate proficiency in digital electronics by constructing and testing logic gates and interpreting their truth tables and voltage levels.
CO 6	Analyze and determine the efficiency of solar cells and other electronic components through practical experiments and data analysis.

CO-PO Mapping

B.Sc. Semester III

Course Title: **Physics-301**
Course Code:**253050301**

CO 1	Recall the fundamental characteristics of transistors and semiconductor devices.
CO 2	Explain the underlying principles of transistor operation and quantum mechanics concepts.
CO 3	Apply transistor principles to design basic amplifier circuits and voltage regulator circuits.
CO 4	Analyze the performance characteristics of transistor amplifiers and voltage regulator circuits under different conditions.
CO 5	Critically evaluate the limitations of classical models and assess the suitability of different semiconductor devices for specific applications.
CO 6	Design innovative transistor amplifier configurations and propose experimental setups to explore advanced topics in wave optics.

Course Title: **Physics-302**
Course Code: **253050302**

CO 1	Recall the fundamental concepts of dielectrics, including polarization and types of dielectric materials.
CO 2	Explain the laws of electrostatics in the presence of dielectrics and analyze the behavior of electric fields and energies.
CO 3	Apply the principles of magnetostatics to analyze the behavior of magnetic fields in different materials and media.
CO 4	Analyze the motion of particles in central force fields and collisions, including elastic and inelastic scattering phenomena.
CO 5	Evaluate the effectiveness of different nuclear particle detectors and particle accelerators in experimental setups.
CO 6	Design experimental setups utilizing nuclear magnetic resonance (NMR) techniques and propose experiments to explore various nuclear physics phenomena.

Course Title: **Physics Practicals**
Course Code: **253050303**

CO 1	Recall the fundamental principles and techniques involved in experimental methods such as Koening's method, Newton's ring, Hartmann formula, and Desauty's method.
CO 2	Understand the concepts behind resolving power, figure of merit, absorption coefficient, electron diffraction, resonance, and Fourier analysis as applied in experimental setups.
CO 3	Apply numerical methods to analyze oscillatory motion and determine parameters such as C1/C2 for electrical circuits and h-parameters for transistor configurations.
CO 4	Analyze the performance characteristics of devices and systems, such as telescope resolving power, load line determination for BJTs, and resonance in pendulum experiments.
CO 5	Evaluate the effectiveness of different experimental techniques and methods in achieving desired outcomes, such as the use of Zener diodes as voltage regulators or liquid lenses in optical systems.
CO 6	Design and conduct experiments utilizing various techniques learned in the course, and propose innovative applications or modifications to existing setups to achieve specific experimental goals.

B.Sc. Semester IV

Course Title: **Physics-401**
Course Code: **253050401**

CO 1	Explain lattice vibrations and phonon quantization in solids.
CO 2	Apply classical and quantum theories to analyze thermal properties of solids.
CO 3	Analyze entropy and thermodynamic principles in pure substances.
CO 4	Evaluate transistor biasing techniques and their impact on circuit stability.
CO 5	Convert and compare different number systems used in digital electronics.
CO 6	Analyze atomic spectra and explain phenomena like Zeeman and Stark effects.

Course Title: **Physics-402**
Course Code: **253050402**

CO 1	Calculate reverberation time and analyze acoustics in architectural spaces.
CO 2	Explain the principles of polarization, double refraction, and analyze polarized light.
CO 3	Analyze macroscopic and microscopic states, and apply principles of statistical mechanics.
CO 4	Apply the special theory of relativity to explain relativistic phenomena like time dilation and mass-energy equivalence.
CO 5	Solve the Schrödinger equation for various potential systems and interpret wave functions.
CO 6	Explain the general formalism of wave mechanics, including eigenvalues, eigenfunctions, and the uncertainty principle.

Course Title: **Physics Practicals**
Course Code: **253050403**

CO 1	Apply Searl's goniometer to measure angles and analyze the properties of crystals.
CO 2	Evaluate the resolving power of telescopes using optical principles.
CO 3	Analyze diffraction patterns and determine the wavelength of light using different methods.
CO 4	Measure and analyze phonon dispersion in a monoatomic lattice.
CO 5	Study and interpret FET characteristics and their applications in circuits.
CO 6	Apply Thevenin's theorem to verify the maximum power transfer in electrical circuits.

B.Sc. Semester V

Course Title: **Mathematical Physics, Quantum & Classical Mechanics-1**
Course Code: **253050501**

CO 1	Apply the method of separation of variables to solve partial differential equations in various coordinate systems.
CO 2	Analyze and solve second-order differential equations using series solutions and the Frobenius method.
CO 3	Formulate and solve problems in classical mechanics using Lagrangian methods and conservation laws.
CO 4	Explain and apply the principles of rigid body motion, including Euler's equations and nutational motion.
CO 5	Solve quantum mechanical problems using exactly soluble eigenvalue methods, including the harmonic oscillator.
CO 6	Analyze angular momentum in quantum systems with spherical symmetry and interpret spherical harmonics.

Course Title: **Electronic Spectra-1, Solid State Physics & Stat. Mech-1**
Course Code: **253050502**

CO 1	Apply the Born-Oppenheimer approximation to explain molecular energy states and types of molecular spectra.
CO 2	Analyze the characteristics of rotational and vibrational-rotational spectra and their experimental setups.
CO 3	Explain the Raman effect using classical and quantum theories and compare it with infrared spectra.
CO 4	Evaluate the mechanisms of fluorescence and phosphorescence, distinguishing them from Raman spectra.
CO 5	Formulate and apply quantum statistics to Bose-Einstein and Fermi-Dirac distributions, including partition functions.
CO 6	Analyze the properties of free electron Fermi gas and the electrical and thermal conductivity in metals.

Course Title: **Nuclear physics-1 & Electrodynamics-1**
Course Code: **253050503**

CO 1	Explain the concepts of hysteresis and Maxwell's equations in electromagnetic induction.
CO 2	Analyze the propagation of electromagnetic waves in different media and evaluate the effects of polarization and skin effect.
CO 3	Apply the principles of electromagnetic radiation to determine the fields and potentials of moving charges.
CO 4	Explain the mechanisms of alpha and beta decay, including the Pauli's neutrino hypothesis and Fermi's theory.
CO 5	Evaluate the energy levels and decay processes in gamma-ray emission and internal conversion.
CO 6	Analyze the liquid drop model of the nucleus and its application to nuclear stability and decay processes.

Course Title: **Linear Electronic Circuits-1**
Course Code: **253050504**

CO 1	Explain the fundamental concepts and characteristics of amplifiers, including gain, efficiency, and distortion.
CO 2	Analyze the frequency response of transistor amplifiers at both low and high frequencies, including the impact of various circuit components.
CO 3	Design and simplify digital circuits using Boolean algebra, Karnaugh maps, and understand the working principles of different flip-flops.
CO 4	Apply network theorems, including Thevenin's and Norton's theorems, to simplify and solve complex electrical networks.
CO 5	Evaluate the performance of resonant circuits by calculating Q factor, bandwidth, and analyzing resonance behavior in series and parallel circuits.
CO 6	Design transistor amplifier circuits and evaluate their performance through the analysisof harmonic distortion and frequency response.

Course Title: **Physics Practicals**
Course Code: **253050505**

CO 1	Demonstrate the ability to measure physical quantities such as gravity, temperature, and electrical properties using standard experimental techniques.
CO 2	Analyze experimental data to determine physical constants and properties, such as melting point, dielectric constant, and viscosity.
CO 3	Use various instruments and techniques to investigate and characterize properties of materials and electronic components.
CO 4	Evaluate the performance of electronic circuits and devices by measuring their characteristics and responses.
CO 5	Interpret experimental results to understand fundamental principles in physics, such as interference, resonance, and electromagnetic effects.
CO 6	Develop skills in using and calibrating scientific instruments for precise measurementand analysis in laboratory experiments.

B.Sc. Semester VI

Course Title: **Mathematical Physics, Quantum & Classical Mechanics-2**
Course Code: **253050601**

CO 1	Apply special functions (e.g., Bessel, Legendre, Hermite) to solve physical problems in various contexts.
CO 2	Analyze and utilize the variational principle and Lagrangian/Hamiltonian formulations in classical mechanics.
CO 3	Solve and interpret quantum mechanical problems using the three-dimensional square well potential model.
CO 4	Demonstrate an understanding of quantum states, representations, and symmetries in the context of quantum mechanics.
CO 5	Derive and apply solutions for special functions relevant to different physical systems and boundary conditions.
CO 6	Evaluate the impact of symmetries and transformations on physical systems and their conservation laws.

Course Title: **Electronic Spectra-2, Solid State Physics & Stat. Mech-2**
Course Code: **253050602**

CO 1	Analyze the formation and features of electronic spectra, including vibrational and rotational structures.
CO 2	Apply the Franck-Condon principle to explain intensity distributions in electronic band spectra for absorption and emission.
CO 3	Evaluate transport phenomena by analyzing mean collision time, scattering cross-section, and various transport properties.
CO 4	Describe and apply theories of dielectric polarization, including ionic, dipole, and optical polarizations.
CO 5	Analyze diamagnetism and paramagnetism theories, including Langevin's theory and quantum mechanical formulations.
CO 6	Explain the quantum mechanical aspects of magnetic susceptibility and its applications in materials and resonance phenomena.

Course Title: **Nuclear physics-2 & Electrodynamics-2**

Course Code: **253050603**

CO 1	Analyze the motion of charged particles in uniform and varying magnetic and electric fields, including drift and gyro relaxation effects.
CO 2	Evaluate the characteristics of plasma in a magnetic field, including the effects of diffusion, oscillations, and waves.
CO 3	Describe the processes involved in neutron-induced fission and the energy release in nuclear reactors.
CO 4	Apply the Boltzmann-Vlasov equation to analyze plasma behavior, including Debye screening and Landau damping.
CO 5	Explain the Mossbauer effect and its applications, as well as the principles of natural and controlled nuclear fusion.
CO 6	Analyze the properties of elementary particles, including their interactions, conservation laws, and the quark model.

