SWARRNIM STARTUP AND INNOVATION UNIVERSITY

SWARRNIM INSTITUTE OF TECHNOLOGY

B.TECH. SEMESTER 1

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At Post Bhoyan Rathod, Nr. ONGC WSS, Opp. IFFCO, Adalaj-Kalol Highway, Gandhinagar, Gujarat - 382420

Course Name: Maths- I

Subject Code: 23000001

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	Analyze and manipulate infinite sequences and series.
CO 2	Evaluate limits involving indeterminate forms.
CO 3	Understand and apply techniques for improper integrals.
CO 4	Analyze functions of several variables and solve optimization problems.
CO 5	Solve systems of linear equations using matrices and determinants.
CO 6	Analyze eigenvalues and eigenvectors for linear transformations and matrices.

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Course Name: Fundamentals of Computer Programming

Subject Code: 23000004

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	Apply fundamental principles of problem solving in software engineering.
CO 2	Apply basic programming principles using C language.
CO 3	Apply basic C program structure in software development
CO 4	Prepare graduates for professional careers in roles including, but not limited to, the following: computer programmer, software engineer, software systems designer, software applications developer, technical software project lead, computer systems analyst, computer systems programmer, software applications tester and maintainer.
CO 5	To prepare graduates with the knowledge and skills to do advanced studies and research in computer science and related engineering and scientific disciplines
CO 6	To equip graduates with the communication skills, both oral and written, to become an effective team-oriented problem solver as well as an effective communicator with nontechnical stakeholders in computer and software systems development, maintenance and administration.

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Course Name: Elements of Electrical Engineering

Subject Code: 23000012

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	Define electrical current, potential difference, power and energy, sources of electrical energy, resistance and its behavior with temperature.
CO 2	Understand the different types of wires, cables, connectors & switches used for wiring Different types of domestic and industrial wiring.
CO 3	Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
CO 4	Analyze the steady state behavior of single phase and three phase AC electrical circuits.
CO 5	Compare various protective devices of working principle, usage and construction such as fuse, MCB, ELCB & Relays.
CO 6	Design and development of varies Electrical Wiring and electronics miniproctes.

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Course Name: Elements of Mechanical Engineering

Subject Code: 23000003

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	Discribe the various sources of energy and basic terminology of Mechanical engineering.
CO 2	Make calculations for commonly used working fluids i.e. ideal gases and steam.
CO 3	Analyze various heat engine cycles and understand construction and working of IC engines.
CO 4	Discuss working and applications of steam boilers and various energy conversion systems.
CO 5	Discuss various power transmission elements and properties of various engineering materials with their applications.

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Course Name: Environmental Studies

Subject Code: 23000006

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	Describe natural resources, importance of ecosystem and conservation of biodiversity with respect to multiple disciplines.
CO 2	Explain causes, effects, solutions for various pollution problems and its minimization strategies.
CO 3	Differentiate between requirements of laws and regulations for environmental conservation and applicability of legislations in society and industries.
CO 4	Discuss environmental ethics and their implementation for betterment of environment and human life.

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Course Name: Orientation Program in Startup and Entrepreneurship

Subject Code: 12300001

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	Apply the basic principles of entrepreneurship
CO 2	Distinguish the concepts of the entrepreneurship ecosystem, entrepreneurship education, and various entrepreneurial opportunities.
CO 3	Understanding various individual attributes of entrepreneurial personality traits, entrepreneurial characteristics, behavioural attributes and importance of creativity and innovation.
CO 4	Develop an understanding of best techniques for idea generation and opportunities exploration.

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Course Name: Workshop

Subject Code: 23000029

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	Understand applications of hand tools and power tools and operations of machine tools.
CO 2	Understand the operations of machine tools.
CO 3	Select the appropriate tools required for specific operation.
CO 4	Comprehend the safety measures required to be taken while using the tools.
CO 5	Prepare Fitting, Carpentry, Plumbing, Welding, and Tin-smithy Jobs.

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Course Name: Electronics Workshop

Subject Code: 23000002

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	Measure different electrical quantities.
CO 2	Understand the requirements and operation of safety devices
CO 3	Select the appropriate tools and components required for the specific operation
CO 4	Wire and trouble shoot of household appliances.

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B.TECH. SEMESTER 2

Course Name: Maths-II

Subject Code: 23000010

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	Understand vectors in $R^n \times R^n$ and operations involving linear combinations.
CO 2	Identify subspaces and determine basis and dimension and Perform coordinate transformations and understand the change of basis.
CO 3	Understand linear transformations and their properties and Represent linear transformations with matrices and explore the concept of similarity.
CO 4	Apply inner product spaces to least squares approximation and diagonalization of symmetric matrices and Explore applications of quadratic forms and optimization.
CO 5	Apply double and triple integrals over different regions and Utilize Fubini's theorem and change of variables in multiple integrals.
CO 6	Apply integration techniques to calculate volumes of various solids.

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Course Name: Engineering Physics

Subject Code: 23000005

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	Understand the basic concepts and classification of sound.
CO 2	Analyze applications of superconductors.
CO 3	Understand the fundamentals of laser radiation.
CO 4	Evaluate the applications of optical fibers.
CO 5	Apply dielectric materials in capacitors and transformers.
CO 6	Explore applications of magnetic materials.
CO 7	Explain the synthesis and applications of nonmaterial's.

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Course Name: Communication Skills

Subject Code: 23000008

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	To improve students' communicative and linguistic approach in English.
CO 2	To provide an ice-breaking technique using LSRW skills and soft skills
CO 3	To learn techniques to improve overall communication abilities and effective use of writing in the field of advertising and public relations.
CO 4	Improve communication skills through practicing debate, discussion and appearing in interview.
CO 5	Use of ethical consideration in order to develop good etiquettes both in online and offline communication.

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Course Name: Basic Electronics

Subject Code: 23000009

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	To study basics of semiconductor & devices and their applications in different areas.
CO 2	Demonstrate the operating principle and output characteristics of pn junction diodes, zener diode, Varactor diode, BJT, rectifiers and different diode circuits
CO 3	Compute and characterization of different biasing techniques to operate transistor FET, MOSFET and operational amplifier in different modes
CO 4	To implementation of basic digital gates using diode and basic family of logic families

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Course Name: Engineering Graphics

Subject Code: 23000011

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	Describe the fundamental methods of engineering drawing, sketching and drafting.
CO 2	Understanding the object through orthographic projections.
CO 3	Construct basic and intermediate geometry and application of engineering curves.
CO 4	Enhance visualization skills for developing new products.
CO 5	Develop new products through technical communication skill in the form of communicative drawings.
CO 6	Develop the theory of orthographic projection and views.

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Course Name: Elements of Civil Engineering

Subject Code: 23000015

Learning Outcomes

CO	**Completion of the course the student should Able to**
CO 1	Carry out simple land survey to prepare maps with existing details.
CO 2	Find out area of irregular shaped plane figures.
CO 3	Understand building plan elevation and section.
CO 4	Get acquainted with construction materials.
CO 5	Get acquainted with hydrological cycle and hydraulic structures.
CO 6	Get acquainted with mass transportation systems.

Course Name: BASIC PROGRAM IN ENTREPRENURESHIP

Subject Code: 12300002

Learning Outcomes

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

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Course Name: Chemistry

Subject Code: 23020216

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	To relate periodic properties such as ionization potential, oxidation states and electro negativity.
CO 2	To analyze microscopic chemistry in terms of atomic and molecular orbital's and inter molecular forces.
CO 3	To describe the importance and relevance of chemistry in our everyday life
CO 4	To select the appropriate chemical material and utilization of it.
CO 5	To interpret the methods of science as a logical means of problem solving.
CO 6	To distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.

Course Name: Personality Development

Subject Code: 24190203

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	To provide an icebreaking technique using LSRW skills and soft skills
CO 2	To learn techniques to improve overall communication abilities and effective use of writing in the field of advertising and public relations.
CO 3	Improve communication skills through practicing debate, discussion and appearing in interview.
CO 4	Use of ethical consideration in order to develop good etiquettes both in online and offline communication.

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Course Name: Web Technology

Subject Code: 24190204

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	Write and debug JavaScript to enhance user interactivity and improve the user experience.
CO 2	Understand server-side programming concepts using languages such as Node.js, Python, or PHP.
CO 3	Create responsive and visually appealing web pages using HTML, CSS, and JavaScript.
CO 4	Explain the basic principles of how the web works, including HTTP, URLs, and web servers.
CO 5	Use Git for version control, including branching, merging, and collaboration workflows.

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Course Name: Introduction to Cloud Technology

Subject Code: 24190205

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	Compare major cloud service providers (e.g., AWS, Azure, Google Cloud) and their offerings.
CO 2	Recognize key security principles and practices in cloud environments, including data protection, compliance, and identity management.
CO 3	Set up and manage basic cloud services, such as virtual machines, storage solutions, and databases.
CO 4	Use cloud management and monitoring tools to oversee cloud resources, optimize performance, and manage costs.
CO 5	Identify emerging trends in cloud technology, such as serverless computing, containerization, and edge computing.

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Course Name: Engineering Graphics & Design

Subject Code: 24190206

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	Explain the principles of engineering graphics, including the importance of technical drawing in engineering design and communication.
CO 2	Apply geometric construction methods to create and analyze shapes, dimensions, and spatial relationships.
CO 3	Construct and visualize 3D models using CAD software, demonstrating an understanding of spatial relationships and design principles.
CO 4	Analyze and evaluate design concepts for functionality, manufacturability, and aesthetics, using appropriate tools and techniques.
CO 5	Work collaboratively in teams to develop a design project from concept through to presentation, demonstrating project management and teamwork skills.
CO 6	Explain the principles of engineering graphics, including the importance of technical drawing in engineering design and communication.

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Course Name: Mentoring and Counselling

Subject Code: 24190207

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	Explain key theories and principles of mentoring and counseling, including various approaches and methodologies.
CO 2	Demonstrate active listening, empathy, and nonverbal communication techniques essential for building rapport with mentees or clients.
CO 3	Foster an inclusive and supportive environment that encourages open communication and trust between the mentor/counselor and the mentee/client.
CO 4	Engage in self-reflection to assess personal strengths and areas for growth as a mentor or counselor, fostering continuous professional development.

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Course Name: Open Project / MOOC

Subject Code: 24190208

Learning Outcomes

CO	Completion of the course the student should Able to
CO 1	Identify and articulate the goals and objectives of their open project, ensuring alignment with personal or community needs.
CO 2	Utilize project management tools and techniques to organize, monitor, and evaluate project progress effectively.
CO 3	Identify, evaluate, and utilize open educational resources (OER) to enhance learning and project outcomes.
CO 4	Engage in self-reflection to assess personal growth, learning experiences, and challenges faced during the project.

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DEPARTMENT: COMPUTER ENGINEERING

Semester: 1

Program:	Bachelor of Engineering	Branch:	CE
Year:	1st Year	Semester:	1
Course title:	Maths-I	Course code	23000001
Course type:	Engineering Science	Course credit:	5

CO 1	Analyze and manipulate infinite sequences and series.
CO 2	Evaluate limits involving indeterminate forms.
CO 3	Understand and apply techniques for improper integrals.
CO 4	Analyze functions of several variables and solve optimization problems.
CO 5	Solve systems of linear equations using matrices and determinants.
CO 6	Analyze eigenvalues and eigenvectors for linear transformations and matrices.

Program:	Bachelor of Engineering	Branch:	CE
Year:	1st Year	Semester:	1
Course title:	Fundamentals of Computer Programming	Course code	23000004
Course type:	Engineering Science	Course credit:	4

CO 1	Apply fundamental principles of problem solving in software engineering.
CO 2	Apply basic programming principles using C language.
CO 3	Apply basic C program structure in software development
CO 4	Prepare graduates for professional careers in roles including, but not limited to, the following: computer programmer, software engineer, software systems designer, software applications developer, technical software project lead, computer systems analyst, computer systems programmer, software applications tester and maintainer.
CO 5	To prepare graduates with the knowledge and skills to do advanced studies and research in computer science and related engineering and scientific disciplines
CO 6	To equip graduates with the communication skills, both oral and written, to become an effective team-oriented problem solver as well as an effective communicator with nontechnical stakeholders in computer and software systems development, maintenance and administration.

Program:	Bachelor of Engineering	Branch:	CE
Year:	1st Year	Semester:	1
Course title:	Elements of Electrical Engineering	Course code	23000012
Course type:	Engineering Science	Course credit:	5

CO 1	Define electrical current, potential difference, power and energy, sources of electrical energy, resistance and its behavior with temperature.
CO 2	Understand the different types of wires, cables, connectors & switches used for wiring Different types of domestic and industrial wiring.
CO 3	Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
CO 4	Analyze the steady state behavior of single phase and three phase AC electrical circuits.
CO 5	Compare various protective devices of working principle, usage and construction such as fuse, MCB, ELCB & Relays.
CO 6	Design and development of varies Electrical Wiring and electronics miniproctes.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	1stYear	Semester:	1
Course title:	Elements of Mechanical Engineering	Course code	23000003
Course type:	Engineering Science	Course credit:	6

CO 1	Discribe the various sources of energy and basic terminology of Mechanical engineering.
CO 2	Make calculations for commonly used working fluids i.e. ideal gases and steam.
CO 3	Analyze various heat engine cycles and understand construction and working of IC engines.
CO 4	Discuss working and applications of steam boilers and various energy conversion systems.
CO 5	Discuss various power transmission elements and properties of various engineering materials with their applications.