Course Title: **Linear Electronic Circuits-2**
Course Code: **253050604**

CO 1	Analyze the effects of negative feedback on transistor amplifier performance and describe various types of feedback circuits.
CO 2	Explain the principles and characteristics of Field Effect Transistors (FETs), including their operation and application in amplifiers.
CO 3	Design and implement arithmetic circuits for binary operations, including addition, subtraction, multiplication, and division.
CO 4	Evaluate the performance and limitations of different voltage regulation techniques in regulated power supplies.
CO 5	Describe the construction, operation, and applications of electronic instruments such as the Cathode Ray Oscilloscope (CRO).
CO 6	Analyze the functionality and design considerations of various transistor oscillators and their feedback mechanisms.

Course Title: **Physics Practicals**
Course Code: **253050605**

CO 1	Perform experiments to measure physical constants such as acceleration due to gravity and permeability of free space using various methods.
CO 2	Analyze electronic circuit behavior and component characteristics, including power transistors and operational amplifiers.
CO 3	Investigate the physical properties and applications of materials such as rubber tubing and ferromagnetic substances.
CO 4	Utilize optical instruments and techniques to calibrate spectrometers, determine interference patterns, and study absorption spectra.
CO 5	Execute and analyze experiments to determine fundamental quantities such as the charge on an electron and the dead time of a Geiger-Muller tube.
CO 6	Design and test various electronic circuits, including digital arithmetic units, multiplexers, and feedback amplifiers using operational amplifiers and transistors.

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Course Outcome for M.Sc. Courses

Department of Biotechnology
M.Sc. Semester I
Course Title: Gene Structure and Function
Course Code: 256010101

CO 1	Understand the chemistry, structure, and forces stabilizing DNA, including Watson-Crick and Hoogsteen base pairing, and analyze the physical properties of dsDNA.
CO 2	Explain DNA topology, supercoiling, and the role of DNA topoisomerases in regulating DNA structure and gene expression in both prokaryotes and eukaryotes.
CO 3	Explore DNA-protein interactions, focusing on helix-turn-helix, B-sheet, and zinc finger motifs, and their roles in regulating genetic processes.
CO 4	Analyze the organization and packaging of DNA into chromosomes in prokaryotes and eukaryotes, including nucleosome assembly and chromatin modification.
CO 5	Describe the mechanisms of DNA replication, including the role of DNA polymerases, replisome assembly, telomerase function, and inhibitors of DNA replication.
CO 6	Evaluate the processes of transcription, translation, and gene regulation in prokaryotes and eukaryotes, focusing on operon models and posttranslational modifications.

Course Title: Bioinstrumentation
Course Code: 256010102

CO 1	Understand the principles of electrochemistry, including pH, buffers, potentiometric and conductometric titrations, and their applications in biological systems.
CO 2	Explore the principles and applications of various microscopy techniques, such as light, electron, and fluorescence microscopy, along with sample preparation methods.
CO 3	Analyze the methodologies and applications of chromatography techniques, including gel-filtration, ion-exchange, affinity, thin layer, gas, and HPLC chromatography.
CO 4	Explain the principles and applications of electrophoresis techniques such as Native and SDS PAGE, agarose, and 2D gel electrophoresis for biomolecule separation.
CO 5	Evaluate the principles and applications of spectroscopy techniques (UV, IR, NMR, ESR) and their relevance in studying biomolecular structures and functions.
CO 6	Apply the principles of centrifugation, radioactive isotope techniques, and biosensors in biological research and biopolymer analysis, with emphasis on radiation dosimetry and tracer methods.

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Course Title: Microbial Diversity
Course Code: 256010103

CO 1	Understand the principles and concepts of microbial diversity, including both culturable and non-culturable microbes, and the methodologies to study them.
CO 2	Explore the principles of metagenomics and its role in understanding microbial diversity, as well as strategies for the conservation of microbial diversity.
CO 3	Analyze the metabolic diversity in bacteria and the systematics of various bacterial groups, with an emphasis on molecular and conventional approaches.
CO 4	Examine the diversity of actinomycetes, cyanobacteria, and fungi, focusing on their classification, reproduction, and ecological significance.
CO 5	Evaluate the systematics, occurrence, and adaptive features of different groups of archaea (Halophiles, Thermophiles, Alkalophiles, Acidophiles) and their applications.
CO 6	Assess the industrial and ecological roles of yeast, molds, and mycorrhizal fungi, including their economic importance and contribution to various ecosystems.

Course Title: Biogeohydrotechnology and Biofuels
Course Code: 256010104

CO 1	Understand the classification and characterization of different types of waste and the principles and mechanisms involved in waste treatment.
CO 2	Analyze biological methods for treating liquid and solid waste, focusing on the principles and applications of these methods in waste management.
CO 3	Explore the marine environment, including bacterial diversity, and the cultivation and enumeration of marine bacteria for various applications.
CO 4	Apply indicators for marine microbial enzymes, polysaccharides, antimicrobial peptides, and carotenoids to assess their potential uses in marine biotechnology.
CO 5	Examine the processes of bioleaching, bio-oxidation, and biogeohydrotechnology for handling sulphidic minerals, including methods and factors affecting these processes.
CO 6	Evaluate fuel biotechnology concepts including types of energy resources, production of biofuels (biogas, bioethanol, biodiesel, bio-hydrogen), and their desirable and undesirable features, energy crops, and microbial enhanced oil recovery (MEOR).

Course Title: Biotechnology Practicals
Course Code: 256010105

CO 1	**Manipulate** basic laboratory instruments and **perform** sterilization and decontamination of lab equipment and media with precision and adherence to safety protocols.
CO 2	**Execute** Gram staining procedures for bacterial identification and **apply** the Folin Lowry method for protein estimation, demonstrating accurate technique.
CO 3	**Carry out** carbohydrate quantification using the Coles method and **conduct** DNA quantification using the DPA method, ensuring careful sample handling and measurement.
CO 4	**Operate** Agarose Gel Electrophoresis for DNA analysis and **isolate** Actinomycetes and fungi from samples using appropriate culturing techniques.
CO 5	**Cultivate** yeast cultures and **demonstrate** the process of column chromatography packing, ensuring the correct setup for effective separation.
CO 6	**Assess** the physical characteristics of wastewater, **measure** phosphate levels, and **isolate** antibiotic-resistant mutants using the replica plate technique, applying experimental accuracy and precision.

M.Sc. Semester II

Course Title: Microbial Genetics
Course Code: 256010201

CO 1	Explain the types, mechanisms, and repair pathways of mutations, including spontaneous mutations, DNA damage, and repair systems.
CO 2	Describe plasmid biology, including types, replication, control of copy number, and plasmid segregation.
CO 3	Discuss the principles of recombination, including homologous and site-specific recombination, and their biological roles.
CO 4	Analyze bacterial conjugation, focusing on processes involving the F-factor, Hfr conjugation, and plasmid-based conjugation.
CO 5	Understand Agrobacterium genetics, including Ti-plasmid function and interkingdom gene transfer mechanisms.
CO 6	Explore transformation and transduction mechanisms in bacteria and viruses, including applications and measurement techniques.

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Course Title: Immunology
Course Code: 256010202

CO 1	Understand the principles of innate and adaptive immunity, including inflammation, roles of cells, receptors, and proteins.
CO 2	Describe the cells and organs of the immune system, including hematopoiesis and the function of primary and secondary lymphoid organs.
CO 3	Explain the properties of antigens and antibodies, including their structure, classes, biological activities, and antibody diversity.
CO 4	Analyze antigen-antibody interactions and the complement system, including its components, activation, regulation, and related diseases.
CO 5	Discuss the Major Histocompatibility Complex (MHC) and its role in antigen presentation, including MHC organization, antigen processing, and disease susceptibility.
CO 6	Explore T-cell and B-cell maturation, activation, differentiation, cytokines, and the mechanisms of cell-mediated cytotoxicity, hypersensitivity, and immune tolerance.

Course Title: Bioprocess Technology
Course Code: 256010203

CO 1	Understand the principles of isolation, preservation, and improvement of industrially important microorganisms.
CO 2	Describe substrates for fermentation processes and methods for medium optimization.
CO 3	Explain bioreactor design, including laboratory, pilot, and large-scale reactors, as well as sterilization of media and air.
CO 4	Discuss mass transfer of oxygen in bioprocesses, including agitation, aeration, determination of KLa, and factors affecting it.
CO 5	Analyze bioprocess kinetics, focusing on growth and substrate utilization in batch, fed-batch, and continuous systems.
CO 6	Explore the control of process parameters, including instrumentation, sensors, controllers, fermentation control systems, and dynamic modeling of fermentation processes.

Course Title: Tools and techniques in synthetic microbiology
Course Code: 256010204

CO 1	Understand the principles of light microscopy, including optical corrections, types of objectives, oculars, and illumination methods.
CO 2	Differentiate between types of light microscopes (bright field, dark field, fluorescence, phase contrast, polarizing, differential interference contrast) and understand micrometry.
CO 3	Describe the basic components of electron microscopes, including thermionic and field emission electron guns, and differentiate between TEM, SEM, STEM, ESEM, and HVEM.
CO 4	Explain fixation and storage techniques, including classification of fixatives, procedures, and factors affecting fixation for plant, animal, and microbial samples.
CO 5	Demonstrate preparation techniques for biological samples for light and electron microscopy, including sectioning, staining, and photomicrography.
CO 6	Apply histochemical and cytochemical techniques to localize metabolites, enzymes, and ultra-structural components in biological samples, including immunocytochemistry.

Course Title: Biotechnology Practical
Course Code: 256010205

CO 1	Perform cell wall and spirochete staining techniques with precision, and isolate and identify fungi and soil bacteria (actinomycetes).
CO 2	Skillfully conduct endospore staining and primary screening for amylase producers, and apply the encapsulation technique for yeast cell immobilization.
CO 3	Proficiently carry out fermentation processes for alcohol and amylase production, and determine amylase activity and ethanol concentration in samples.
CO 4	Demonstrate techniques such as agglutination, paper chromatography, and the serodiagnosis of diseases like syphilis (RPR test) and enteric fever (Widal test).
CO 5	Develop expertise in enzyme immobilization, sauerkraut production, double immunodiffusion (ring test), and studying the biodeterioration of given samples.
CO 6	Execute advanced laboratory techniques such as HPLC, gas chromatography, and agarose gel electrophoresis with accuracy and precision.

M.Sc. Semester III

Course Title: Microbial Biotechnology

Course Code: 256010301

CO 1	Understand the microbial production processes for primary metabolites such as amino acids (glutamic acid, lysine), enzymes (proteases, amylases), organic acids (citric acid, acetic acid), and industrial alcohol.
CO 2	Explain the production methods and applications of secondary metabolites, including antibiotics (penicillin, streptomycin), vitamins (B12, B2), ergot alkaloids, and carotenoid pigments (β-carotene, lycopene).
CO 3	Describe microbial production techniques for other products and biotransformation, including microbial polysaccharides (xanthan, alginate, dextran), beverages (beer, wine), polyhydroxyalkanoates (PHA, PHB), biosurfactants, and steroid transformation.
CO 4	Analyze the methods and applications of fungal biomass production, including baker's yeast and single cell oil, and evaluate their industrial uses.
CO 5	Discuss mushroom cultivation techniques and the use of algal biomass, including their applications in various industries.
CO 6	Identify the microbial production techniques for food and feed, emphasizing their benefits and challenges in industrial settings.

Course Title: ENZYMOLOGY

Course Code: 256010302

CO 1	Understand the historical developments in enzymology, protein structure (primary, secondary, tertiary, and quaternary), and the techniques used in enzyme characterization.
CO 2	Explain enzyme classification according to the IUB system, and describe the principles and techniques of enzymatic analysis, including factors affecting enzyme activity, extraction, and purification strategies.
CO 3	Analyze enzyme kinetics, including single substrate kinetics (equilibrium and steady-state kinetics, Km, Vmax, Kcat), multisubstrate kinetics (general rate equations, mechanisms), and thermal kinetics (temperature effects, Arrhenius equation).
CO 4	Discuss enzyme inhibition and its kinetics, covering reversible and irreversible inhibition, competitive, noncompetitive, uncompetitive, mixed, partial, substrate, and allosteric inhibition.
CO 5	Describe the mechanisms of enzyme action, including enzyme activators, coenzymes, cofactors, specificity, and experimental approaches to determining enzyme mechanisms. Analyze specific enzyme mechanisms and allosteric regulation.
CO 6	Explore enzyme engineering techniques, including chemical modification of enzymes, enzyme immobilization, the use of enzymes in non-conventional media, enzyme sensors, and their applications as analytical reagents.

Course Title: r-DNA technology
Course Code: 256010303

CO 1	Understand the concept and importance of genetic engineering, including general strategies, steps involved in gene cloning, and the extraction and purification of DNA from bacterial, plant, and animal cells.
CO 2	Describe the roles of restriction enzymes, DNA ligase, and other enzymes in gene cloning, and explain the processes of mRNA and cDNA preparation.
CO 3	Explain the chemical synthesis of genes and DNA cloning and expression vectors, including plasmids, bacteriophages, phagemids, cosmids, YACs, BACs, and MACs, and the expression of cloned genes in heterologous hosts.
CO 4	Outline the techniques for recombinant selection and screening, including Southern blotting, Northern analysis, Western blotting, various electrophoresis methods, and protein activity assays (e.g., yeast-one hybrid, yeast-two hybrid).
CO 5	Discuss advanced methods for gene characterization and mapping, such as restriction mapping, DNA sequencing, nucleic acid microarrays, metagenomics, and gene therapy, as well as molecular markers and genomic mapping techniques.
CO 6	Analyze recombinant products, including recombinant hormones, DNA vaccines, transgenic plants and animals, and understand the guidelines for genetic engineering, including physical and biological containment levels and Indian guidelines.

Course Title: Animal Tissue Culture and Pharmaceutical Biotechnology
Course Code: 256010304

CO 1	Understand the principles of animal tissue culture, including primary culture and established cell line cultures, equipment and material for cell technology, basic media and techniques, and manipulation and application of animal cell culture.
CO 2	Analyze bioprocess economics, including expenses for industrial materials, equipment, product recovery, effluent treatments, cost recovery from waste usage and recycling, and the principles of IPR and patent processes.
CO 3	Describe the benefits, problems, and management of IPR, international harmonization of patent law, and the protection of biotechnological processes, with a focus on the Indian scenario.
CO 4	Explain regulatory affairs related to pharmacopoeia, good microbiological techniques, good laboratory practice (GLP), quality control (QA) and quality assurance (QC), validation studies, and the roles of culture collection centres and regulatory agencies.
CO 5	Discuss biosafety and bioethics, including biosafety guidelines, risk assessment, biosafety levels, laboratory biosecurity concepts, drug design, pre-clinical and clinical trials, and bioethics principles, including international codes and guidelines in India.
CO 6	Evaluate the ethical considerations and guidelines in the post-genomic era, and understand the implications for biosafety and bioethics in modern research and applications.

Course Title: Biotechnology Practicals
Course Code: 256010305

CO 1	Understand the principles of animal tissue culture, including primary culture and established cell line cultures, equipment and material for cell technology, basic media and techniques, and manipulation and application of animal cell culture.
CO 2	Analyze bioprocess economics, including expenses for industrial materials, equipment, product recovery, effluent treatments, cost recovery from waste usage and recycling, and the principles of IPR and patent processes.
CO 3	Describe the benefits, problems, and management of IPR, international harmonization of patent law, and the protection of biotechnological processes, with a focus on the Indian scenario.
CO 4	Explain regulatory affairs related to pharmacopoeia, good microbiological techniques, good laboratory practice (GLP), quality control (QA) and quality assurance (QC), validation studies, and the roles of culture collection centres and regulatory agencies.
CO 5	Discuss biosafety and bioethics, including biosafety guidelines, risk assessment, biosafety levels, laboratory biosecurity concepts, drug design, pre-clinical and clinical trials, and bioethics principles, including international codes and guidelines in India.
CO 6	Evaluate the ethical considerations and guidelines in the post-genomic era, and understand the implications for biosafety and bioethics in modern research and applications.

M.Sc. Semester IV
Course Title: Plant Biotechnology
Course Code: 256010401

CO 1	Understand the principles and techniques of cell and tissue culture in plants, including callus cultures, in-vitro morphogenesis, organogenesis, embryogenesis, artificial seeds, micropropagation, and haploidy.
CO 2	Describe the methods for protoplast isolation, culture, fusion, somatic hybridization, and cybrids, and explain somaclonal variation, in-vitro mutation methods, virus elimination, pathogen indexing, and cryopreservation.
CO 3	Analyze the production of secondary metabolites in plants, including sources, criteria for cell selection, factors affecting culture, bioreactors used, biochemical pathways, and biotransformation processes.
CO 4	Explain the principles and methods of genetic engineering in agriculture, including genetic transformation techniques such as Agrobacterium tumefaciens, A. rhizogenes, PEG-mediated transformation, microinjection, particle bombardment, and electroporation.
CO 5	Discuss the importance of molecular markers in plant breeding, including Marker Assisted Selection (MAS) and the use of molecular markers for genetic transformation and transgenic plant production.
CO 6	Examine molecular plant pathology, focusing on mechanisms of ıce, signaling pathways, and molecular events during pathogen-plant ıd understand the implications of biotechnology and intellectual pr 'R) in plant genetic resources.

Course Title: Environmental Biotechnology
Course Code: 256010402

CO 1	Understand environmental monitoring techniques, including the use of bio-indicators, biomarkers, biosensors, and toxicity testing, and analyze environmental impacts, conservation strategies, and environmental laws and policies in India.
CO 2	Explain the principles and strategies of bioremediation, including in situ and ex situ techniques, and discuss bioremediation of metals, phytoremediation, and the role and impact of GMOs in bioremediation processes.
CO 3	Describe the principles of biodegradation and mechanisms of detoxification, focusing on the biodegradation of detergents, pesticides, lignin, hydrocarbons, and dyes.
CO 4	Analyze the principles and mechanisms of biodeterioration, including methodologies for assessing biodeterioration and strategies for its prevention and control.
CO 5	Evaluate the environmental impacts of various pollutants and the effectiveness of different bioremediation and biodegradation techniques in mitigating these impacts.
CO 6	Discuss the integration of rDNA technology in environmental monitoring and bioremediation, and understand the role of conservation strategies and environmental policies in addressing environmental problems.

Course Title: Biotechnology Practicals
Course Code: 256010403

CO 1	Demonstrate Polymerase Chain Reaction (PCR) and perform Agarose Gel Electrophoresis.
CO 2	Estimate sulfate, Total Solids (TS), Total Dissolved Solids (TDS), Total Suspended Solids (TSS), and chloride in given samples.
CO 3	Study dye degradation and analyze the results.
CO 4	Isolate DNA and RNA from given samples.
CO 5	Perform Native SDS-PAGE for protein analysis.
CO 6	Apply and interpret techniques for nucleic acid and protein isolation and analysis.