Program:	Bachelor of Engineering	Branch:	CE
Year:	1st Year	Semester:	1
Course title:	Environmental Studies	Course code	23000006
Course type:	Engineering Science	Course credit:	2

CO 1	Describe natural resources, importance of ecosystem and conservation of biodiversity with respect to multiple disciplines.
CO 2	Explain causes, effects, solutions for various pollution problems and its minimization strategies.
CO 3	Differentiate between requirements of laws and regulations for environmental conservation and applicability of legislations in society and industries.
CO 4	Discuss environmental ethics and their implementation for betterment of environment and human life.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	1st Year	Semester:	1
Course title:	Orientation Program in Startup and Entrepreneurship	Course code	12300001
Course type:	Engineering Science	Course credit:	3

CO 1	Apply the basic principles of entrepreneurship
CO 2	Distinguish the concepts of the entrepreneurship ecosystem, entrepreneurship education, and various entrepreneurial opportunities.
CO 3	Understanding various individual attributes of entrepreneurial personality traits, entrepreneurial characteristics, behavioural attributes and importance of creativity and innovation.
CO 4	Develop an understanding of best techniques for idea generation and opportunities exploration.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	1stYear	Semester:	1
Course title:	Workshop	Course code	23000029
Course type:	Engineering Science	Course credit:	4

CO 1	Understand applications of hand tools and power tools and operations of machine tools.
CO 2	Understand the operations of machine tools.
CO 3	Select the appropriate tools required for specific operation.
CO 4	Comprehend the safety measures required to be taken while using the tools.
CO 5	Prepare Fitting, Carpentry, Plumbing, Welding, and Tin-smithy Jobs.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	1st Year	Semester:	1
Course title:	Electronics Workshop	Course code	23000002
Course type:	Engineering Science	Course credit:	4

CO 1	Measure different electrical quantities.
CO 2	Understand the requirements and operation of safety devices
CO 3	Select the appropriate tools and components required for the specific operation
CO 4	Wire and trouble shoot of household appliances.

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SEMESTER:-2

Program:	Bachelor of Engineering	Branch:	CE
Year:	1st Year	Semester:	2
Course title:	Maths-II	Course code	23000010
Course type:	Engineering Science	Course credit:	5

CO 1	Understand vectors in $R^n \times R^n$ and operations involving linear combinations.
CO 2	Identify subspaces and determine basis and dimension and Perform coordinate transformations and understand the change of basis.
CO 3	Understand linear transformations and their properties and Represent linear transformations with matrices and explore the concept of similarity.
CO 4	Apply inner product spaces to least squares approximation and diagonalization of symmetric matrices and Explore applications of quadratic forms and optimization.
CO 5	Apply double and triple integrals over different regions and Utilize Fubini's theorem and change of variables in multiple integrals.
CO 6	Apply integration techniques to calculate volumes of various solids.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	1ˢᵗYear	Semester:	2
Course title:	Engineering Physics	Course code	23000005
Course type:	Engineering Science	Course credit:	5

CO 1	Understand the basic concepts and classification of sound.
CO 2	Analyze applications of superconductors.
CO 3	Understand the fundamentals of laser radiation.
CO 4	Evaluate the applications of optical fibers.
CO 5	Apply dielectric materials in capacitors and transformers.
CO 6	Explore applications of magnetic materials.
CO 7	Explain the synthesis and applications of nonmaterial's.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	1st Year	Semester:	2
Course title:	Communication Skills	Course code	23000008
Course type:	Engineering Science	Course credit:	3

CO 1	To improve students' communicative and linguistic approach in English.
CO 2	To provide an ice-breaking technique using LSRW skills and soft skills
CO 3	To learn techniques to improve overall communication abilities and effective use of writing in the field of advertising and public relations.
CO 4	Improve communication skills through practicing debate, discussion and appearing in interview.
CO 5	Use of ethical consideration in order to develop good etiquettes both in online and offline communication.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	1stYear	Semester:	2
Course title:	Basic Electronics	Course code	23000009
Course type:	Engineering Science	Course credit:	5

CO 1	To study basics of semiconductor & devices and their applications in different areas.
CO 2	Demonstrate the operating principle and output characteristics of pn junction diodes, zener diode, Varactor diode, BJT, rectifiers and different diode circuits
CO 3	Compute and characterization of different biasing techniques to operate transistor FET, MOSFET and operational amplifier in different modes
CO 4	To implementation of basic digital gates using diode and basic family of logic Families

Program:	Bachelor of Engineering	Branch:	CE
Year:	1st Year	Semester:	2
Course title:	Engineering Graphics	Course code	**23000011**
Course type:	Engineering Science	Course credit:	6

CO 1	Describe the fundamental methods of engineering drawing, sketching and drafting.
CO 2	Understanding the object through orthographic projections.
CO 3	Construct basic and intermediate geometry and application of engineering curves.
CO 4	Enhance visualization skills for developing new products.
CO 5	Develop new products through technical communication skill in the form of communicative drawings.
CO 6	Develop the theory of orthographic projection and views.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	1st Year	Semester:	2
Course title:	Elements of Civil Engineering	Course code	23000015
Course type:	Engineering Science	Course credit:	6

CO 1	Carry out simple land survey to prepare maps with existing details.
CO 2	Find out area of irregular shaped plane figures.
CO 3	Understand building plan elevation and section.
CO 4	Get acquainted with construction materials.
CO 5	Get acquainted with hydrological cycle and hydraulic structures.
CO 6	Get acquainted with mass transportation systems.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	1stYear	Semester:	2
Course title:	BASIC PROGRAM IN ENTREPRENURESHIP	Course code	12300002
Course type:	Engineering Science	Course credit:	3

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

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Program:	Bachelor of Engineering	Branch:	CE
Year:	1st Year	Semester:	2
Course title:	Chemistry	Course code	23020216
Course type:	Engineering Science	Course credit:	4

CO 1	To relate periodic properties such as ionization potential, oxidation states and electro negativity.
CO 2	To analyze microscopic chemistry in terms of atomic and molecular orbital's and inter molecular forces.
CO 3	To describe the importance and relevance of chemistry in our everyday life
CO 4	To select the appropriate chemical material and utilization of it.
CO 5	To interpret the methods of science as a logical means of problem solving.
CO 6	To distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	1st Year	Semester:	2
Course title:	Personality Development	Course code	24190203
Course type:	Engineering Science	Course credit:	3

CO 1	To provide an icebreaking technique using LSRW skills and soft skills
CO 2	To learn techniques to improve overall communication abilities and effective use of writing in the field of advertising and public relations.
CO 3	Improve communication skills through practicing debate, discussion and appearing in interview.
CO 4	Use of ethical consideration in order to develop good etiquettes both in online and offline communication.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	1st Year	Semester:	2
Course title:	Web Technology	Course code	24190204
Course type:	Engineering Science	Course credit:	4

CO 1	Write and debug JavaScript to enhance user interactivity and improve the user experience.
CO 2	Understand server-side programming concepts using languages such as Node.js, Python, or PHP.
CO 3	Create responsive and visually appealing web pages using HTML, CSS, and JavaScript.
CO 4	Explain the basic principles of how the web works, including HTTP, URLs, and web servers.
CO 5	Use Git for version control, including branching, merging, and collaboration workflows.

Program:	Bachelor of Engineering	Branch:	CE
Year:	1st Year	Semester:	2
Course title:	Introduction to Cloud Technology	Course code	24190205
Course type:	Engineering Science	Course credit:	3

CO 1	Compare major cloud service providers (e.g., AWS, Azure, Google Cloud) and their offerings.
CO 2	Recognize key security principles and practices in cloud environments, including data protection, compliance, and identity management.
CO 3	Set up and manage basic cloud services, such as virtual machines, storage solutions, and databases.
CO 4	Use cloud management and monitoring tools to oversee cloud resources, optimize performance, and manage costs.
CO 5	Identify emerging trends in cloud technology, such as serverless computing, containerization, and edge computing.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	1st Year	Semester:	2
Course title:	Engineering Graphics & Design	Course code	24190206
Course type:	Engineering Science	Course credit:	4

CO 1	Explain the principles of engineering graphics, including the importance of technical drawing in engineering design and communication.
CO 2	Apply geometric construction methods to create and analyze shapes, dimensions, and spatial relationships.
CO 3	Construct and visualize 3D models using CAD software, demonstrating an understanding of spatial relationships and design principles.
CO 4	Analyze and evaluate design concepts for functionality, manufacturability, and aesthetics, using appropriate tools and techniques.
CO 5	Work collaboratively in teams to develop a design project from concept through to presentation, demonstrating project management and teamwork skills.
CO 6	Explain the principles of engineering graphics, including the importance of technical drawing in engineering design and communication.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	1stYear	Semester:	2
Course title:	Mentoring and Counselling	Course code	24190207
Course type:	Engineering Science	Course credit:	

CO 1	Explain key theories and principles of mentoring and counseling, including various approaches and methodologies.
CO 2	Demonstrate active listening, empathy, and nonverbal communication techniques essential for building rapport with mentees or clients.
CO 3	Foster an inclusive and supportive environment that encourages open communication and trust between the mentor/counselor and the mentee/client.
CO 4	Engage in self-reflection to assess personal strengths and areas for growth as a mentor or counselor, fostering continuous professional development.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	1st Year	Semester:	2
Course title:	Open Project / MOOC	Course code	24190208
Course type:	Engineering Science	Course credit:	

CO 1	Identify and articulate the goals and objectives of their open project, ensuring alignment with personal or community needs.
CO 2	Utilize project management tools and techniques to organize, monitor, and evaluate project progress effectively.
CO 3	Identify, evaluate, and utilize open educational resources (OER) to enhance learning and project outcomes.
CO 4	Engage in self-reflection to assess personal growth, learning experiences, and challenges faced during the project.

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Semester: 3

Program:	Bachelor of Engineering	Branch:	CE
Year:	2nd Year	Semester:	3
Course title:	Maths - III	Course code	2300015
Course type:	Engineering Science	Course credit:	5

CO 1	Apply Fourier series to analyze and represent periodic functions.
CO 2	Apply Laplace transforms to solve differential equations and system problems.
CO 3	Apply methods such as integrating factor, Bernoulli equations, and linear differential equations.
CO 4	Apply series solutions to solve differential equations and analyze the convergence and divergence of series solutions.
CO 5	Apply the method of separation of variables to solve PDEs to analyze solutions in cylindrical and spherical polar coordinates.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	2nd Year	Semester:	3
Course title:	Digital Electronics	Course code	23070301
Course type:	Engineering Science	Course credit:	5

CO 1	Have a thorough understanding of the fundamental concepts and techniques used in
CO 2	Apply on Gate of digital electronics.
CO 3	To understand and examine the structure of various number systems and its
CO 4	Application in digital design.
CO 5	The ability to understand, analyze and design various combinational and sequential

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Program:	Bachelor of Engineering	Branch:	CE
Year:	2nd Year	Semester:	3
Course title:	Data Structure And Algorithm	Course code	23040302
Course type:	Engineering Science	Course credit:	5

CO 1	Learn the basic types for data structure, implementation and application.
CO 2	Know the strength and weakness of different data structures.
CO 3	Use the appropriate data structure in context of solution of given problem..
CO 4	Develop programming skills which require solving given problem.
CO 5	Learn the data structure, implementation and application.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	2nd Year	Semester:	3
Course title:	Database Management System	Course code	23040301
Course type:	Engineering Science	Course credit:	5

CO 1	Understand the basic concepts of database management systems (L2)
CO 2	Apply SQL to find solutions to a broad range of queries (L3).
CO 3	Apply normalization techniques to improve database design (L3)
CO 4	Analyze a given database application scenario to use ER model
CO 5	Conceptual design of the database

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Program:	Bachelor of Engineering	Branch:	CE
Year:	2nd Year	Semester:	3
Course title:	Computer Network	Course code	23040303
Course type:	Engineering Science	Course credit:	4

CO 1	Understand Basics of Computer Networks and different
CO 2	Transmission Media.
CO 3	Differentiate Protocols which play a major role in providing
CO 4	**Computer** network internet effectively.
CO 5	Understand various protocol layers and inner operations.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	2 Year	Semester:	4
Course title:	Operating System	Course code	23040401
Course type:	Engineering Science	Course Credit	4

CO 1	Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication.
CO 2	Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and th communication.
CO 3	Differentiate Protocols which play a major role in providing
CO 4	Discuss the storage management policies with respect to different storage management technologies
CO 5	Analyze the memory management and its allocation policies

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Program:	Bachelor of Engineering	Branch:	CE
Year:	2Year	Semester:	4
Course title:	Object Oriented Programming with C++	Course code	23040402
Course type:	Engineering Science	Course Credit	5

CO 1	Codes basic programs in Java programming language.
CO 2	Prints to the screen in Java language.
CO 3	Makes relational operations in Java.
CO 4	Constructs loops in Java.
CO 5	Defines arrays in Java and uses them.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	2Year	Semester:	4
Course title:	System Software	Course code	23040403
Course type:	Engineering Science	Course Credit	4

CO 1	To understand the relationship between system software and machine
CO 2	To understand architecture.
CO 3	To understand the processing of an HLL program for execution on a computer.
CO 4	To understand the process of scanning and parsing.
CO 5	To know the design and implementation of assemblers, macro processor, linker

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Program:	Bachelor of Engineering	Branch:	CE
Year:	2 Year	Semester:	4
Course title:	Computer Organization and MicroProcessor	Course code	23070401
Course type:	Engineering Science	Course Credit	4

CO 1	To know the background of internal communication of computer
CO 2	To have better idea on how to write assemble language programs
CO 3	To be clear with memory management techniques
CO 4	To better with IO devices communication with processor
CO 5	To notice how to perform computer arithmetic operations

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Semester: 5

Program:	Bachelor of Engineering	Branch:	CE
Year:	3 Year	Semester:	5
Course title:	Object Oriented Programming with JAVA	Course code	23040501
Course type:	Engineering Science	Course Credit	6

CO 1	Able to solve real world problems using OOP techniques.
CO 2	Able to understand the use of abstract classes.
CO 3	Able to solve problems using java collection framework and I/o classes.
CO 4	Able to develop multithreaded applications with synchronization.
CO 5	Able to develop applets for web applications.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	3 Year	Semester:	5
Course title:	Theory of Computation	Course code	23040502
Course type:	Engineering Science	Course Credit	6

CO 1	To give an overview of the theoretical foundations of computer science from
CO 2	the perspective of formal languages
CO 3	To illustrate finite state machines to solve problems in computing
CO 4	To explain the hierarchy of problems arising in the computer sciences.
CO 5	To familiarize Regular grammars, context frees grammar

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Program:	Bachelor of Engineering	Branch:	CE
Year:	3 Year	Semester:	5
Course title:	Information Network & Cyber Security	Course code	23040503
Course type:	Engineering Science	Course Credit	4

CO 1	Identify some of the factors driving the need for network security.
CO 2	Identify and classify particular examples of attacks.
CO 3	Define the terms vulnerability, threat and attack.
CO 4	Identify physical points of vulnerability in simple networks.
CO 5	Identify the need for network security.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	3 Year	Semester:	5
Course title:	Web Technology	Course code	23040504
Course type:	Engineering Science	Course Credit	4

CO 1	Students are able to develop a dynamic webpage by the use of java script and
CO 2	DHTML.
CO 3	Students will be able to write a well formed / valid XML document.
CO 4	Students will be able to connect a java program to a DBMS and perform insert,
CO 5	DHTML update and delete operations on DBMS table.

Program:	Bachelor of Engineering	**Branch:**	CE
Year:	3 Year	**Semester:**	5
Course title:	Computer Graphics and Visulization	**Course code**	**23040506**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Understand the basics of computer graphics, different
CO 2	Graphics systems and applications of computer graphics.
CO 3	Discuss various algorithms for scan conversion and
CO 4	Filling of basic objects and their comparative analysis.
CO 5	Use of geometric transformations on graphics objects

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Semester 6

Program:	Bachelor of Engineering	Branch:	CE
Year:	3 Year	Semester:	6
Course title:	Wireless Network	Course code	23040601
Course type:	Engineering Science	Course Credit	4

CO 1	Conversant with the latest 3G/4G and Wi-MAX networks and its architecture.
CO 2	Design and implement wireless network environment for any application using latest
CO 3	Wireless protocols and standards.
CO 4	Implement different type of applications for smart phones and mobile devices with
CO 5	latest network strategies

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Program:	Bachelor of Engineering	Branch:	CE
Year:	3 Year	Semester:	6
Course title:	Compiler Design	Course code	23040602
Course type:	Engineering Science	Course Credit	4

CO 1	Realize basics of compiler design and apply for real time applications.
CO 2	To introduce different translation languages
CO 3	To understand the importance of code optimization
CO 4	To know about compiler generation tools and techniques
CO 5	To learn working of compiler and non compiler applications

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Program:	Bachelor of Engineering	Branch:	CE
Year:	3 Year	Semester:	6
Course title:	Cloud Computing	Course code	23040603
Course type:	Engineering Science	Course Credit	4

CO 1	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
CO 2	Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.
CO 3	Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
CO 4	Analyze various cloud programming models and apply them to solve problems on the cloud.
CO 5	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.

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Program:	Bachelor of Engineering	**Branch:**	CE
Year:	3 Year	**Semester:**	6
Course title:	Data Mining and Warehousing	**Course code**	**23040604**
Course type:	Engineering Science	**Course Credit**	4

CO 1	Be familiar with mathematical foundations of data mining tools..
CO 2	Understand and implement classical models and algorithms in data warehouses and
CO 3	data mining discovered by association rule
CO 4	Characterize the kinds of patterns that can be discovered by association rule
CO 5	data mining, classification and clustering.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	3 Year	Semester:	6
Course title:	Advance JAVA	Course code	23040606
Course type:	Engineering Science	Course Credit	5

CO 1	Able to solve real world problems using OOP techniques.
CO 2	Able to understand the use of abstract classes.
CO 3	Able to solve problems using java collection framework and I/o classes.
CO 4	Able to develop multithreaded applications with synchronization.
CO 5	Able to develop applets for web applications.

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Semester 7

Program:	Bachelor of Engineering	Branch:	CE
Year:	4 Year	Semester:	7
Course title:	Artificial Intelligence	Course code	23040701
Course type:	Engineering Science	Course Credit	5

CO 1	Develop mathematical thinking and problem solving skills associated with research and writing proofs.
CO 2	Get exposure to a wide variety of mathematical concepts used in computer science discipline like probability.
CO 3	Use Graph Theory for solving problems.
CO 4	Acquire basic knowledge of sampling and estimation.
CO 5	Understand basic concepts of hypothesis

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Program:	Bachelor of Engineering	Branch:	CE
Year:	4 Year	Semester:	7
Course title:	Python Programming	Course code	23040702
Course type:	Engineering Science	Course Credit	5

CO 1	Create your first program in Python IDLE
CO 2	Implement OOPs concepts in your programming
CO 3	Use Arrays, and Data structures
CO 4	Create an application with the support of graphics in Python
CO 5	Implement error handling

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Semester: 8

Program:	Bachelor of Engineering	Branch:	CE
Year:	4 Year	Semester:	8
Course title:	Programming with XML & JSON	Course code	23040802
Course type:	Engineering Science	Course Credit	6

CO 1	Students are able to develop a dynamic webpage by the use of java script and DHTML.
CO 2	Students will be able to write a well formed / valid XML document. ·
CO 3	Students will be able to connect a java program to a DBMS and perform insert, update.
CO 4	Delete operations on DBMS table.
CO 5	Students will be able to write a server side java application called Servlet to catch form data

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SWARRNIM INSTITUTE OF TECHNOLOGY
PROGRAM NAME :- ELECTRICAL ENGINEERING
ACADEMIC YEAR 2023 -2024
COURSE OUT COME OF B.TECH ELECTRICAL ENGINEERING
SEMESTER I /II

B.TECH SEMESTER 1st/2nd ELECTRICAL

Program:	Bachelor of Engineering	Branch:	Electrical /Mechanical/Civil/Computer/IT /Chemical
Year:	1ST Year	Semester:	1st/2nd
Course title:	Elements of Electrical Engineering	Course code	**23000012**
Course type:	Engineering Science	Course credit:	5

Course Outcome:

CO 1	**Define** electrical current, potential difference, power and energy, sources of electrical energy, resistance and its behavior with temperature.
CO 2	**Understand** the different types of wires, cables, connectors & switches used for wiring Different types of domestic and industrial wiring.
CO 3	**Apply** the concepts of KVL/KCL and network theorems in solving DC circuits.
CO 4	**Analyze** the steady state behavior of single phase and three phase AC electrical circuits.
CO 5	**Compare** various protective devices of working principle, usage and construction such as fuse, MCB, ELCB & Relays.
CO 6	**Design and development** of varies Electrical Wiring and electronics mini projects.

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Program:	Bachelor of Engineering	Branch:	Electrical / Computer/IT
Year:	1ST Year	Semester:	1st/2nd
Course title:	Electronics Workshop	Course code	23000002
Course type:	Engineering Science	Course credit:	2

Course Outcome:

CO-1	Measure different electrical quantities.
CO-2	Understand the requirement and operation of safety devices
CO-3	Select the appropriate tools and components required for specific operation
CO-4	Wire and trouble shoot of house-hold appliances.

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Program:	Bachelor of Engineering	Branch:	Electrical / Computer/IT
Year:	1ST Year	Semester:	1st/2nd
Course title:	Basic Electronics	Course code	23000009
Course type:	Engineering Science	Course credit:	5

Course Outcome:

Sr. No.	CO statement
CO-1	To study basics of semiconductor & devices and their applications in different areas.
CO-2	Demonstrate the operating principle and output characteristics of pn junction diodes, zener diode, Varactor diode, BJT, rectifiers and different diode circuits
CO-3	Compute and characterization of different biasing techniques to operate transistor , FET , MOSFET and operational amplifier in different modes
CO-4	To implementation of basic digital gates using diode and basic family of logic families

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SWARRNIM INSTITUTE OF TECHNOLOGY
PROGRAM NAME :- ELECTRICAL ENGINEERING
ACADEMIC YEAR 2023 -2024
COURSE OUT COME OF B.TECH ELECTRICAL ENGINEERING
SEMESTER III - VIII

B.TECH SEMESTER 3RD ELECTRICAL

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	2nd Year	Semester:	3
Course title:	Electrical measurements & measuring Instruments	Course code	**23050301**
Course type:	Professional Core	Course credit:	4

Course Outcome: -

CO STATEMENTS

CO 1	Understand the working principle and construction of the measuring instruments and recorders.
CO 2	Calibrate the measuring devices such as meters and transducers.
CO 3	Measure various electrical and physical quantities and parameters using meters and transducers.
CO 4	Analyze the performance of electrical instruments and recorders

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	2nd Year	Semester:	3
Course title:	Digital Electronics	Course code	**23070301**
Course type:	Professional Core	Course credit:	4

Course Outcome: -

CO STATEMENTS

CO 1	Understand different number systems and its inter-conversions.
CO 2	Understand the concept of Boolean algebra and its different theorems, properties etc.

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CO 3	Understand simplification of Boolean functions.
CO 4	Understand the construction and working of different combinational circuits etc.
CO 5	Understand different flip-flops and its applications.
CO 6	Understand different sequential logic circuits and basic design of sequential circuits and counters.

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	2ndYear	**Semester:**	3
Course title:	DC Machines & Transformer	**Course code**	**23050303**
Course type:	Professional Core	**Course credit:**	4

Course Outcome: -

CO STATEMENTS

CO 1	Understand working principle, performance, control and applications of DC Machines and Transformer.
CO 2	Identify, formulate and solve DC machine and Transformer related problems.
CO 3	Carry out test and conduct performance experiments on DC machine and Transformer.
CO 4	Analyze testing and and conduct performance experiments on DC machine and Transformer.
CO 5	Observe the parameters taken into consideration for testing of Machines.

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	2ndYear	**Semester:**	3
Course title:	Circuits & Networks	**Course code**	23050302
Course type:	Professional Core	**Course credit:**	5

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CO 1	To apply various circuit laws like Ohm's Law, KVL, KCL, etc.
CO 2	To apply dot convention technique for analysis of transformer based circuits.
CO 3	To apply node and mesh circuit analysis techniques.
CO 4	To apply various network theorems such as Superposition, Thevenin, Norton, Reciprocity,Maximum Power Transfer, Millman's Theorem, etc..
CO 5	To analyze behavior of passive circuits such as RC, RL and RLC.
CO 6	To obtain transfer function of a network.
CO 7	To analyze circuit taking into account initial conditions.
CO 8	To calculate two port parameters such as y, z, h, ABCD, etc. for the given two port network.
CO 9	To understand basics of network topologies and the tieset and cutset schedules.

Program:	Bachelor of Engineering	Branch:	Electrical Engineering/Electronics and Communication Engi.
Year:	2ndYear	Semester:	4
Course title:	Signals & System	Course code	23070402
Course type:	Professional core	Course credit:	4

Course Outcome: -

CO STATEMENTS

CO 1	Understand about various types of signals, classify them, analyze them, and perform various operations on them.
CO 2	Understand about various types of systems, classify them, analyze them and understand their response behavior.
CO 3	Appreciate use of transforms in analysis of signals and system.
CO 4	Carry simulation on signals and systems for observing effects of applying various properties and operations
CO 5	Create strong foundation of communication and signal processing to be studied in the subsequent semester

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Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	2ndYear	Semester:	4
Course title:	Electric power generation	Course code	23050403
Course type:	Professional core	Course credit:	5

Course Outcome: -

CO STATEMENTS

CO 1	Explain hydro energy conversion process with block diagrams and identify the appropriate site for it.
CO 2	Explain the working of Nuclear power station.
CO 3	Describe the working of Diesel power station and Gas turbine power plant.
CO 4	Compare various economic aspects of different types of Tariffs.
CO 5	Classify various substations and describe working of its equipments.
CO 6	Measure earth resistance.