Department of Chemistry
M.Sc Semester-I

Course Title: Organic Chemistry -I
Course Code: 256020101

CO 1	Understand the E1, E2, E1CB elimination reaction mechanisms, stereo chemistry, and factors affecting reactivity and orientation
CO 2	Analyze mixed SN1, SN2, SET mechanisms and nucleophilic substitution, focusing on substrate structures and stereochemistry.
CO 3	Explain the concept of aromaticity using resonance, Huckel's rule, and molecular orbitals, and distinguish between aromatic, anti-aromatic, and homoaromatic compounds
CO 4	Understand acid-base concepts, pKa, and the effect of structure on acidity and basicity.
CO 5	Examine the structure, stability, and fate of reactive intermediates such as carbocations, carbanions, carbenes, free radicals, and nitrenes
CO 6	Analyze carbon-carbon and carbon-nitrogen migration reactions, including pinacol-pinacolone, Curtius, Schmidt, and Baeyer-Villiger rearrangements

Course Title: Inorganic Chemistry -I
Course Code: 256020102

CO 1	Understand and apply the principles of quantum mechanics to atomic structure, including solving Schrödinger wave equations and interpreting hydrogenic orbitals.
CO 2	Analyze and apply group theory to molecular symmetry, focusing on character tables and their relevance to physical and chemical properties.
CO 3	Evaluate the principles of magnetochemistry, understanding Curie and Curie-Weiss laws and analyzing diamagnetic and antiferromagnetic properties in materials.
CO 4	Apply the concept of metalloporphyrins and bio-inorganic chemistry to understand their role in biological systems, such as hemoglobin, myoglobin, and enzymes.
CO 5	Investigate coordination compounds used in medicine, focusing on chelation therapy, platinum-based anticancer drugs, and radiodiagnostic agents.
CO 6	Develop skills in the use of approximation methods in quantum mechanics, including the variation method and perturbation theory, applied to atomic systems.

Course Title: Physical Chemistry - I
Course Code: 256020103

CO 1	Understand and apply the principles of quantum mechanics to atomic structure, including solving Schrödinger wave equations and interpreting hydrogenic orbitals.
CO 2	Analyze and apply group theory to molecular symmetry, focusing on character tables and their relevance to physical and chemical properties.
CO 3	Evaluate the principles of magnetochemistry, understanding Curie and Curie-Weiss laws and analyzing diamagnetic and antiferromagnetic properties in materials.
CO 4	Apply the concept of metalloporphyrins and bio-inorganic chemistry to understand their role in biological systems, such as hemoglobin, myoglobin, and enzymes.
CO 5	Investigate coordination compounds used in medicine, focusing on chelation therapy, platinum-based anticancer drugs, and radiodiagnostic agents.
CO 6	Develop skills in the use of approximation methods in quantum mechanics, including the variation method and perturbation theory, applied to atomic systems.

Course Title: Analytical Chemistry - I
Course Code: 256020104

CO 1	Understand the scope of analytical science, qualitative/quantitative analysis, and data handling.
CO 2	Learn error analysis, significance testing, and precision/accuracy in experimental results.
CO 3	Develop competence in GLP, standard operating procedures, and quality control/assurance.
CO 4	Understand sampling, calibration methods, and calibration curve construction.
CO 5	Demonstrate mastery in spectrophotometry fundamentals, including Beer's law and photometric accuracy
CO 6	Apply advanced spectrophotometric techniques to real-world problems such as equilibrium constant measurement.

Course Title: Chemistry Practical
Course Code: 256020105

CO 1	Understand the mechanisms and applications of nitration, bromination, and acylation reactions.
CO 2	Demonstrate the reduction and oxidation reactions and analyze their role in organic synthesis
CO 3	Gain proficiency in condensation reactions (Aldol, Cannizzaro) and their synthetic importance.
CO 4	Conduct diazotization and Friedel-Crafts reactions, understanding their industrial and lab applications.
CO 5	Master experimental techniques for the synthesis of organic compounds through various methodologies.
CO 6	Develop innovative approaches to solving organic chemistry problems through reaction mechanism analysis

M.Sc Semester-II

Course Title: Organic Chemistry -II
Course Code: 256020201

CO 1	Demonstrate expertise in spectroscopy and heterocyclic chemistry, including detailed knowledge of structure determination and photochemistry.
CO 2	Perform independent research on mass spectrometry fragmentation patterns and advanced organic reactions.
CO 3	Analyze the reactivity of heterocycles and stereochemistry in organic compounds, focusing on specific reagents and reaction mechanisms.
CO 4	Solve complex reaction mechanisms related to photochemical and heterocyclic reactions, employing advanced problem-solving techniques.
CO 5	Utilize spectroscopy techniques (NMR, IR, UV) in structure determination, particularly with heterocyclic compounds and functional groups.
CO 6	Demonstrate effective communication of scientific results through written reports on spectroscopy and organic reactions, adhering to professional standards.

Course Title: Inorganic Chemistry -II
Course Code: 256020202

CO 1	Demonstrate a comprehensive understanding of chemical bonding theories.
CO 2	Apply symmetry principles to molecular orbitals, IR/Raman spectral data interpretation, and hybrid orbital formation.
CO 3	Understand the structure and reactivity of organometallic compounds, especially π-bonded and electron-ligand complexes.
CO 4	Analyze reaction mechanisms in square planar complexes and electron transfer processes in oxidation-reduction reactions.
CO 5	Demonstrate problem-solving skills in analyzing kinetic effects in substitution reactions and electron transfer mechanisms.
CO 6	Effectively communicate the applications of chemical bonding, organometallic chemistry, and reaction mechanisms in catalysis and materials science.

Course Title: Physical Chemistry -II
Course Code: 256020203

CO 1	Understand the distribution of molecules and thermodynamic probability in statistical thermodynamics.
CO 2	Apply nuclear chemistry principles to nuclear models, radioactive decay, and nuclear reactions.
CO 3	Analyze the kinetics and mechanisms of polymerization processes, and the properties of polymers.
CO 4	Conduct experiments to determine dissociation constants and apply electrochemical principles to real-world problems
CO 5	Demonstrate proficiency in using laboratory tools for the characterization of polymers and electrochemical measurements.
CO 6	Effectively communicate the principles and findings in statistical thermodynamics, nuclear chemistry, polymer chemistry, and electrochemistry.

Course Title: Analytic Chemistry-II
Course Code:256020204

CO 1	focuses on the distribution of molecules and thermodynamic probability in statistical thermodynamics. This requires a strong understanding of theoretical principles and contributes to interdisciplinary knowledge
CO 2	Involves applying concepts from nuclear chemistry, such as nuclear models, radioactive decay, and nuclear reactions, which aligns well with advanced knowledge , critical analysis , and interdisciplinary integration
CO 3	Relates to the kinetics and mechanism of polymer processes in polymer chemistry, as well as the characterization of polymers. This outcome emphasizes problem-solving , critical analysis , and technical expertise .
CO 4	Involves electrochemical experiments, including the determination of dissociation constants through conductometry and potentiometry, which correlates strongly with research competency , technical expertise , and problem-solving.
CO 5	emphasizes the practical use of laboratory tools for polymer characterization and electrochemical measurements, focusing on technical skills , research competency , and problem-solving.
CO 6	ddresses the ability to communicate findings in statistical thermodynamics, nuclear chemistry, polymer chemistry, and electrochemistry. This relates to scientific communication and interdisciplinary integration

Course Title: Chemistry Practical
Course Code: 256020205

CO 1	Perform the analysis and separation of mixtures (solid) using physical and chemical methods.
CO 2	Conduct conductometric, potentiometric, and pH-metric titrations to verify theoretical principles like Ostwald's Law.
CO 3	Apply principles of adsorption, kinetics, and distribution methods to determine reaction orders and complex formulas.
CO 4	Perform the analysis and separation of mixtures (liquid) using physical and chemical methods.
CO 5	Estimate the saponification, iodine, and acid values of oils and perform EDTA titrations for simultaneous estimations
CO 6	Separate amino acids, drugs, and dyes using thin layer chromatography (TLC) and interpret results effectively.

M.Sc Semester-III

Course Title: Natural Products and Bio molecules
Course Code: 256020301

CO 1	Understand the general classification and biosynthesis of natural pigments like anthocyanins, flavones, and flavanols.
CO 2	Study the chemistry, synthesis, and biochemical role of alkaloids and vitamins like quinine, vitamin B, and vitamin C.
CO 3	Explore the structure, stereochemistry, and biochemical role of steroids and hormones, including cholesterol, androgens, estrogens, and gestrogens.
CO 4	Analyze the structure and synthesis of terpenoids and carotenoids, including compounds like abietic acid, farnesol, and squalene.
CO 5	Demonstrate the ability to apply general methods of structure determination in natural compounds and steroids.
CO 6	nvestigate biosynthetic pathways of terpenoids, steroids, and alkaloids through theoretical and experimental research, and develop methods for solving advanced biochemical problems.

Course Title: Medicinal Chemistry
Course Code: 256020302

CO 1	Understand the structures and mechanisms of antibiotics that interfere with bacterial cell wall biosynthesis, including β-lactam antibiotics (penicillin and cephalosporin) and non-lactam antibiotics.
CO 2	Analyze the SAR (structure-activity relationship) of penicillins and tetracyclines, and study antibiotics that interfere with protein biosynthesis like tetracycline and chloramphenicol.
CO 3	Study psychoactive drugs, including CNS depressants (general and local anesthetics, sedatives, and hypnotics), and explore the synthesis of thiopental, diazepam, lidocaine, and other relevant drugs.
CO 4	Investigate modern chemotherapy for malaria, including the synthesis and SAR of antimalarial drugs such as chloroquine, primaquine, and mefloquine, and explore their modes of action.
CO 5	Analyze the synthesis and biochemical roles of antituberculosis drugs like isoniazid, ethionamide, and ethambutol, as well as their pharmacological implications in tuberculosis treatment.
CO 6	Examine cardiovascular drugs, diuretics, and hypoglycemic agents, including the synthesis of atenolol, diltiazem, tolbutamide, and others, and understand their role in treating cardiovascular and metabolic diseases.

Course Title: Organic Spectroscopy
Course Code: 256020303

CO 1	List the different types of errors in analytical chemistry
CO 2	Explain the significance of accuracy, precision, and sensitivity in analytical measurements.
CO 3	Calculate the standard deviation and confidence interval for a set of analytical data.
CO 4	Analyze a data set to identify possible sources of error and suggest ways to minimize them.
CO 5	Evaluate the reliability and validity of analytical data by comparing it with known standards.
CO 6	Develop a protocol for the systematic treatment of errors in a new analytical method.