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	2ndYear	Semester:	4
Course title:	Electromagnetics	Course code	23050404
Course type:	Engineering Science	Course credit:	4

Course Outcome: -

CO STATEMENTS

CO 1	Understanding of electrostatic and magneto static fields.
CO 2	Apply mathematical knowledge of vector algebra to determine charge behavior in magnetic field and its applications.
CO 3	Describe the magnetic behavior of various materials in different electric condition and its applications.
CO 4	Solve problems analytically and numerically.
CO 5	Solve simple electrostatic boundary problems.
CO 6	Mathematically model a wide variety of electromagnetic behavior of waves.

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	2ndYear	Semester:	4
Course title:	Analog Electronics	Course code	23050401
Course type:	Professional Core	Course credit:	4

Course Outcome: -

CO STATEMENTS

CO 1	Understand the different configurations of transistor and amplifiers.
CO 2	To test and design the circuits with op-amps and other electronics components for different applications.
CO 3	To test and design circuit using different ICs.
CO 4	Analyze performance of various circuits and analog devices

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	2ndYear	Semester:	4
Course title:	A C Machines	Course code	23050402
Course type:	Professional Core	Course credit:	5

Course Outcome: -

CO STATEMENTS

CO 1	Explain the construction, working principle, performance and applications of Poly-phase induction motor.
CO 2	Perform experiments on above machines.
CO 3	Describe the need of these machines in the society
CO 4	Identify, formulate and solve the numerical problems related to above machines
CO 5	Single phase motors, synchronous generator (Alternator), synchronous motor and commutator motors.

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	3rd Year	Semester:	5
Course title:	Power Electronics	Course code	23050501
Course Type:	Professional Core	Course credit:	4

Course Outcome: -

CO - STATEMENTS

CO 1	Explain the construction and characteristics of Power semiconductor devices
CO 2	Analyze, operate and design ac-to-dc converters.
CO 3	Analyze, operate and design dc-to-dc converters.
CO 4	Apply the knowledge of power electronic converter for speed control of DC motors.
CO 5	Simulate power electronic converters and their control scheme.

	Bachelor of Engineering	Branch:	Electrical Engineering
Program:			
Year:	3rd Year	Semester:	5
Course title:	Microprossessor & Microcontroller archietechture & interfacing	Course code	23050505
Course type:	Professional Core	Course credit:	5

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Course Outcome: -

CO STATEMENTS

CO 1	Apply the concept of buses, microprocessor architecture and interrupts.
CO 2	Interface memory and I/O devices with 8 bit microprocessor/microcontroller
CO 3	Describe 8 bit microcontroller architecture-of MCS -51 family
CO 4	Program assembly language programming/ C programming of 8051
CO 5	Design microcontroller based small system

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	3rd Year	Semester:	5
Course title:	Power System - I	Course code	23050502
Course type:	Professional Core	Course credit:	3

Course Outcome: -

CO STATEMENTS

CO 1	Understand Supply Systems. Explain mechanical design of transmission line
CO 2	Calculation of line parameters (Resistance, inductance and capacitance
CO 3	Describe underground cables
CO 4	Compare DC and AC distribution
CO 5	Explain the representation of different power system components and loading capability of a generator

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Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	3rd Year	Semester:	5
Course title:	Elements of Electrical Design	Course code	23050504
Course type:	Professional Core	Course credit:	3

Course Outcome: -

CO STATEMENTS

CO 1	Explain the basic concepts related to design of electrical equipments.
CO 2	Design the starters, field regulators, small transformers and choke coils.
CO 3	Draw and explain the winding diagrams for AC and DC machines.
CO 4	Estimate the cost of wirings.

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	3rd Year	Semester:	5
Course title:	Control System Engineering	Course code	23050503
Course type:	Professional core	Course credit:	5

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Course Outcome: -

CO STATEMENTS

CO 1	Apply systems theory to complex real world problems in order to obtain models that are expressed using differential equations, transfer functions, and state space equations .
CO 2	Predict system behavior based on the mathematical model of that system where the model may be expressed in time or frequency domain
CO 3	Analyze the behavior of closed loop systems using tools such as root locus, Routh Hurwitz, Bode, Nyquist, and Matlab
CO 4	Design controllers using classical PID methods, root locus methods, and frequency domain methods
CO 5	Devise a safe and effective method of investigating a system identification problem in the lab
CO-6	Write a report that effectively communicates the results of an analysis or design.

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	3rd Year	Semester:	6
Course title:	Utilization of electrical energy & traction	Course code	23050605
Course type:	Professional core	Course credit:	3

Course Outcome: -

CO STATEMENTS

CO 1	Understand the power electronics technology in efficient utilization of electrical power
CO 2	Apply power electronics technology in efficient utilization of electrical power
CO 3	Analyze effective utilization of Power Electronic Technologies in Electrical Traction.
CO 4	Evaluate the use of Power Electronic Technologies in various process control.
CO 5	Create lighting system using LED Technologies.

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	3rd Year	Semester:	6
Course title:	Industrial automation	Course code	23050601
Course type:	Professional core	Course credit:	4

Course Outcome: -

CO STATEMENTS

CO 1	To identify potential areas for automation and justify need for automation
CO 2	To select suitable major control components required to automate a process or an activity
CO 3	To translate and simulate a real-time activity using modern tools and discuss the benefits of automation.
CO 4	To identify suitable automation hardware for the given application.
CO 5	To recommend appropriate modeling and simulation tool for the given manufacturing application

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	3rd Year	Semester:	6
Course title:	High voltage Engineering	Course code	23050604
Course type:	Professional core	Course credit:	4

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Course Outcome: -

CO STATEMENTS

CO 1	Understand the basic generation and measurement of High voltage
CO 2	Analyze High current for testing purposes
CO 3	Comprehend Breakdown phenomenon in air, solid and liquid insulation
CO 4	Test high voltage electrical Equipment with various testing devices

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	3rd Year	Semester:	6
Course title:	Electrical Power System - II	Course code	23050602
Course type:	Professional core	Course credit:	3

Course Outcome: -

CO STATEMENTS

CO 1	Analyze the performance of Short and Medium transmission line.
CO 2	Describe the symmetrical components and its applications.
CO 3	Analyze Symmetrical and Unsymmetrical faults in power systems.
CO 4	Describe transients in power systems.
CO 5	Describe corona effect

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Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	3rd Year	Semester:	6
Course title:	Design of DC machine & Transformer	Course code	23050603
Course type:	Professional core	Course credit:	4

Course Outcome: -

CO STATEMENTS

CO 1	Design the DC machine of given specifications.
CO 2	Design the transformers of given specifications.
CO 3	Prepare the detailed sketches of the designed machines.

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	3rd Year	Semester:	6
Course title:	Control of Electrical Drives	Course code	23050607
Course type:	Department Elective -I	Course credit:	4

Course Outcome: -

CO STATEMENTS

CO 1	Select a drive for a particular application based on power rating.
CO 2	Select a drive based on mechanical characteristics for a particular drive application.
CO 3	Operate and maintain solid state drives for speed control of DC and AC machines.
CO 4	Operate and maintain solid state drives for speed control of various special electrical machines.

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	3rd Year	Semester:	6
Course title:	Advance Microcontroller	Course code	**23050606**
Course type:	3rd Year	Course credit:	4

Course Outcome: -

CO STATEMENTS

CO 1	Understand how microcontroller and its peripherals function.
CO 2	Interface to external peripherals
CO 3	Program an embedded system in assembly and C
CO 4	Design, implement and test a single-processor embedded systems for real-time applications
CO 5	Optimizing embedded software for speed and size for industrial applications

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Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	4th Year	Semester:	7
Course title:	Switchgear & Protection	Course code	**23050702**
Course type:	Professional core	Course credit:	5

Course Outcome: -

CO STATEMENTS

CO 1	Explain the purposes of protection, in relation to major types of apparatus, protection principle, dangers and criteria.
CO 2	Choose and justify a suitable protection system for a specified application.
CO 3	Analyze and compare specified protection systems
CO 4	Compare merits of various principles, relay hardware and interrupting devices.
CO 5	Compare the different type of circuit breakers performance based on which selection of circuit breaker can be made for a given application

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	4th Year	Semester:	7
Course title:	Interconnected Power System	Course code	23050701
Course type:	Professional core	Course credit:	5

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Course Outcome: -

CO STATEMENTS

CO 1	Model modern power system network.
CO 2	Solve the problem of power flow through any power system network
CO 3	Find economical generation of power and rescheduling of power Solve swing equation
CO 4	Find the stability of a power system
CO 5	Find the variation in the frequency because of change in generation

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	4th Year	Semester:	7
Course title:	Design of AC Machines	Course code	23050703
Course type:	Professional core	Course credit:	4

Course Outcome: -

CO STATEMENTS

CO 1	Design the Induction machines of given specifications.
CO 2	Prepare the detailed sketches of the designed machine.
CO 3	Use computer for electrical machine design.
CO 4	Design the synchronous machines of given specifications.

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Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	4th Year	Semester:	7
Course title:	Advanced Power Electronics	Course code	23050704
Course type:	Department Elective -II	Course credit:	4

Course Outcome: -

CO STATEMENTS

CO 1	Evaluate different dc-dc voltage regulators.
CO 2	Simulate and analyze resonant converters.
CO 3	Select appropriate phase shifting converter for a multi-pulse converter.
CO 4	Evaluate various multi-level inverter configurations.

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	4th Year	Semester:	7
Course title:	Industrial Instrumentation	Course code	23050705
Course type:	Department Elective -II	Course credit:	4

Course Outcome: -

CO STATEMENTS

CO 1	Select a transducer based on its operating characteristics for the required application.
CO 2	Check various available techniques available and select appropriate to obtain satisfactory task for the parameter to be measured.
CO 3	Know advantages and limitations of selected techniques.
CO 4	Interpret the measurement results and cause of any possible error.

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Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	4th Year	Semester:	8
Course title:	Power System Planning & Design	Course code	23050801
Course type:	Professional core	Course credit:	4

Course Outcome: -

CO STATEMENTS

CO 1	Design transmission line (electrical and mechanical aspects)
CO 2	Design primary and secondary distribution.
CO 3	Selection of sizes and location of generating stations, substations.
CO 4	Explain the basic concepts of power system earthing and measurement of earthing resistance.
CO 5	Explain the basic concepts of insulation co-ordination.
CO 6	Explain the basic concepts of generation planning, transmission planning and distribution planning.

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	4th Year	Semester:	8
Course title:	Power System Operation & Control	Course code	23050803
Course type:	Engineering Science	Course credit:	3

Course Outcome: -

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CO STATEMENTS

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CO 1	Understand the techniques to control power flows, frequency andvoltage.
CO 2	Explore the significance of power systemrestructuring.
CO 3	Perform system state estimation and explore itsimportance.
CO 4	Learn the power system security and its application as a systemoperator.
CO 5	Carry out load forecasting using availablemethods.

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	4th Year	Semester:	8
Course title:	Energy Consservation & Audit	Course code	23050804
Course type:	Department Elective - III	Course credit:	4

Course Outcome: -

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CO STATEMENTS

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CO 1	Identify and assess the energy conservation/saving opportunities in different electric system
CO 2	Identify and assess energy conservation opportunities in thermal system
CO 3	Demonstrate skills required for energy audit and management.
CO 4	Prepare energy flow diagrams and energy audit report
CO 5	Suggest cost-effective measures towards improving energy efficient and energy conservation

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Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	4th Year	Semester:	8
Course title:	Testing & Commissioning of Electrical Equipments	Course code	23050802
Course type:	Professional Core	Course credit:	4

Course Outcome: -

CO STATEMENTS

CO 1	Preparation of maintenance schedule of different equipment and machines.
CO 2	Trouble shooting chart for various electrical equipment, machines and domestic appliances.
CO 3	Procedure of different types of earthing for different types of electrical installations.
CO 4	Familiar about electrical safety regulations and rules during maintenance.

Program:	Bachelor of Engineering	Branch:	Electrical Engineering
Year:	4th Year	Semester:	8
Course title:	Power Quality Management	Course code	23050805
Course type:	Department Elective - III	Course credit:	4

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Course Outcome: -

CO STATEMENTS

CO 1	Understand the major power quality problems.
CO 2	Use equipment that are required to measure the quality of power
CO 3	Apply and analyze/compare techniques available to mitigate power quality problems.
CO 4	To observe & Analyze Total Harmonic distortion using FFT Analysis.

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SWARRNIM INSTITUTE OF TECHNOLOGY
PROGRAM NAME :- M.TECH IN ELECTRICAL POWER SYSTEM ENGINEERING
ACADEMIC YEAR 2023 -2024
COURSE OUT COME OF M.TECH ELECTRICAL POWER SYSTEM ENGINEERING
SEMESTER I – IV

COURSE OUT COME OF M.TECH ELECTRICAL POWER SYSTEM ENGINEERING - SEM – I

Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	1
Course title:	Applied linear algebra	Course code	24010101
Course type:	Basic Science	Course credit:	6

Course Outcome:-

Sr.No	CO Statement
CO 1	Define matrices, linear equations, and determinants, recall basic vector algebra.
CO 2	Understand basic concepts such as vector spaces, linear dependence /independence of vectors, basis and linear maps.
CO 3	Analyze and calculate eigen values, eigen vectors, rank nullity of a matrix / linear map.
CO 4	Pro ve theorems, apply Gram-Schmidt process on inner product spaces, diagonalize special matrices.
CO 5	Apply concepts of linear algebra to various applications including real life problems.

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	1
Course title:	Electrical Drives	Course code	24010105
Course type:	Major Elective - I	Course credit:	6

Course Outcome:-

Sr.No	CO Statement
CO 1	Ability to analyze the steady state models of DC and AC motors
CO 2	Ability to evaluate the different speed control methods on different performance parameters
CO 3	Ability to describe and operate the DC and AC machines in different quadrants as per load requirements
CO 4	Ability to determine the components of electrical drive for the required applications
CO 5	Ability to select and design the power electronics converter based control logic for speed control of DC and AC motors

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	1
Course title:	Instrumentation	Course code	24010106
Course type:	Major Elective - I	Course credit:	6

Course Outcome:-

Sr.No	CO Statement
CO 1	Use A/D and D/A convertors and Data Acquisition System.
CO 2	Carry out interfacing using USB ports and different networks medium.
CO 3	Understand the different communication protocols.
CO 4	Carry out the industrial application.

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	1
Course title:	Advanced power system protection & switchgear	Course code	24010104
Course type:	Major Elective - I	Course credit:	6

Course Outcome:-

Sr.No	CO Statement
CO 1	Analyze the tripping characteristics of various relays and its applications.
CO 2	Design inductors and transformers for power electronic converters.
CO 3	To operate various static relays, set their parameters and also to confirm its operations.
CO 4	To operate various Numeric relays, set their parameters and also to confirm its operations.

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	1
Course title:	Computer methods in power system analysis	Course code	24010103
Course type:	Professional core	Course credit:	6

Course Outcome:-

Sr.No	CO Statement
CO 1	Recent techniques and computer application for modeling of practical and large interconnected power system networks using programming languages.
CO 2	Recent methodologies for simulation and analysis of power system networks like real and reactive power flows and optimal scheduling.
CO 3	Effect of outage of any important component of power system on the operation and reliability of power systems.
CO 4	Algorithm required to find out parameters for monitoring and control of power system in real time from actual measurement data.
CO 5	Computer Algorithms used to solve algebra-differential pertaining to power system to assess the stability performance of power systems.

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	1
Course title:	Power Electronics	Course code	24010102
Course type:	Professional core	Course credit:	6

Course Outcome:-

Sr.No	CO Statement
CO 1	Analyze the characteristics of Power electronics devices and to determine the suitable device for a particular application.
CO 2	Analyze, design and operate DC-DC converters, phase controlled converters, inverters and AC-AC converters
CO 3	Design inductors and transformers for power electronic converters
CO 4	Design of driver, protection and control circuits for power electronic devices
CO 5	Design the schemes for reduction or elimination of harmonics.

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	1
Course title:	Research Skills	Course code	24010001
Course type:	Professional core	Course credit:	2

Course Outcome:-

Sr.No	CO Statement
CO 1	Conduct a quality literature review and find the research gap
CO 2	Identify an original and relevant problem and identify methods to find its solution
CO 3	Validate the model
CO 4	Present and defend the solution obtained in an effective manner in written or spoken form.

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COURSE OUT COME OF M.TECH ELECTRICAL POWER SYSTEM ENGINEERING - SEM - II

Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	2
Course title:	Electrical Machine Modeling And Analysis	Course code	24010202
Course type:	Professional core	Course credit:	6

Course Outcome:-

Sr.No	CO Statement
CO 1	Understanding of the principles of operation for various electrical machines
CO 2	Construction, characteristics, and performance of these machines.
CO 3	Understand and apply different modeling approaches like dynamic, steady-state, and transient analyses.
CO 4	Understand the impact of different operating conditions and parameters on machine performance.

Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	2
Course title:	Modern control system	Course code	24010201
Course type:	Professional core	Course credit:	5

Course Outcome:-

Sr.No	CO Statement
CO 1	Understand how the state space system representation provides an internal description of the system including possible internal oscillations or instabilities.
CO 2	Design state observers.
CO 3	Place closed loop poles at desirable locations
CO 4	Derive the describing function for different types of non-linearities and then do the stability analysis
CO 5	Understand how the system design minimizes or maximizes the selected performance index

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	2
Course title:	Economics Of Energy Generation & Supply	Course code	24010215
Course type:	Inter department Elective	Course credit:	6

Course Outcome:-

Sr.No	CO Statement
CO 1	Understand the concepts of energy management.
CO 2	Forecast energy demand.
CO 3	Forecast energy demand 3. Analyze economics of energy supply

Program:	Master of Engineering	Branch:	EE
Year:	1st Year	Semester:	2
Course title:	Digital Signal Processing For Power Electronics	Course code	24010214
Course type:	Inter department Elective	Course credit:	6

Course Outcome:-

Sr.No	CO Statement
CO 1	Understand the basics of power diodes, power bipolar junction transistors, metal oxide semiconductior field effect transistor, insulated gate bipolar transistors.
CO 2	Understanding of various power converter topologies like buck, boost, buck boost, cuk, half bridge and full bridge.
CO 3	Students will be able to generate pulse width modulated output using TMS320F2407/28335 high performance

Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	2
Course title:	Power System Transients	Course code	24010208
Course type:	Major Elective III	Course credit:	5

Course Outcome:-

Sr.No	CO Statement
CO 1	Understand how the various types of Transients in the system produced and provide an internal description of the system including possible Transients in the systems
CO 2	Understand Lightning and effect on power systems.
CO 3	Understand Modelling of transmission line for travelling waves.
CO 4	Understand the protection of power system against transient over voltages.
CO 5	Design ideas of Insulations under the presence of transients.

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	2
Course title:	Artificial Intelligent Application To Power System	Course code	24010209
Course type:	Major Elective III	Course credit:	5

Course Outcome:-

Sr.No	CO Statement
CO 1	Understand how the soft computing techniques can be used for solving the problems of power systems operation and control.
CO 2	Solve problem of Optimization in power systems
CO 3	Design of ANN based systems for function approximation used in load forecasting.
CO 4	Design of Fuzzy based systems for load frequency control in power systems
CO 5	Solve problem of Optimization in power systems.

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	2
Course title:	Digital Control System	Course code	24010206
Course type:	Major Elective II	Course credit:	6

Course Outcome:-

Sr.No	CO Statement
CO 1	Do the z-transform analysis for open and closed loop systems.
CO 2	Design digital control system.
CO 3	Do stability analysis of discrete time system.

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	2
Course title:	Advanced Power Converters	Course code	24010205
Course type:	Major Elective II	Course credit:	6

Course Outcome:-

Sr.No	CO Statement
CO 1	Simulate and design resonant converters.
CO 2	Select and design the appropriate phase shifting converter for a multi-pulse converter.
CO 3	Evaluate various multi-level inverter configurations and design control schemes for them
CO 4	Apply the knowledge of power electronic converters in the area of Power Systems, Renewable Energy Sources and other industrial applications.

Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	2
Course title:	FACTS Devices	Course code	24010203
Course type:	Major Elective II	Course credit:	6

Course Outcome:-

Sr.No	CO Statement
CO 1	Analyze reactive power requirement and management.
CO 2	Assess and evaluate various compensators
CO 3	Simulate and design compensators
CO 4	Analyze various control schemes in HVDC system.

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	2
Course title:	Power System Management & Optimization	Course code	24010204
Course type:	Major Elective II	Course credit:	6

Course Outcome:-

Sr.No	CO Statement
CO 1	Learn the unified and exact mathematical basis as well as the general principles of optimization techniques.
CO 2	Understand detailed theoretical and practical aspects of application of optimization techniques
CO 3	Formulate deterministic mathematical programs and solutions for Power System applications
CO 4	Determine the operating condition of the power systems, in which optimization of some system variable are obtained

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	2
Course title:	Robotics & Automation	Course code	24010213
Course type:	Major Elective III	Course credit:	5

Sr.No	CO Statement
CO 1	Understand various terminology and co-ordinate frame structures.
CO 2	Design mapping from one space to another and coordinate transformation
CO 3	Understand modeling of both forward and inverse kinematics.
CO 4	Carry out the dynamic modeling of manipulator to find the forces and torques to cause the motion of manipulator.
CO 5	Design trajectory planning through specified points or paths.

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	**Semester:**	2
Course title:	Adaptive Control	**Course code**	24010212
Course type:	Major Elective III	**Course credit:**	5

Course Outcome:-

Sr.No	CO Mapping
CO 1	The general principles of adaptive control and learning.
CO 2	The System identification (i.e. learning a model from empirical data
CO 3	Analyze the behaviour of adaptive control schemes such as model reference adaptive control and self-tuning regulators
CO 4	Issues of convergence, stability, and robustness
CO 5	Various analytical methods i.e. Methods from averaging theory and singular perturbation.

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	2
Course title:	Industrial Electronics And Instrumentation	Course code	24010211
Course type:	Major Elective III	Course credit:	5

Course Outcome:-

Sr.No	CO Statement
CO 1	Demonstrate concepts of different transducers and use them in industrial applications.
CO 2	Design measurement and signal conditioning circuits for industrial applications
CO 3	Design wiring schemes for industrial control.
CO 4	To take corrective measures for EMI

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	1st Year	Semester:	2
Course title:	Non-Linear Control System	Course code	24010207
Course type:	Major Elective III	**Course credit:**	6

Course Outcome:-

Sr.No	CO Statement
CO 1	Fundamentals of nonlinear systems analysis and control.
CO 2	Analysis of nonlinear systems, driven by a number of real-world examples, and some preliminary mathematical background.
CO 3	Stability through Lyapunov techniques and input-output analysis.
CO 4	Control of nonlinear systems, through feedback linearization, sliding mode control, and gain scheduling.

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COURSE OUT COME OF M.TECH ELECTRICAL POWER SYSTEM ENGINEERING - SEM - III

Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	2nd Year	Semester:	3
Course title:	Power System Dynamics and Control	Course code	24010302
Course type:	Major Elective – IV	Course credit:	6

Course Outcome:

Sr.No	CO Statement
CO 1	Explain the dynamic models of power system components.
CO 2	Select the appropriate model depending on the analysis to be done.
CO 3	Prepare the detailed simulations for single machine and multi-machine systems
CO 4	Analyze the performance of the system with small signal analysis.
CO 5	Explain the controllers and their significance in power system

Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	2nd Year	Semester:	3
Course title:	Power Quality Issues And Their Mitigation Techniques In Power Systems	Course code	24010301
Course type:	Major Elective – IV	Course credit:	6

Course Outcome: -

Sr.No	CO Statement
CO 1	Comprehend concept of Power Quality & it's issues for various electrical systems .
CO 2	Understand effects of power quality on electrical apparatus
CO 3	Know different power quality improvement.

Program:	Master of Engineering	**Branch:**	Electrical Engineering
Year:	2nd Year	**Semester:**	3
Course title:	Seminar - I	**Course code**	24000001
Course type:	Skill	**Course credit:**	4

Course Outcome: -

Sr No.	CO Statement
CO 1	Establish motivation for any topic of interest and develop a thought process for technical presentation
CO 2	Organize a detailed literature survey and build a document with respect to technical publications.
CO 3	Analysis and comprehension of proof-of-concept and related data.
CO 4	Effective presentation and improve soft skills.
CO 5	Make use of new and recent technology (e.g. Latex) for creating technical reports

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	2nd Year	Semester:	3
Course title:	Internal Review	Course code	24000002
Course type:	Dissertation	Course credit:	2

Course Outcome: -

Sr No.	CO Statement
CO 1	Understand the chosen research topic and its relevant challenges.
CO 2	Systematically identify relevant theoretical concepts and appropriate quality literature from reputed recent journal publications to validate the problem statement.
CO 3	Do a comparative analysis of the existing solutions for the chosen research problem and identify the further scope of work
CO 4	Evaluate the comparative analysis with relevant quantitative and qualitative performance parameters using problem-specific datasets.
CO 5	Design a hypothesis with significant technicality using the appropriate algorithm/methodology to solve the chosen research problem.