Course Title: Industrial Chemsitry
Course Code: 256020304

CO 1	Understand basic chemical data, batch vs continuous operations, process design, and flow charts for chemical process selection and safety management.
CO 2	Apply the principles of nitration, sulfonation, halogenation, amination, and alkylation in industrial processes, especially for chemicals derived from benzene, naphthalene, and anthracene.
CO 3	Analyze and understand the 12 principles of Green Chemistry and apply them in the development of sustainable chemical processes.
CO 4	Explore the use of green solvents like ionic liquids in aqueous phase reactions and Wurtz, Wittig-Horner, and Michael reactions, and their industrial applications.
CO 5	Understand the role of green catalysts and reagents in promoting sustainable reactions such as hydrogenation, Diels-Alder, o-alkylation, and N-alkylation.
CO 6	Study the manufacture and uses of agrochemicals such as insecticides, fungicides, weedicides, pesticides, plant nutrients, and hormones, focusing on sustainability and environmental impact.

Course Title :Organic Chemistry Practicals
Course Code:256020305

CO 1	Analyze kinetics data using various methods and interpret solubility equilibrium data to assess factors affecting solubility in inorganic compounds.
CO 2	Explain the impact of factors like temperature, catalysts, and concentration on reaction rates, and the role of solubility equilibria in solutions.
CO 3	Use integrated rate laws and solubility principles to solve problems involving reaction kinetics and solubility equilibria.
CO 4	Apply solubility rules, precipitation methods, and flame tests to distinguish between different cations and anions in inorganic mixtures.
CO 5	Analyze and interpret qualitative tests and separate ions based on chemical properties in complex inorganic mixtures.
CO 6	Recall principles of cation and anion analysis, along with reagents and general procedures in inorganic qualitative analysis.

M.Sc Semester-IV

Course Title: Advanced Organic Chemistry
Course Code: 256020401

CO 1	Understand and apply the Sandmeyer reaction, including its mechanism, purification, and characterization of products.
CO 2	Study and apply the Pechmann reaction, Skraup synthesis, Riemer-Tiemann reaction, Kolbe-Smith reaction, and Claisen-Smith synthesis .
CO 3	Analyze and apply the Hofmann reaction, Diels-Alder reaction, and Green bromination, including their mechanisms and product characterization.
CO 4	Perform drug assays including the estimation of sulpha drugs, understanding its significance and methodology.
CO 5	Apply non-aqueous titration, nitrite value estimation, and drug dissolution techniques in pharmaceutical analysis
CO 6	Integrate preparation techniques and estimation methods to solve complex problems in industrial and pharmaceutical chemistry.

Course Title: Advanced Organic Synthesis
Course Code: 256020402

CO 1	Understand the principle of protecting functional groups (hydroxyl, amino, carbonyl, carboxylic acid) and apply methods of protection and deprotection in complex syntheses.
CO 2	Apply synthetic equivalent groups and carry out synthetic analysis and planning, controlling stereochemistry in multi-step reactions.
CO 3	Use the disconnection approach to design synthesis pathways, including functional group inter-conversions, and plan selective disconnections of C-X bonds.
CO 4	Apply C-C disconnections to alcohol and carbonyl compounds, and explore regioselectivity and the use of aliphatic nitro compounds in organic synthesis.
CO 5	Synthesize saturated heterocycles (3-6 membered rings) and aromatic heterocycles, understanding the stereochemistry and regioselectivity of ring closure reactions.
CO 6	Integrate protection, disconnection, and ring synthesis strategies to plan and execute complex organic syntheses, controlling stereochemistry and functional group interactions.

Course Title: Bio-Organic Chemistry
Course Code: 256020403

CO 1	Understand the role of water in biological systems, including interactions among biomolecules, buffering systems, and its participation in biological reactions.
CO 2	Explore the chemistry and biochemical functions of vitamins (A, D, E, K, C, B complex, H, and folic acid) in absorption, transport, and mobilization.
CO 3	Examine protein properties, stereochemistry, peptide formation, separation and sequencing of proteins, and the roles of oxygen-binding proteins (hemoglobin and myoglobin).
CO 4	Analyze enzyme activity, catalytic specificity, regulation, and inhibition through key examples like chymotrypsin, hexokinase, and lysozyme.
CO 5	Understand carbohydrate structure and classification, biologically important derivatives, and the roles of glucoconjugates in biological systems.
CO 6	Investigate the structure and properties of lipids, including fatty acids, triacylglycerols, membrane lipids, and bile acids, and their roles in biological systems.

Course Title: Selected topics in medicinal chemistry
Course Code: 256020404

CO 1	Understand the procedure of drug design, including lead compound modification, clinical trials, and SAR theories.
CO 2	Explore pharmacokinetics and the factors affecting drug absorption, distribution, metabolism, and elimination.
CO 3	Analyze pharmacodynamics, including enzyme stimulation/inhibition and the significance of drug metabolism.
CO 4	Understand dosage forms, routes of administration, and modern methods of pharmaceutical analysis and quality control.
CO 5	Investigate the application of computers in chemistry, including online resources, data search, and pharmaceutical applications.
CO 6	Study the medicinal use of nanomaterials for drug delivery, cancer treatment, and the application of nanotechnology in medical devices.

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Course Title: Dissertation Program
Course Code: 256020405

CO 1	Understand the disaster management strategies and their theoretical foundations.
CO 2	Conduct research and develop methodologies for assessing risks and vulnerabilities.
CO 3	Critically evaluate disaster scenarios and responses within the company's operations, interpreting complex data.
CO 4	Develop disaster preparedness and response plans to solve real-world issues encountered during company operations.
CO 5	Integrate interdisciplinary knowledge from fields like engineering, environmental science, and risk management.
CO 6	Collaborate with teams in designing emergency management protocols, while ensuring compliance with ethical standards.

Department of Microbiology
M.Sc. Semester I
Course Title: Gene Structure and Function
Course Code: 256030101

CO 1	Understand the chemistry, structure, and forces stabilizing DNA, including Watson-Crick and Hoogsteen base pairing, and analyze the physical properties of dsDNA.
CO 2	Explain DNA topology, supercoiling, and the role of DNA topoisomerases in regulating DNA structure and gene expression in both prokaryotes and eukaryotes.
CO 3	Explore DNA-protein interactions, focusing on helix-turn-helix, B-sheet, and zinc finger motifs, and their roles in regulating genetic processes.
CO 4	Analyze the organization and packaging of DNA into chromosomes in prokaryotes and eukaryotes, including nucleosome assembly and chromatin modification.
CO 5	Describe the mechanisms of DNA replication, including the role of DNA polymerases, replisome assembly, telomerase function, and inhibitors of DNA replication.
CO 6	Evaluate the processes of transcription, translation, and gene regulation in prokaryotes and eukaryotes, focusing on operon models and posttranslational modifications.

Course Title: Bioinstrumentation
Course Code: 256030102

CO 1	Understand the principles of electrochemistry, including pH, buffers, potentiometric and conductometric titrations, and their applications in biological systems.
CO 2	Explore the principles and applications of various microscopy techniques, such as light, electron, and fluorescence microscopy, along with sample preparation methods.
CO 3	Analyze the methodologies and applications of chromatography techniques, including gel-filtration, ion-exchange, affinity, thin layer, gas, and HPLC chromatography.
CO 4	Explain the principles and applications of electrophoresis techniques such as Native and SDS PAGE, agarose, and 2D gel electrophoresis for biomolecule separation.
CO 5	Evaluate the principles and applications of spectroscopy techniques (UV, IR, NMR, ESR) and their relevance in studying biomolecular structures and functions.
CO 6	Apply the principles of centrifugation, radioactive isotope techniques, and biosensors in biological research and biopolymer analysis, with emphasis on radiation dosimetry and tracer methods.

Course Title: Microbial Diversity
Course Code: 256030103

CO 1	Understand the principles and concepts of microbial diversity, including both culturable and non-culturable microbes and the methodologies to study them.
CO 2	Explore the principles of metagenomics and its role in understanding microbial diversity, as well as strategies for the conservation of microbial diversity.
CO 3	Analyze the metabolic diversity in bacteria and the systematics of various bacterial groups, with an emphasis on molecular and conventional approaches.
CO 4	Examine the diversity of actinomycetes, cyanobacteria, and fungi, focusing on their classification, reproduction, and ecological significance.
CO 5	Evaluate the systematics, occurrence, and adaptive features of different groups of archaea (Halophiles, Thermophiles, Alkalophiles, Acidophiles) and their applications.
CO 6	Assess the industrial and ecological roles of yeast, moulds, and mycorrhizal fungi, including their economic importance and contribution to various ecosystems.

Course Title: Biogeohydrotechnology and Biofuels
Course Code: 256030104

CO 1	Understand the classification and characterization of different types of waste and the principles and mechanisms involved in waste treatment.
CO 2	Analyze biological methods for treating liquid and solid waste, focusing on the principles and applications of these methods in waste management.
CO 3	Explore the marine environment, including bacterial diversity, and the cultivation and enumeration of marine bacteria for various applications.
CO 4	Apply indicators for marine microbial enzymes, polysaccharides, antimicrobial peptides, and carotenoids to assess their potential uses in marine biotechnology.
CO 5	Examine the processes of bioleaching, bio-oxidation, and biogeohydrotechnology for handling sulphidic minerals, including methods and factors affecting these processes.
CO 6	Evaluate fuel biotechnology concepts including types of energy resources, production of biofuels (biogas, bioethanol, biodiesel, bio-hydrogen), and their desirable and undesirable features, energy crops, and microbial enhanced oil recovery (MEOR).