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	2nd Year	Semester:	3
Course title:	Dissertation Phase - I	Course code	24000003
Course type:	Dissertation	Course credit:	10

Course Outcome: -

Sr No.	CO Statement
CO 1	Design a research investigation that incorporates appropriate theoretical approaches, conceptual models, and a review of the existing literature.
CO 2	Learn to structure a discussion coherently and convincingly by synthesizing the material in the context of the research questions.
CO 3	Get good literature/experimental data collection for the implantation/experimentation in Dissertation Phase-II.

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	2nd Year	Semester:	4
Course title:	Power System Restructuring	Course code	24010402
Course type:	Major Elective – IV	Course credit:	4

Course Outcome: -

Sr No.	CO Statement
CO 1	This course is intended to provide a comprehensive treatment towards understanding of the new dimensions associated with the power systems.
CO 2	The course will bring out the differences between the conventional power system operation and the restructured one. the course will prepare a background with fundamentals of microeconomics
CO 3	In this course the design of power markets and market architectural aspects, the changes in operational aspects with new operational challenges like congestion management and ancillary service management will be elaborated.
CO 4	One of the outcome of the course also efficient pricing of transmission network usage operation and Genco bidding strategies and market power with mitigation techniques.

Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	2nd Year	Semester:	4
Course title:	Smart Grid Technology and Applications	Course code	24010401
Course type:	Major Elective – IV	Course credit:	4

Course Outcome: -

Sr. No	CO Statement
CO 1	Know what a function of smart grid is, what is the futuristic grid
CO 2	Issues while implementing the smart grid approach.
CO 3	Concept of Microgrid and distributed generation.
CO 4	Need of communication technology in smart grid.

Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	2nd Year	Semester:	4
Course title:	Seminar - II	Course code	24000006
Course type:	Skill	Course credit:	4

Course Outcome: -

Sr No.	CO Statement
CO 1	Establish motivation for any topic of interest and develop a thought process for technical presentation
CO 2	Organize a detailed literature survey and build a document with respect to technical publications.
CO 3	Analysis and comprehension of proof-of-concept and related data.
CO 4	Effective presentation and improve soft skills.
CO 5	Make use of new and recent technology (e.g. Latex) for creating technical reports

Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	2nd Year	Semester:	4
Course title:	External Mid Sem Review	Course code	24000004
Course type:	Dissertation	Course credit:	10

Course Outcome: -

Sr No.	CO Statement
CO 1	Systematically identify relevant theoretical concepts and appropriate quality literature from reputed recent journal publications to validate the problem statement.
CO 2	Do a comparative analysis of the existing solutions for the chosen research problem and identify the further scope of work.
CO 3	Evaluate the comparative analysis with relevant quantitative and qualitative performance parameters using problem-specific datasets.
CO 4	Design a hypothesis with significant technicality using the appropriate algorithm/methodology to solve the chosen research problem.

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Program:	Master of Engineering	Branch:	Electrical Engineering
Year:	2nd Year	Semester:	4
Course title:	Dissertation Phase - II	Course code	24000005
Course type:	Dissertation	Course credit:	12

Course Outcome: -

Sr No.	CO Statement
CO 1	Design a research investigation that incorporates appropriate theoretical approaches, conceptual models, and a review of the existing literature.
CO 2	Learn to structure a discussion coherently and convincingly by synthesizing the material in the context of the research questions.
CO 3	Get good literature/experimental data collection for the implantation/experimentation in Dissertation Phase-II.

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DEPARTMENT: INFORMATION TECHNOLOGY

Program:	Bachelor of Engineering	Branch:	CE
Year:	1st Year	Semester:	1
Course title:	Maths-I	Course code	23000001
Course type:	Engineering Science	Course credit:	5

CO 1	Analyze and manipulate infinite sequences and series.
CO 2	Evaluate limits involving indeterminate forms.
CO 3	Understand and apply techniques for improper integrals.
CO 4	Analyze functions of several variables and solve optimization problems.
CO 5	Solve systems of linear equations using matrices and determinants.
CO 6	Analyze eigenvalues and eigenvectors for linear transformations and matrices.

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Program:	Bachelor of Engineering	Branch:	CE
Year:	1st Year	Semester:	1
Course title:	Fundamentals of Computer Programming	Course code	23000004
Course type:	Engineering Science	Course credit:	4

CO 1	Apply fundamental principles of problem solving in software engineering.
CO 2	Apply basic programming principles using C language.
CO 3	Apply basic C program structure in software development
CO 4	Prepare graduates for professional careers in roles including, but not limited to, the following: computer programmer, software engineer, software systems designer, software applications developer, technical software project lead, computer systems analyst, computer systems programmer, software applications tester and maintainer.
CO 5	To prepare graduates with the knowledge and skills to do advanced studies and research in computer science and related engineering and scientific disciplines
CO 6	To equip graduates with the communication skills, both oral and written, to become an effective team-oriented problem solver as well as an effective communicator with nontechnical stakeholders in computer and software systems development, maintenance and administration.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1st Year	Semester:	1
Course title:	Elements of Electrical Engineering	Course code	23000012
Course type:	Engineering Science	Course credit:	5

CO 1	Define electrical current, potential difference, power and energy, sources of electrical energy, resistance and its behavior with temperature.
CO 2	Understand the different types of wires, cables, connectors & switches used for wiring Different types of domestic and industrial wiring.
CO 3	Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
CO 4	Analyze the steady state behavior of single phase and three phase AC electrical circuits.
CO 5	Compare various protective devices of working principle, usage and construction such as fuse, MCB, ELCB & Relays.
CO 6	Design and development of varies Electrical Wiring and electronics miniproctes.

Program:	Bachelor of Engineering	Branch:	IT
Year:	1st Year	Semester:	1
Course title:	Elements of Mechanical Engineering	Course code	23000003
Course type:	Engineering Science	Course credit:	6

CO 1	Discribe the various sources of energy and basic terminology of Mechanical engineering.
CO 2	Make calculations for commonly used working fluids i.e. ideal gases and steam.
CO 3	Analyze various heat engine cycles and understand construction and working of IC engines.
CO 4	Discuss working and applications of steam boilers and various energy conversion systems.
CO 5	Discuss various power transmission elements and properties of various engineering materials with their applications.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1st Year	Semester:	1
Course title:	Environmental Studies	Course code	23000006
Course type:	Engineering Science	Course credit:	2

CO 1	Describe natural resources, importance of ecosystem and conservation of biodiversity with respect to multiple disciplines.
CO 2	Explain causes, effects, solutions for various pollution problems and its minimization strategies.
CO 3	Differentiate between requirements of laws and regulations for environmental conservation and applicability of legislations in society and industries.
CO 4	Discuss environmental ethics and their implementation for betterment of environment and human life.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1st Year	Semester:	1
Course title:	Orientation Program in Startup and Entrepreneurship	Course code	12300001
Course type:	Engineering Science	Course credit:	3

CO 1	Apply the basic principles of entrepreneurship
CO 2	Distinguish the concepts of the entrepreneurship ecosystem, entrepreneurship education, and various entrepreneurial opportunities.
CO 3	Understanding various individual attributes of entrepreneurial personality traits, entrepreneurial characteristics, behavioural attributes and importance of creativity and innovation.
CO 4	Develop an understanding of best techniques for idea generation and opportunities exploration.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1st Year	Semester:	1
Course title:	Workshop	Course code	23000029
Course type:	Engineering Science	Course credit:	4

CO 1	Understand applications of hand tools and power tools and operations of machine tools.
CO 2	Understand the operations of machine tools.
CO 3	Select the appropriate tools required for specific operation.
CO 4	Comprehend the safety measures required to be taken while using the tools.
CO 5	Prepare Fitting, Carpentry, Plumbing, Welding, and Tin-smithy Jobs.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1stYear	Semester:	1
Course title:	Electronics Workshop	Course code	23000002
Course type:	Engineering Science	Course credit:	4

CO 1	Measure different electrical quantities.
CO 2	Understand the requirements and operation of safety devices
CO 3	Select the appropriate tools and components required for the specific operation
CO 4	Wire and trouble shoot of household appliances.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1st Year	Semester:	2
Course title:	Maths-II	Course code	23000010
Course type:	Engineering Science	Course credit:	5

CO 1	Understand vectors in $R^n \times R^n$ and operations involving linear combinations.
CO 2	Identify subspaces and determine basis and dimension and Perform coordinate transformations and understand the change of basis.
CO 3	Understand linear transformations and their properties and Represent linear transformations with matrices and explore the concept of similarity.
CO 4	Apply inner product spaces to least squares approximation and diagonalization of symmetric matrices and Explore applications of quadratic forms and optimization.
CO 5	Apply double and triple integrals over different regions and Utilize Fubini's theorem and change of variables in multiple integrals.
CO 6	Apply integration techniques to calculate volumes of various solids.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1st Year	Semester:	2
Course title:	Engineering Physics	Course code	23000005
Course type:	Engineering Science	Course credit:	5

CO 1	Understand the basic concepts and classification of sound.
CO 2	Analyze applications of superconductors.
CO 3	Understand the fundamentals of laser radiation.
CO 4	Evaluate the applications of optical fibers.
CO 5	Apply dielectric materials in capacitors and transformers.
CO 6	Explore applications of magnetic materials.
CO 7	Explain the synthesis and applications of nonmaterial's.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1st Year	Semester:	2
Course title:	Communication Skills	Course code	23000008
Course type:	Engineering Science	Course credit:	3

CO 1	To improve students' communicative and linguistic approach in English.
CO 2	To provide an ice-breaking technique using LSRW skills and soft skills
CO 3	To learn techniques to improve overall communication abilities and effective use of writing in the field of advertising and public relations.
CO 4	Improve communication skills through practicing debate, discussion and appearing in interview.
CO 5	Use of ethical consideration in order to develop good etiquettes both in online and offline communication.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1st Year	Semester:	2
Course title:	Basic Electronics	Course code	23000009
Course type:	Engineering Science	Course credit:	5

CO 1	To study basics of semiconductor & devices and their applications in different areas.
CO 2	Demonstrate the operating principle and output characteristics of pn junction diodes, zener diode, Varactor diode, BJT, rectifiers and different diode circuits
CO 3	Compute and characterization of different biasing techniques to operate transistor FET, MOSFET and operational amplifier in different modes
CO 4	To implementation of basic digital gates using diode and basic family of logic Families

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1st Year	Semester:	2
Course title:	Engineering Graphics	Course code	23000011
Course type:	Engineering Science	Course credit:	6

CO 1	Describe the fundamental methods of engineering drawing, sketching and drafting.
CO 2	Understanding the object through orthographic projections.
CO 3	Construct basic and intermediate geometry and application of engineering curves.
CO 4	Enhance visualization skills for developing new products.
CO 5	Develop new products through technical communication skill in the form of communicative drawings.
CO 6	Develop the theory of orthographic projection and views.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1st Year	Semester:	2
Course title:	Elements of Civil Engineering	Course code	23000015
Course type:	Engineering Science	Course credit:	6

CO 1	Carry out simple land survey to prepare maps with existing details.
CO 2	Find out area of irregular shaped plane figures.
CO 3	Understand building plan elevation and section.
CO 4	Get acquainted with construction materials.
CO 5	Get acquainted with hydrological cycle and hydraulic structures.
CO 6	Get acquainted with mass transportation systems.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1stYear	Semester:	2
Course title:	BASIC PROGRAM IN ENTREPRENURESHIP	Course code	12300002
Course type:	Engineering Science	Course credit:	3

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

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1st Year	Semester:	2
Course title:	Chemistry	Course code	23020216
Course type:	Engineering Science	Course credit:	4

CO 1	To relate periodic properties such as ionization potential, oxidation states and electro negativity.
CO 2	To analyze microscopic chemistry in terms of atomic and molecular orbital's and inter molecular forces.
CO 3	To describe the importance and relevance of chemistry in our everyday life
CO 4	To select the appropriate chemical material and utilization of it.
CO 5	To interpret the methods of science as a logical means of problem solving.
CO 6	To distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1st Year	Semester:	2
Course title:	Personality Development	Course code	24190203
Course type:	Engineering Science	Course credit:	3

CO 1	To provide an icebreaking technique using LSRW skills and soft skills
CO 2	To learn techniques to improve overall communication abilities and effective use of writing in the field of advertising and public relations.
CO 3	Improve communication skills through practicing debate, discussion and appearing in interview.
CO 4	Use of ethical consideration in order to develop good etiquettes both in online and offline communication.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1st Year	Semester:	2
Course title:	Web Technology	Course code	24190204
Course type:	Engineering Science	Course credit:	4

CO 1	Write and debug JavaScript to enhance user interactivity and improve the user experience.
CO 2	Understand server-side programming concepts using languages such as Node.js, Python, or PHP.
CO 3	Create responsive and visually appealing web pages using HTML, CSS, and JavaScript.
CO 4	Explain the basic principles of how the web works, including HTTP, URLs, and web servers.
CO 5	Use Git for version control, including branching, merging, and collaboration workflows.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1st Year	Semester:	2
Course title:	Introduction to Cloud Technology	Course code	24190205
Course type:	Engineering Science	Course credit:	3