Course Title: Microbiology Practicals
Course Code: 256030105

CO 1	Demonstrate proper sterilization techniques for lab equipment and media, including autoclaving and chemical methods.
CO 2	Perform Gram staining on bacterial samples to distinguish between Gram-positive and Gram-negative bacteria.
CO 3	Use the Coles method to quantify carbohydrates, employing colorimetric assays or other techniques for concentration measurement.
CO 4	Apply the DPA (Diphenylamine) method to quantify DNA, understanding the principles and application of this technique.
CO 5	Perform the Biuret method to quantify protein concentrations, based on the formation of a colored complex.
CO 6	Demonstrate the isolation of Rhizobium bacteria from root nodules, emphasizing the symbiotic relationship with leguminous plants.

M.Sc. Semester II

Course Title: Microbial Genetics
Course Code: 256030201

CO 1	Explain the types, mechanisms, and repair pathways of mutations, including spontaneous mutations, DNA damage, and repair systems.
CO 2	Describe plasmid biology, including types, replication, control of copy number, and plasmid segregation.
CO 3	Discuss the principles of recombination, including homologous and site-specific recombination, and their biological roles.
CO 4	Analyze bacterial conjugation, focusing on processes involving the F-factor, Hfr conjugation, and plasmid-based conjugation.
CO 5	Understand Agrobacterium genetics, including Ti-plasmid function and interkingdom gene transfer mechanisms.
CO 6	Explore transformation and transduction mechanisms in bacteria and viruses, including applications and measurement techniques.

Course Title: Immunology
Course Code: 256030202

CO 1	Understand the principles of innate and adaptive immunity, including inflammation, roles of cells, receptors, and proteins.
CO 2	Describe the cells and organs of the immune system, including hematopoiesis and the function of primary and secondary lymphoid organs.
CO 3	Explain the properties of antigens and antibodies, including their structure, classes, biological activities, and antibody diversity.
CO 4	Analyze antigen-antibody interactions and the complement system, including its components, activation, regulation, and related diseases.
CO 5	Discuss the Major Histocompatibility Complex (MHC) and its role in antigen presentation, including MHC organization, antigen processing, and disease susceptibility.
CO 6	Explore T-cell and B-cell maturation, activation, differentiation, cytokines, and the mechanisms of cell-mediated cytotoxicity, hypersensitivity, and immune tolerance.

Course Title: Bioprocess Technology
Course Code: 256030203

CO 1	Understand the principles of isolation, preservation, and improvement of industrially important microorganisms.
CO 2	Describe substrates for fermentation processes and methods for medium optimization.
CO 3	Explain bioreactor design, including laboratory, pilot, and large-scale reactors, as well as sterilization of media and air.
CO 4	Discuss mass transfer of oxygen in bioprocesses, including agitation, aeration, determination of KLa, and factors affecting it.
CO 5	Analyze bioprocess kinetics, focusing on growth and substrate utilization in batch, fed-batch, and continuous systems.
CO 6	Explore the control of process parameters, including instrumentation, sensors, controllers, fermentation control systems, and dynamic modeling of fermentation processes.

Course Title: Tools and techniques in synthetic microbiology
Course Code: 256030204

CO 1	Understand the principles of light microscopy, including optical corrections, types of objectives, oculars, and illumination methods.
CO 2	Differentiate between types of light microscopes (bright field, dark field, fluorescence, phase contrast, polarizing, differential interference contrast) and understand micrometry.
CO 3	Describe the basic components of electron microscopes, including thermionic and field emission electron guns, and differentiate between TEM, SEM, STEM, ESEM, and HVEM.
CO 4	Explain fixation and storage techniques, including classification of fixatives, procedures, and factors affecting fixation for plant, animal, and microbial samples.
CO 5	Demonstrate preparation techniques for biological samples for light and electron microscopy, including sectioning, staining, and photomicrography.
CO 6	Apply histochemical and cytochemical techniques to localize metabolites, enzymes, and ultra-structural components in biological samples, including immunocytochemistry.

Course Title: Microbiology Practicals
Course Code: 256030205

CO 1	Perform cell wall and spirochete staining techniques with precision, and isolate and identify fungi and soil bacteria (actinomycetes).
CO 2	Skillfully conduct endospore staining and primary screening for amylase producers, and apply the encapsulation technique for yeast cell immobilization.
CO 3	Proficiently carry out fermentation processes for alcohol and amylase production, and determine amylase activity and ethanol concentration in samples.
CO 4	Demonstrate techniques such as agglutination, paper chromatography, and the serodiagnosis of diseases like syphilis (RPR test) and enteric fever (Widal test).
CO 5	Develop expertise in enzyme immobilization, sauerkraut production, double immunodiffusion (ring test), and studying biodeterioration of given samples.
CO 6	Execute advanced laboratory techniques such as HPLC, gas chromatography, and agarose gel electrophoresis with accuracy and precision.

M.Sc. Semester III
Course Title: Microbial Biotechnology
Course Code: 256030301

CO 1	Understand the microbial production processes for primary metabolites such as amino acids (glutamic acid, lysine), enzymes (proteases, amylases), organic acids (citric acid, acetic acid), and industrial alcohol.
CO 2	Explain the production methods and applications of secondary metabolites, including antibiotics (penicillin, streptomycin), vitamins (B12, B2), ergot alkaloids, and carotenoid pigments (β-carotene, lycopene).
CO 3	Describe microbial production techniques for other products and biotransformation, including microbial polysaccharides (xanthan, alginate, dextran), beverages (beer, wine), polyhydroxyalkanoates (PHA, PHB), biosurfactants, and steroid transformation.
CO 4	Analyze the methods and applications of fungal biomass production, including baker's yeast and single cell oil, and evaluate their industrial uses.
CO 5	Discuss mushroom cultivation techniques and the use of algal biomass, including their applications in various industries.
CO 6	Identify the microbial production techniques for food and feed, emphasizing their benefits and challenges in industrial settings.

Course Title: ENZYMOLOGY
Course Code: 256030302

CO 1	Understand the historical developments in enzymology, protein structure (primary, secondary, tertiary, and quaternary), and the techniques used in enzyme characterization.
CO 2	Explain enzyme classification according to the IUB system, and describe the principles and techniques of enzymatic analysis, including factors affecting enzyme activity, extraction, and purification strategies.
CO 3	Analyze enzyme kinetics, including single substrate kinetics (equilibrium and steady-state kinetics, Km, Vmax, Kcat), multisubstrate kinetics (general rate equations, mechanisms), and thermal kinetics (temperature effects, Arrhenius equation).
CO 4	Discuss enzyme inhibition and its kinetics, covering reversible and irreversible inhibition, competitive, noncompetitive, uncompetitive, mixed, partial, substrate, and allosteric inhibition.
CO 5	Describe the mechanisms of enzyme action, including enzyme activators, coenzymes, cofactors, specificity, and experimental approaches to determining enzyme mechanisms. Analyze specific enzyme mechanisms and allosteric regulation.
CO 6	Explore enzyme engineering techniques, including chemical modification of enzymes, enzyme immobilization, the use of enzymes in non-conventional media, enzyme sensors, and their applications as analytical reagents.

Course Title: FOOD & DAIRY MICROBIOLOGY
Course Code: 256030303

CO 1	Understand the scope of food microbiology and recognize microorganisms such as bacteria, yeast, and molds important in food microbiology, while analyzing the factors influencing microbial growth in food.
CO 2	Explain the general principles underlying food spoilage, including the spoilage of canned food, sugar products, vegetables, fruits, meat, milk, fish, seafood, and poultry, and assess the contamination risks involved.
CO 3	Analyze foodborne pathogens and the processes involved in bacterial foodborne infections and intoxications caused by Clostridium, Escherichia, Salmonella, and Shigella, while evaluating general diagnostic and preventive methods.
CO 4	Apply the principles of food preservation techniques such as asepsis, microbial removal, and temperature control, and evaluate the use of chemical and biological preservatives along with food additives.
CO 5	Evaluate the role of food packaging and labeling, genetically modified foods, and biosensors in food research, while comparing recent foodborne outbreaks and their impacts.
CO 6	Analyze food safety regulations, including HACCP, Codex Alimentarius, PFA, FPO, MFPO, BIS, and AGMARK, and assess microbiological testing procedures for water, milk, and food plant sanitation.

Course Title: Agricultural Microbiology
Course Code: 256030304

CO 1	Understand the composition of the lithosphere and analyze the role of soil microbes, along with the factors influencing soil microbial populations.
CO 2	Explain the distribution, abundance, and nutritional groups of soil bacteria, actinomycetes, fungi, algae, protozoa, and viruses, and evaluate their ecological significance in the soil environment.
CO 3	Assess microbial transformations of minerals like phosphorus, sulfur, iron, and other elements, focusing on the processes of mineralization, immobilization, and oxidation/reduction.
CO 4	Analyze the types, production, and applications of biofertilizers, including nitrogen-fixing organisms (Azotobacter, Azospirillum, cyanobacteria), phosphate-solubilizing microbes, and their role in plant growth and integrated nutrient management.
CO 5	Evaluate plant pathogenic microorganisms, including their entry modes and factors affecting disease incidence, as well as plant disease resistance mechanisms and control measures.
CO 6	Understand the history and application of biopesticides (viral, bacterial, fungal, protozoan) and their interaction with plant pathogens, and assess the potential of biopesticides in sustainable agriculture.

Course Title: Microbiology Practicals
Course Code: 256030305

CO 1	Perform primary screening of amylase and organic acid-producing microorganisms, demonstrating proper microbial handling and culturing techniques.
CO 2	Execute experiments to measure the effect of temperature, pH, and substrate concentration on enzyme activity with precision and accuracy.
CO 3	Conduct the isolation of DNA from plant cells and demonstrate gel electrophoresis techniques, ensuring the correct handling of samples and equipment.
CO 4	Demonstrate the processes of PCR and animal tissue culture with adherence to procedural steps and safety protocols in a laboratory setting.
CO 5	Carry out sterility testing of pharmaceutical products and study protein structure using PDB, following standard laboratory practices.
CO 6	Operate bioinformatics databases (NCBI, DDBJ, GenBank) for sequence alignment and analysis, and design primers from a cDNA library, applying computational tools efficiently.