CO 1	Compare major cloud service providers (e.g., AWS, Azure, Google Cloud) and their offerings.
CO 2	Recognize key security principles and practices in cloud environments, including data protection, compliance, and identity management.
CO 3	Set up and manage basic cloud services, such as virtual machines, storage solutions, and databases.
CO 4	Use cloud management and monitoring tools to oversee cloud resources, optimize performance, and manage costs.
CO 5	Identify emerging trends in cloud technology, such as serverless computing, containerization, and edge computing.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1st Year	Semester:	2
Course title:	Engineering Graphics & Design	Course code	24190206
Course type:	Engineering Science	Course credit:	4

CO 1	Explain the principles of engineering graphics, including the importance of technical drawing in engineering design and communication.
CO 2	Apply geometric construction methods to create and analyze shapes, dimensions, and spatial relationships.
CO 3	Construct and visualize 3D models using CAD software, demonstrating an understanding of spatial relationships and design principles.
CO 4	Analyze and evaluate design concepts for functionality, manufacturability, and aesthetics, using appropriate tools and techniques.
CO 5	Work collaboratively in teams to develop a design project from concept through to presentation, demonstrating project management and teamwork skills.
CO 6	Explain the principles of engineering graphics, including the importance of technical drawing in engineering design and communication.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1stYear	Semester:	2
Course title:	Mentoring and Counselling	Course code	24190207
Course type:	Engineering Science	Course credit:	

CO 1	Explain key theories and principles of mentoring and counseling, including various approaches and methodologies.
CO 2	Demonstrate active listening, empathy, and nonverbal communication techniques essential for building rapport with mentees or clients.
CO 3	Foster an inclusive and supportive environment that encourages open communication and trust between the mentor/counselor and the mentee/client.
CO 4	Engage in self-reflection to assess personal strengths and areas for growth as a mentor or counselor, fostering continuous professional development.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	1st Year	Semester:	2
Course title:	Open Project / MOOC	Course code	24190208
Course type:	Engineering Science	Course credit:	

CO 1	Identify and articulate the goals and objectives of their open project, ensuring alignment with personal or community needs.
CO 2	Utilize project management tools and techniques to organize, monitor, and evaluate project progress effectively.
CO 3	Identify, evaluate, and utilize open educational resources (OER) to enhance learning and project outcomes.
CO 4	Engage in self-reflection to assess personal growth, learning experiences, and challenges faced during the project.

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Semester: 3

Program:	Bachelor of Engineering	Branch:	IT
Year:	2nd Year	Semester:	3
Course title:	Maths - III	Course code	2300015
Course type:	Engineering ScienIT	Course credit:	5

CO 1	Apply Fourier series to analyze and represent periodic functions.
CO 2	Apply Laplace transforms to solve differential equations and system problems.
CO 3	Apply methods such as integrating factor, Bernoulli equations, and linear differential equations.
CO 4	Apply series solutions to solve differential equations and analyze the convergence and divergence of series solutions.
CO 5	Apply the method of separation of variables to solve PDEs to analyze solutions in cylindrical and spherical polar coordinates.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	2nd Year	Semester:	3
Course title:	Digital Electronics	Course code	23070301
Course type:	Engineering ScienIT	Course credit:	5

CO 1	Have a thorough understanding of the fundamental conITpts and techniques used in
CO 2	Apply on Gate of digital electronics.
CO 3	To understand and examine the structure of various number systems and its
CO 4	Application in digital design.
CO 5	The ability to understand, analyze and design various combinational and sequential

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Program:	Bachelor of Engineering	Branch:	IT
Year:	2nd Year	Semester:	3
Course title:	Data Structure And Algorithm	Course code	23040302
Course type:	Engineering Science	Course credit:	5

CO 1	Learn the basic types for data structure, implementation and application.
CO 2	Know the strength and weakness of different data structures.
CO 3	Use the appropriate data structure in context of solution of given problem..
CO 4	Develop programming skills which require solving given problem.
CO 5	Learn the data structure, implementation and application.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	2nd Year	Semester:	3
Course title:	Database Management System	Course code	23040301
Course type:	Engineering Science	Course credit:	5

CO 1	Understand the basic conITpts of database management systems (L2)
CO 2	Apply SQL to find solutions to a broad range of queries (L3).
CO 3	Apply normalization techniques to improve database design (L3)
CO 4	Analyze a given database application sITnario to use ER model
CO 5	ConITptual design of the database

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Program:	Bachelor of Engineering	Branch:	IT
Year:	2nd Year	Semester:	3
Course title:	Computer Network	Course code	23040303
Course type:	Engineering Science	Course credit:	4

CO 1	Understand Basics of Computer Networks and different
CO 2	Transmission Media.
CO 3	Differentiate Protocols which play a major role in providing
CO 4	**Computer** network internet effectively.
CO 5	Understand various protocol layers and inner operations.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	2 Year	Semester:	4
Course title:	Operating System	Course code	23040401
Course type:	Engineering Science	Course Credit	4

CO 1	Describe the basics of the operating systems, mechanisms of OS to handle proITsses, threads, and their communication.
CO 2	Describe the basics of the operating systems, mechanisms of OS to handle proITsses, threads, and th communication.
CO 3	Differentiate Protocols which play a major role in providing
CO 4	Discuss the storage management policies with respect to different storage management technologies
CO 5	Analyze the memory management and its allocation policies

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Program:	Bachelor of Engineering	Branch:	IT
Year:	2Year	Semester:	4
Course title:	Object Oriented Programming with C++	Course code	23040402
Course type:	Engineering ScienIT	Course Credit	5

CO 1	Codes basic programs in Java programming language.
CO 2	Prints to the screen in Java language.
CO 3	Makes relational operations in Java.
CO 4	Constructs loops in Java.
CO 5	Defines arrays in Java and uses them.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	2Year	Semester:	4
Course title:	System Software	Course code	**23040403**
Course type:	Engineering Science	Course Credit	4

CO 1	To understand the relationship between system software and machine
CO 2	To understand architecture.
CO 3	To understand the proITssing of an HLL program for execution on a computer.
CO 4	To understand the proITss of scanning and parsing.
CO 5	To know the design and implementation of assemblers, macro proITssor, linker

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Program:	Bachelor of Engineering	Branch:	IT
Year:	2 Year	Semester:	4
Course title:	Computer Organization and MicroProcessor	Course code	23070401
Course type:	Engineering Science	Course Credit	4

CO 1	To know the background of internal communication of computer
CO 2	To have better idea on how to write assemble language programs
CO 3	To be clear with memory management techniques
CO 4	To better with IO deviITs communication with proITssor
CO 5	To notiIT how to perform computer arithmetic operations

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Semester: 5

Program:	Bachelor of Engineering	Branch:	IT
Year:	3 Year	Semester:	5
Course title:	Object Oriented Programming with JAVA	Course code	23040501
Course type:	Engineering Science	Course Credit	6

CO 1	Able to solve real world problems using OOP techniques.
CO 2	Able to understand the use of abstract classes.
CO 3	Able to solve problems using java collection framework and I/o classes.
CO 4	Able to develop multithreaded applications with synchronization.
CO 5	Able to develop applets for web applications.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	3 Year	Semester:	5
Course title:	Computer Graphics and Visualization	Course code	23040506
Course type:	Engineering Science	Course Credit	4

CO 1	Understand the basics of computer graphics, different
CO 2	Graphics systems and applications of computer graphics.
CO 3	Discuss various algorithms for scan conversion and
CO 4	Filling of basic objects and their comparative analysis.
CO 5	Use of geometric transformations on graphics objects

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Program:	Bachelor of Engineering	Branch:	IT
Year:	3 Year	Semester:	5
Course title:	Information Network & Cyber Security	Course code	23040503
Course type:	Engineering Science	Course Credit	4

CO 1	Identify some of the factors driving the need for network security.
CO 2	Identify and classify particular examples of attacks.
CO 3	Define the terms vulnerability, threat and attack.
CO 4	Identify physical points of vulnerability in simple networks.
CO 5	Identify the need for network security.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	3 Year	Semester:	5
Course title:	IT Industry Management with ERP	Course code	23080501
Course type:	Engineering Science	Course Credit	3

CO 1	To provide a contemporary and forward-looking on the theory and practice of
CO 2	Enterprise Resource Planning Technology.
CO 3	To focus on a strong emphasis upon practice of theory in Applications and Practical-
CO 4	To aim at preparing the students technological competitive and make them ready to self-upgrade with the higher technical skills.
CO 5	To train the students to develop the basic understanding of how ERP enriches the

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Year:	3 Year	Semester:	5
Course title:	Image Processing	Course code	23040507
Course type:	Engineering Science	Course Credit	4

CO 1	To provide a contemporary and forward-looking on the theory and practice of
CO 2	Enterprise Resource Planning Technology.
CO 3	To focus on a strong emphasis upon practice of theory in Applications and Practical-
CO 4	To aim at preparing the students technological competitive and make them ready to self-upgrade with the higher technical skills.
CO 5	To train the students to develop the basic understanding of how ERP enriches the

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Semester 6

Program:	Bachelor of Engineering	Branch:	IT
Year:	3 Year	Semester:	6
Course title:	Wireless Network	Course code	23040601
Course type:	Engineering Science	Course Credit	4

CO 1	Conversant with the latest 3G/4G and Wi-MAX networks and its architecture.
CO 2	Design and implement wireless network environment for any application using latest
CO 3	Wireless protocols and standards.
CO 4	Implement different type of applications for smart phones and mobile deviITs with
CO 5	latest network strategies

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Program:	Bachelor of Engineering	Branch:	IT
Year:	3 Year	Semester:	6
Course title:	Compiler Design	Course code	23040602
Course type:	Engineering Science	Course Credit	4

CO 1	Realize basics of compiler design and apply for real time applications.
CO 2	To introduce different translation languages
CO 3	To understand the importance of code optimization
CO 4	To know about compiler generation tools and techniques
CO 5	To learn working of compiler and non compiler applications

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Program:	Bachelor of Engineering	Branch:	IT
Year:	3 Year	Semester:	6
Course title:	Cloud Computing	Course code	23040603
Course type:	Engineering Science	Course Credit	4

CO 1	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
CO 2	Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.
CO 3	Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
CO 4	Analyze various cloud programming models and apply them to solve problems on the cloud.
CO 5	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	3 Year	Semester:	6
Course title:	Data Mining and Warehousing	Course code	23040604
Course type:	Engineering Science	Course Credit	4

CO 1	Be familiar with mathematical foundations of data mining tools..
CO 2	Understand and implement classical models and algorithms in data warehouses and
CO 3	data mining discovered by association rule
CO 4	Characterize the kinds of patterns that can be discovered by association rule
CO 5	data mining, classification and clustering.

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Program:	Bachelor of Engineering	Branch:	IT
Year:	3 Year	Semester:	6
Course title:	Advance JAVA	Course code	23040606
Course type:	Engineering Science	Course Credit	5

CO 1	Able to solve real world problems using OOP techniques.
CO 2	Able to understand the use of abstract classes.
CO 3	Able to solve problems using java collection framework and I/o classes.
CO 4	Able to develop multithreaded applications with synchronization.
CO 5	Able to develop applets for web applications.

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Semester 7

Program:	Bachelor of Engineering	Branch:	IT
Year:	4 Year	Semester:	7
Course title:	Artificial Intelligence	Course code	23040701
Course type:	Engineering Science	Course Credit	5

CO 1	Develop mathematical thinking and problem solving skills associated with research and writing proofs.
CO 2	Get exposure to a wide variety of mathematical conITpts used in computer scienIT discipline like probability.
CO 3	Use Graph Theory for solving problems.
CO 4	Acquire basic knowledge of sampling and estimation.
CO 5	Understand basic concepts of hypothesis

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Program:	Bachelor of Engineering	Branch:	IT
Year:	4 Year	Semester:	7
Course title:	Python Programming	**Course code**	**23040702**
Course type:	Engineering Science	**Course Credit**	5

CO 1	Create your first program in Python IDLE
CO 2	Implement OOPs conITpts in your programming
CO 3	Use Arrays, and Data structures
CO 4	Create an application with the support of graphics in Python
CO 5	Implement error handling

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Semester: 8

Program:	Bachelor of Engineering	Branch:	IT
Year:	4 Year	Semester:	8
Course title:	Programming with XML & JSON	Course code	23040802
Course type:	Engineering Science	Course Credit	6

CO 1	Students are able to develop a dynamic webpage by the use of java script and DHTML.
CO 2	Students will be able to write a well formed / valid XML document. ·
CO 3	Students will be able to connect a java program to a DBMS and perform insert, update.
CO 4	Delete operations on DBMS table.
CO 5	Students will be able to write a server side java application called Servlet to catch form data

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Program Name: Bachelor of Technology in Mechanical Engineering

Semester: I

Subject Name: Maths-I
Subject Code: 23000001
Course Outcomes (COs):

CO1	Analyze and manipulate infinite sequences and series.
CO2	Evaluate limits involving indeterminate forms.
CO3	Understand and apply techniques for improper integrals.
CO4	Analyze functions of several variables and solve optimization problems.
CO5	Solve systems of linear equations using matrices and determinants.
CO6	Analyze eigenvalues and eigenvectors for linear transformations and matrices.