M.Sc. Semester IV
Course Title: ENVIRONMENTAL MICROBIOLOGY
Course Code: 256030401

CO 1	Understand the global environmental problems, including global warming, ozone depletion, acid rain, and their impacts on ecosystems and infectious diseases.
CO 2	Explain the sources and types of water pollution, including microbial indicators, eutrophication, and control methods, along with the mechanisms of biodeterioration of wood and metals.
CO 3	Analyze the biogeochemical cycles of carbon, nitrogen, sulfur, iron, and phosphorus, along with the detrimental effects of biogeochemical cycle diversions, such as acid mine drainage and nitrate pollution.
CO 4	Discuss biological nitrogen fixation, including asymbiotic, symbiotic, and associative nitrogen fixation, with emphasis on the structure, function, and genetic regulation of nitrogenase.
CO 5	Evaluate the mechanisms and factors affecting the biodegradation of organic pollutants, and examine bioremediation techniques for oil spills, heavy metal pollution, and the use of GMOs in bioremediation.
CO 6	Describe bioleaching of metals, microbial insecticides, and biofertilizers, along with their industrial applications in biomining, pest management, and enhanced oil recovery processes.

Course Title: r-DNA Technology
Course Code: 256030402

CO 1	Understand the concept and importance of genetic engineering, including general strategies, steps involved in gene cloning, and the extraction and purification of DNA from bacterial, plant, and animal cells.
CO 2	Describe the roles of restriction enzymes, DNA ligase, and other enzymes in gene cloning, and explain the processes of mRNA and cDNA preparation.
CO 3	Explain the chemical synthesis of genes and DNA cloning and expression vectors, including plasmids, bacteriophages, phagemids, cosmids, YACs, BACs, and MACs, and the expression of cloned genes in heterologous hosts.
CO 4	Outline the techniques for recombinant selection and screening, including Southern blotting, Northern analysis, Western blotting, various electrophoresis methods, and protein activity assays (e.g., yeast-one hybrid, yeast-two hybrid).
CO 5	Discuss advanced methods for gene characterization and mapping, such as restriction mapping, DNA sequencing, nucleic acid microarrays, metagenomics, and gene therapy, as well as molecular markers and genomic mapping techniques.
CO 6	Analyze recombinant products, including recombinant hormones, DNA vaccines, transgenic plants and animals, and understand the guidelines for genetic engineering, including physical and biological containment levels and Indian guidelines.

Course Title: Microbiology Practicals
Course Code: 256030403

CO 1	Perform Polymerase Chain Reaction (PCR) technique, demonstrating the ability to accurately amplify specific DNA sequences.
CO 2	Operate Agarose Gel Electrophoresis for the separation and visualization of DNA fragments based on size.
CO 3	Execute the detection of Treponema pallidum antibodies for syphilis diagnosis through appropriate serological testing.
CO 4	Conduct the Widal test to diagnose malaria antibody, demonstrating precision in antigen-antibody reactions.
CO 5	Measure and estimate the concentration of sulfate, total solids (TS), total dissolved solids (TDS), total suspended solids (TSS), and chloride in given samples, following proper laboratory protocols.
CO 6	Isolate and purify DNA and RNA from biological samples and use Native SDS-PAGE for protein analysis, exhibiting accurate technique and analysis skills.

Department of Environmental Science
M.Sc. Semester I
Course Title: Environmental Science and Ecology
Course Code: 256060101

CO 1	Explain the fundamental concepts of ecology, including species interactions, natural selection, species richness, ecological succession, and ecosystem stability.
CO 2	Analyze the structure and functioning of ecosystems, focusing on energy flow, primary and secondary production, food chains, food webs, and decomposition processes.
CO 3	Compare and contrast the characteristics of various terrestrial biomes, including tundra, taiga, temperate forests, grasslands, deserts, and tropical rainforests, with a focus on forest resources and their sustainable management.
CO 4	Evaluate the impact of human activities, such as deforestation, forest degradation, and dam construction, on forest ecosystems and indigenous communities, with particular attention to India's forest resources.
CO 5	Assess the environmental implications of mineral resource exploration and usage, and the challenges associated with global food production, including the use of pesticides and the impact of modern agriculture on the environment.
CO 6	Propose sustainable solutions for conserving natural resources, emphasizing the role of individuals in promoting sustainable agriculture, pollution prevention, and equitable resource management.

Course Title: ENVIRONMENTAL ISSUES AND IMPACTS
Course Code: 256060102

CO 1	Explain the composition and temperature profile of the atmosphere, including the evolution of the primitive atmosphere and the sources and sinks of atmospheric components, with a focus on the causes, impacts, and mitigation of acid rain.
CO 2	Analyze the chemical processes affecting the stratospheric ozone layer, including the role of chlorofluorocarbons (CFCs) and nitrogen oxides in ozone depletion, as well as the significance of international agreements like the Montreal Protocol for ozone protection.
CO 3	Examine the chemical reactions in the troposphere, focusing on photochemical smog, the role of the hydroxyl radical (OH), and the effects of atmospheric particles on climate, air quality, and human health, while exploring strategies for particle control.
CO 4	Discuss the greenhouse effect, global warming, and climate change, evaluating the impact of greenhouse gases, the consequences of rising CO_2 levels, and international policy responses like the Kyoto Protocol to mitigate climate-related environmental changes.
CO 5	Investigate the formation and consequences of the ozone hole and assess the worldwide trends in ozone concentration, along with strategies to address the environmental challenges induced by CO_2 rise and other greenhouse gases.
CO 6	Evaluate the risks associated with radiation hazards and enviro ıtion, including radioactive pollution from anthropogenic sources, the lear winter, and preventive measures to minimize the effects of ioni nd radioactive waste.

Course Title: ENERGY AND ENVIRONMENT -103
Course Code: 256060103

CO 1	Understand the fundamental laws of energy flow, dynamic equilibrium, and the principles of chemical kinetics, including the structure of atoms, elements, molecules, and chemical reactions.
CO 2	Analyze the processes of energy production and consumption, identifying various energy sources such as renewable and conventional fuels, and evaluating energy conservation strategies and solar energy input.
CO 3	Evaluate the production and management of nuclear energy, including nuclear reactions, the role of uranium, and the risks associated with nuclear accidents.
CO 4	Explore non-conventional energy sources such as photovoltaics, solar heating, wind energy, and tidal power, emphasizing their potential as sustainable energy solutions.
CO 5	Examine the role of biomass and biofuels in energy production, focusing on the use of natural vegetation, energy tree plantations, and specific energy crops for sustainable energy development.
CO 6	Assess the environmental implications of biomass energy programs and the impact of various renewable energy sources on environmental sustainability.

Course Title: ENVIRONMENT AND SOIL
Course Code: 256060104

CO 1	Understand the processes of soil formation, weathering, and the factors influencing soil development, including land degradation, soil horizons, and the use of GIS and GPS in soil mapping and quality assessment.
CO 2	Analyze the physical properties of soil, such as texture, structure, density, porosity, permeability, and soil temperature, while evaluating their impact on soil health and plant growth.
CO 3	Evaluate the relationship between soil and water, focusing on soil water content, water flow, and plant water uptake, and explore techniques for improving water efficiency and reducing water loss in soils.
CO 4	Investigate the chemical properties of soil, including the behavior of soil clays, organic colloids, cation/anion exchange, and the reactions that influence soil acidity and buffering capacity.
CO 5	Examine the role of lime in soil management, focusing on the composition and reactions of lime, its impact on soil acidity, and the relationship between lime balance and crop productivity.
CO 6	Assess the ecological impact of soil acidity and acidification, and explore methods for managing acidic soils to improve soil fertility and environmental sustainability.

Course Title: WATER QUALITY AND WASTEWATER TREATMENT TECHNIQUES
Course Code: 256060201

CO 1	Understand the hydrological cycle, surface water and groundwater systems, and evaluate natural conditions and human activities that influence water quality, including the classification and effects of different water pollutants.
CO 2	Analyze methods for managing water resources and the utilization of water, focusing on the origin and characteristics of wastewater from various sources.
CO 3	Develop skills in wastewater sampling and analysis, including the determination of organic and inorganic substances, physical characteristics, and bacteriological measurements for water quality assessment.
CO 4	Examine the stages of wastewater treatment processes, from primary and secondary (biological) treatment to advanced treatment techniques, and explore the recovery of valuable materials from industrial effluents.
CO 5	Investigate the impact of industrial chemical processes on water quality, focusing on sectors such as sugar, distillery, pharmaceuticals, pulp and paper, tanneries, fertilizers, and dairy industries.
CO 6	Assess water quality regulations and their implementation in various industries, emphasizing the importance of compliance to reduce environmental pollution and ensure sustainable water resource management.

Course Title: INTEGRATED SOLID WASTE MANAGEMENT
Course Code: 256060202

CO 1	Understand the basic concepts of solid waste management, including types of solid waste, collection methods, volume reduction technologies, and the hierarchy of waste management, with a focus on cost and efficiency in environmental management.
CO 2	Analyze source reduction policies and methodologies, evaluate government programs and initiatives aimed at reducing garbage, and explore various concentrating methods such as vacuum filtration, rotary drum precoat filter, and incineration of municipal sludge.
CO 3	Evaluate recycling processes and technologies, including collection of recyclables, processing equipment like baling and magnetic separation, and the recycling of materials such as glass, plastics, and automotive batteries.
CO 4	Examine composting and landfilling processes, including the classification of compost systems and landfills, composting phases, environmental factors affecting composting, and the generation and management of landfill gases and leachate.
CO 5	Understand the management of hazardous waste, including definitions, transportation, treatment, storage, disposal, site remediation, and minimization strategies, with a focus on medical, hospital, and nuclear wastes.
CO 6	Assess the environmental impacts of various waste management techniques and regulations, and explore sustainable practices for reducing, recycling, composting, and safely managing hazardous and non-hazardous waste.

Course Title: Aquatic and marine Environmental Chemistry
Course Code: 256060203

CO 1	Understand the fundamentals of aquatic and marine chemistry, including the properties of aquatic environments, water acidity, metal complexes, oxidation-reduction processes, and the significance of pharmaceuticals from the sea.
CO 2	Analyze the sources, nature, and effects of pollutants in the marine environment, with a focus on oil pollution, microbial degradation of petrochemicals, and metallic pollutants, and evaluate the status and mitigation strategies for coastal and estuarine pollution, particularly in India.
CO 3	Examine the role of oceans in climate regulation, including the chemical properties of seawater, spatial scales of oceanic change, the carbon cycle, oceanic gases, and their interaction with climate feedback processes.
CO 4	Explore the impact of oceanic chemical processes on climate, including feedback mechanisms involving marine chemistry and potential future changes in ocean-climate interactions.
CO 5	Understand the principles of remote sensing, including types of remote sensing systems, their overview, and applications, as well as the integration of Geographic Information Systems (GIS) and Global Positioning Systems (GPS) in environmental monitoring.
CO 6	Apply remote sensing, GIS, and GPS technologies to analyze and environmental data, with a focus on their applications in studying marine and coastal pollution.

Course Title: AIR POLLUTION: QUALITY AND CONTROL METHODS
Course Code: 256060204

CO 1	Understand the sources, classification, and properties of air pollutants, including their behavior, fate, and the formation of photochemical smog, and evaluate the effects of air pollution on human health, vegetation, and materials, as well as the Air (Prevention and Control of Pollution) Act of 1981.
CO 2	Analyze various methods for sampling and measuring air pollutants, including ambient air sampling, collection techniques for gaseous and particulate pollutants, and stack sampling, while understanding the principles of analysis for air pollutants.
CO 3	Examine air pollution control methods and equipment, focusing on source correction methods and the operation of control systems for particulate emissions (e.g., gravitational settling chambers, cyclone separators) and gaseous pollutants (e.g., sulfur dioxide, nitrogen oxides).
CO 4	Evaluate the effectiveness of different air pollution control technologies and equipment, including fabric filters, electrostatic precipitators, and wet collectors, in managing emissions from various sources.
CO 5	Understand indoor air quality issues, including the sources and toxicity of indoor air pollutants, and recognize syndromes related to poor indoor air quality, such as Sick Building Syndrome and Multiple Chemical Sensitivity.
CO 6	Assess the sources and sinks of pollutants in indoor environments and develop strategies to improve indoor air quality and mitigate health risks associated with indoor air pollution.

M.Sc. Semester III
Course Title: ENVIRONMENTAL BIOTECHNOLOGY
Course Code: 256060301

CO 1	Evaluate the environmental impact of various processes and technologies, including the use of nitrogen fertilizers, impermeable barrier liners in landfills, and the control of submicron air toxin particles from coal combustion, with a focus on cleaner bioprocesses and sustainable development.
CO 2	Analyze advanced recycling and treatment methods for organic wastes, such as duckweed-based wastewater treatment, anaerobic treatment of tequila vinasse, and engineered reed bed systems, while exploring their effectiveness in resource recovery and reuse.
CO 3	Investigate methods for the removal of recalcitrant compounds from contaminated environments, including the use of immobilized non-viable cyanobacteria for heavy metal adsorption, bioremediation of soils and aquifers, and strategies for increasing the bioavailability of recalcitrant molecules.
CO 4	Examine bioremediation techniques for cleaning up contaminated soils and aquifers, focusing on the application of biotechnologies for environmental restoration and the role of environmental oil biocatalysis.
CO 5	Explore cleaner bioprocesses in industrial applications, including l bleaching processes in the pulp and paper industry, and microbial contribute to economic benefits and sustainability.
CO 6	Assess the implementation of cleaner technologies and productio ss various industries, emphasizing their role in enhancing environme ity and reducing industrial impacts.

Course Title: ENVIRONMENTAL TOXICOLOGY AND ITS IMPACT
Course Code: 256060302

CO 1	Understand the fundamentals of toxicology and toxicological chemistry, including dose-response relationships, relative toxicities, xenobiotic and endogenous substances, and the effects of toxins on teratogenesis, mutagenesis, carcinogenesis, immune, and reproductive systems.
CO 2	Analyze the toxicology of various chemical substances, including toxic elements, heavy metals (e.g., cadmium, lead, arsenic), and toxic inorganic and organic compounds, focusing on their health hazards and environmental impact.
CO 3	Examine the environmental presence and effects of heavy metals such as arsenic, cadmium, lead, mercury, and chromium, including their biochemical effects, emission sources, toxicity, transformation, and remedial measures.
CO 4	Evaluate the impact of toxic elements and compounds, including elemental halogens, organometallic compounds, and specific toxic inorganic compounds like cyanide and carbon monoxide, on human health and the environment.
CO 5	Assess the environmental impact of pesticides, including their historical use, classification, application potential, limitations, persistence, and issues related to bioaccumulation and biomagnification.
CO 6	Apply knowledge of toxicological principles to evaluate health hazards associated with various chemicals and develop strategies for mitigating their impact on the environment and human health.

Course Title: ENVIRONMENTAL RULES AND REGULATIONS
Course Code: 256060303

CO 1	Understand the framework of environmental legislation in India, including key laws such as the Water (Prevention and Control of Pollution) Act, the Air (Prevention and Control of Pollution) Act, the Environment (Protection) Act, and the Biological Diversity Act, as well as similar legislation in the USA and historical acts like the Factories Act, 1948.
CO 2	Analyze the National Conservation Strategy and Policy Statement on Environment and Development, including environmental problems, legal actions, institutional frameworks, and strategies for pollution prevention, conservation, and sustainable development.
CO 3	Evaluate the Policy Statement for Abatement of Pollution, focusing on future directions, standards for critically polluted areas, assistance for adopting clean technologies, fiscal measures, environmental auditing, and public-private partnerships.
CO 4	Examine the role and function of the National Environment Tribunal Bill, 1992, including its provisions for compensation for environmental damage, establishment of the tribunal and its jurisdiction, and proceedings related to environmental disputes.
CO 5	Assess the impact of various environmental policies on industrial nergy generation, mining, tourism, transportation, and human settlemen international cooperation and support systems for sustainable dev
CO 6	Apply knowledge of environmental laws and policies to evaluate environmental challenges, including pollution control, conservati he legal mechanisms for resolving environmental disputes.

Course Title: ENVIRONMENTAL IMPACT ASSESSMENT
Course Code: 256060304

CO 1	Understand the fundamental concepts and methodologies of Environmental Impact Assessment (EIA), including its role as a planning tool, criteria for selecting EIA methodologies, and the use of predictive models for impact assessment.
CO 2	Assess and predict the impacts of major projects on various environmental aspects, including noise, transport, landscape, air quality, soil, water, ecology, and socio-economic factors.
CO 3	Analyze environmental risk assessment (ERA) concepts and methods, including key steps in performing an ERA, legislative and policy backgrounds, and the similarities and challenges between ERA and EIA.
CO 4	Evaluate the application of environmental remote sensing (RS) and geographical information systems (GIS) in EIA, including the use of RS data and software for impact prediction, mitigation, and monitoring.
CO 5	Develop skills in integrating GIS and remote sensing data into the EIA process, including their application in screening, scoping, baseline studies, impact prediction, and mitigation efforts.
CO 6	Apply knowledge of EIA methodologies, environmental risk assessment, and remote sensing technologies to real-world case studies, assessing their effectiveness in managing environmental impacts.

M.Sc. Semester IV
Course Title: REMOTE SENSING AND GEOGRAPHICAL INFORMATION
Course Code: 256060401

CO 1	Understand the fundamentals of remote sensing, including definitions, scope, electromagnetic radiation, atmosphere windows, and the various platforms and sensors used in remote sensing systems, with a focus on LANDSAT, SPOT, and Indian remote sensing satellites.
CO 2	Analyze aerial photography techniques, including the use of vantage points, cameras, filters, and films, and comprehend the elements of visual image interpretation, as well as the principles of multispectral and microwave remote sensing and photogrammetry.
CO 3	Examine digital image processing techniques, including image restoration and enhancement, and apply image classification methods to various remote sensing applications in forestry, ecology, land use, agriculture, soils, geology, and disaster management.
CO 4	Explore the applications of remote sensing technologies in environmental science, including their use in monitoring and managing forestry, ecological systems, land use, and disaster response.
CO 5	Understand the principles and applications of Geographic Information Systems (GIS), including hardware and software requirements, and the conceptua tial and non-spatial information.
CO 6	Apply GIS technology and GPS for environmental science applic ng spatial and non-spatial data to support environmental analysis and ng.

Course Title: ENVIRONMENTAL MODELLING AND BIOSTATISTICS
Course Code: 256060402

CO 1	Apply statistical measures of central tendency (mean, median, mode) and dispersion (standard deviation, skewness, kurtosis) to analyze data, and use correlation and linear regression techniques to model relationships between variables.
CO 2	Understand and utilize probability concepts, random variables, and density functions, including the application of binomial and normal distributions in statistical analysis and hypothesis testing.
CO 3	Explore the role of modeling in environmental sciences, including the classification of deterministic and stochastic models, steady-state and dynamic models, and the stages involved in building and formulating these models.
CO 4	Apply microbial growth kinetics models, such as the Monod equation, and methods for formulating dynamic balance equations, including mass balance procedures, to environmental and biological systems.
CO 5	Analyze and apply various environmental models, including the Lotka-Volterra model for population interactions, Leslie's matrix model, point source stream pollution models, box models, and Gaussian plume models, for understanding and predicting environmental phenomena.
CO 6	Develop and validate regression models (linear, simple, and multiple) for environmental data analysis and forecasting, and apply these models to practical environmental scenarios for accurate prediction and decision-making.