Subject Name: Fundamentals of Computer
Programming Subject Code: 23000004
Course Outcomes (COs):

CO1	Apply fundamental principles of problem solving in software engineering.
CO2	Apply basic programming principles using C language.
CO3	Apply basic C program structure in software development
CO4	Prepare graduates for professional careers in roles including, but not limited to, the following: computer programmer, software engineer, software systems designer, software applications developer, technical software project lead, computer systems analyst, computer systems programmer, software applications tester and maintainer.
CO5	To prepare graduates with the knowledge and skills to do advanced studies and research in computer science and related engineering and scientific disciplines
CO6	To equip graduates with the communication skills, both oral and written, to become an effective team-oriented problem solver as well as an effective communicator with nontechnical stakeholders in computer and software systems development, maintenance and administration.

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Subject Name: Elements of Electrical
Engineering Subject Code: 23000012
Course Outcomes (COs):

CO1	Define electrical current, potential difference, power and energy, sources of electrical energy, resistance and its behavior with temperature.
CO2	Understand the different types of wires, cables, connectors & switches used for wiring Different types of domestic and industrial wiring.
CO3	Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
CO4	Analyze the steady state behavior of single phase and three phase AC electrical circuits.
CO5	Compare various protective devices of working principle, usage and construction such as fuse, MCB, ELCB & Relays.
CO6	Design and development of varies Electrical Wiring and electronics miniproctes.

Subject Name: Elements of Mechanical Engineering
Subject Code: 23000003
Course Outcomes (COs):

CO1	**Discribe** the various sources of energy and basic terminology of Mechanical engineering.
CO2	Make calculations for commonly used working fluids i.e. ideal gases and steam.
CO3	Analyze various heat engine cycles and understand construction and working of IC engines.
CO4	Discuss working and applications of steam boilers and various energy conversion systems.
CO5	Discuss various power transmission elements and properties of various engineering materials with their applications.

Subject Name: Environmental Studies
Subject code: 23000006
Course outcome:

CO1	Describe natural resources, importance of ecosystem and conservation of biodiversity with respect to multiple disciplines.
CO2	Explain causes, effects, solutions for various pollution problems and its minimization strategies.
CO3	Differentiate between requirements of laws and regulations for environmental conservation and applicability of legislations in society and industries.
CO4	Discuss environmental ethics and their implementation for betterment of environment and human life.

Subject Name: Orientation Program in Startup and Entrepreneurship
Subject code: 12300001
Course outcome:

CO1	Apply the basic principles of entrepreneurship
CO2	Distinguish the concepts of the entrepreneurship ecosystem, entrepreneurship education, and various entrepreneurial opportunities.
CO3	Understanding various individual attributes of entrepreneurial personality traits, entrepreneurial characteristics, behavioural attributes and importance of creativity and innovation.
CO4	Develop an understanding of best techniques for idea generation and opportunities exploration.

Subject Name: Workshop
Subject code: 23000029
Course outcome:

CO1	Understand applications of hand tools and power tools and operations of machine tools.
CO2	Understand the operations of machine tools.
CO3	Select the appropriate tools required for specific operation.
CO4	Comprehend the safety measures required to be taken while using the tools.
CO5	Prepare Fitting, Carpentry, Plumbing, Welding, and Tin-smithy Jobs.

Semester-II

Subject Name: ENGINEERING PHYSICS
Subject code: 23000005
Course outcome:

CO1	To acquire knowledge of calculus which are integral part of any branch of Physics
CO2	Students learn accurately how to describe motion of objects, planetary motions, gravitation etc. Understand the motion of objects in different frame of references
CO3	To learn about basic concepts of electrical charges and currents and their properties
CO4	Student learn about various types of waves and their propagation.
CO5	To understand the principle of calorimetry
CO6	To know about Radiation and its nature, old quantum theory, concept of wave-particle duality and de Broglie hypethesis.
CO7	To study complex analysis, Cauchy Riemann conditions, Analyticity, Cauchy Integral formula, Laurent and Taylor series expansion and definite integrals using contour integration.

Subject Name: Communication skills
Subject code: 23000008
Course outcome:

CO1	Students will become master of four communication skills.
CO2	They feel confident in speaking and writing English language.
CO3	Students will be able to improve the language skills i.e. Listening Skill, Speaking Skill, Reading Skill, and Writing Skill (LSRW).
CO4	To make them learn about life skills and soft skills.

Subject Name: Maths II
Subject code: 23000010
Course outcome:

CO1	Understand vectors in RnRn and operations involving linear combinations.
CO2	Identify subspaces and determine basis and dimension and Perform coordinate transformations and understand the change of basis.
CO3	Understand linear transformations and their properties and represent linear transformations with matrices and explore the concept of similarity.
CO4	Apply inner product spaces to least squares approximation and diagonalization of symmetric matrices and Explore applications of quadratic forms and optimization.
CO5	Apply double and triple integrals over different regions and Utilize Fubini's theorem and change of variables in multiple integrals.
CO6	Apply integration techniques to calculate volumes of various solids.

Subject Name: Engineering Graphics
Subject code: 23000011
Course outcome:

CO1	Describe the fundamental methods of engineering drawing, sketching and drafting.
CO2	Understanding the object through orthographic projections.
CO3	Construct basic and intermediate geometry and application of engineering curves.
CO4	Enhance visualization skills for developing new products.
CO5	Develop new products through technical communication skill in the form of communicative drawings.
CO6	Develop the theory of orthographic projection and views.

Subject Name: Elements of Civil Engineering
Subject code: 23000015
Course outcome:

CO1	Carry out simple land survey to prepare maps with existing details.
CO2	Find out area of irregular shaped plane figures.
CO3	Understand building plan elevation and section.
CO4	Get acquainted with construction materials.
CO5	Get acquainted with hydrological cycle and hydraulic structures.
CO6	Get acquainted with mass transportation systems.

Subject Name: BASIC PROGRAM IN ENTREPRENURESHIP
Subject code: 12300002
Course outcome:

CO1	Develop an understanding of best techniques for idea generation, opportunities exploration, and market research.
CO2	Check technical, market, financial and other types of Feasibility of their business idea
CO3	Develop business model to describe the rationale of how an organization creates, delivers, and captures value
CO4	Conduct the customer's survey to know the need of their business idea.

Semester: III

Subject Name: Maths III
Subject code: 23000015
Course outcome:

CO1	To have a rigorous understanding of the concept of limit of a function.
CO2	The geometrical properties of continuous functions on closed and bounded intervals.
CO3	Extensively about the concept of differentiability using limits, leading to a better understanding for applications.
CO4	The applications of mean value theorems and Taylor's theorem.
CO5	Employ De Moivre's theorem in a number of applications to solve numerical problems

Subject Name: Mechanics of Solid
Subject code: 23080301
Course outcome:

CO1	Explain the basic concepts of Engineering Mechanics,
CO2	to evaluate the variations of shear force and bending moment in different kinds of beams
CO3	Evaluate the shear stress and angle of deflection in a shaft subjected to torque.
CO4	Evaluate Bending and shear stresses in different shaped channels.
CO5	Determine the buckling in the columns using different theories

Subject Name: Material Science and Metallurgy
Subject code: 23080302
Course outcome:

CO1	Application of knowledge relating the composition, structure and processing of materials to their uses.
CO2	The Study materials that covers metals, ceramics, polymers, and combinations of materials or composites
CO3	Able to investigate the relationship between structure of materials and their properties.
CO4	Able to understand the new developments such as nano-science and nanotechnology e forefront of the studies
CO5	continue to propel materials science and engineering to the forefront of the studies

Subject Name: Manufacturing Process I
Subject code: 23080303
Course outcome:

CO1	Understand classification, scope and applications of manufacturing methods used in industries.
CO2	Explain the different casting methods with their process details, applications and limitations.
CO3	Understand process details of rolling, forging, extrusion and drawing operations.
CO4	Classify and explain in detail different welding methods with brief introduction to brazing and soldering.
CO5	Understand powder metallurgy process with advantages, limitations and industrial applications.

Subject Name: Kinematics of Machines
Subject code: 23080304
Course outcome:

CO1	Classify and solve for mobility of planar mechanisms
CO2	Perform kinematic synthesis and analysis of planar mechanisms
CO3	Construct and analyze cam profiles for a specified motion of the follower
CO4	Analyze different types of gear trains
CO5	Model and analyze planar mechanisms using software package

Subject Name: Electriacal Technology
Subject code: 23080305
Course outcome:

CO1	Understand the basic concepts of DC circuits and Magnetic circuits and also able to solve problems related to DC and magnetic circuits.
CO2	Analysis of Single Phase and three phase AC Circuits and the representation of alternating quantities and also determining the power and other parameters in these circuits
CO3	Explain the construction, basic principle of operation, applications and also determine performance parameters of electrical Machines.
CO4	Practice Electrical Safety Rules & standards and types of electrical wiring and domestic earthing.

Subject Name: Foundation Program in Entrepreneurship
Subject code: 12300003
Course outcome:

CO1	Demonstrate different Python data types and their structures
CO2	Interpretation of the role of python in steps involved in data science
CO3	Illustrate the use of various operations for data cleansing and transformation
CO4	Analyze data visualization tools for data interpretation and insights of data
CO5	Perform data Wrangling with Scikit-learn applying exploratory data analysis

Semester IV

Subject Name: Maths IV
Subject code: 23000018
Course outcome:

CO1	Extract the solution of differential equations of the first order and of the first degree by variables separable, Homogeneous and Non-Homogeneous methods
CO2	Find a solution of differential equations of the first order and of a degree higher than the first by using methods of solvable for p, x and y
CO3	Compute all the solutions of second and higher order linear differential equations with constant coefficients, linear equations with variable coefficients.
CO4	Solve simultaneous linear equations with constant coefficients and Total Differential equations
CO5	Form partial differential equations
CO6	Find the solution of First order partial differential equations for some standard types.

Subject Name: Mechanical Measurement & Metrology
Subject code: 23090402
Course outcome:

CO1	Explain the basics knowledge of measurements, metrology and measuring devices.
CO2	Understand the principle of linear and angular measuring instruments
CO3	Fundamentals of various methods for the measurements of screw threads, surface roughness parameters and working of optical measuring instruments.
CO4	Understand various advanced measuring devices and machine tool metrology
CO5	Understand and able to use various devices for measuring torque, force, strain, stress and temperature.

Subject Name: Manufacturing Process-II
Subject code: 23090404
Course outcome:

CO1	Understand basic concepts of Manufacturing processes.
CO2	To understand Metal casting process, patterns, defect and its applications.
CO3	To understand different types of welding process, soldering and brazing process.
CO4	To understand metal shaping and forming process.
CO5	Understanding of Plastic, Ceramic and Glass processing techniques.

Subject Name: Engineering Thermodynamics
Subject code: 23090401
Course outcome:

CO1	Explain basic concepts, Zeroth and First Laws of Thermodynamics.
CO2	Describe Second Law of Thermodynamics and its corollaries
CO3	Estimate various thermodynamic properties of pure substance, ideal gas and mixture
CO4	Derive various thermodynamic relations such as Joule-Thomson, Clausius Clapeyron, etc.
CO5	Analyse various Vapour power cycles and effect of operating parameters on their performance.

Subject Name: Machine Design and Industrial Drafting
Subject code: 23090403
Course outcome:

CO1	To understand theory of failures.
CO2	Understand fundamentals of Beams and Column.
CO3	To design shafts, keys and couplings.
CO4	To understand design of power screws and threaded joints.
CO5	Basic understanding of Tolerances, Limits and Fits.

Subject Name: Intermediate Program in Entrepreneurship
Subject code: 12300004
Course outcome:

CO1	Demonstrate the various features of microprocessor, memory and I/O devices
CO2	Identify the hardware elements of 8085 microprocessor.
CO3	Select appropriate 8085 instructions based on size and functions to write an assembly language program
CO4	Design different interfacing system using concepts of memory and I/O interfacing.
CO5	Demonstrate the features of advance microprocessors.

Subject Name: Fluid Mechanics
Subject code: 23090501
Course outcome:

CO1	To understand fluids and its properties.
CO2	Understand laminar and turbulent flow through pipes and parallel plates.
CO3	Understand various types of flow, Mass Momentum and energy conservation and related equations.
CO4	Explain various applications of Bernoulli's Equation, Notches and Weirs, Orifices and Mouthpieces
CO5	Understand different types of flow through pipes, Viscous and turbulent flow.

Subject Name: Design of Machine Elements
Subject code: 23090502
Course outcome:

CO1	Introduction to design, material and its properties.
CO2	To design against fluctuating loads, S-N diagram, Soderberg and Gerber criteria.
CO3	To design thin and spherical vessels.
CO4	To understand design procedure of belt and chain drives.
CO5	To understand different types of springs, stresses and different loading condition of spring.

Subject Name: Heat Transfer
Subject code: 23090503
Course outcome:

CO1	Explain the governing laws and modes of heat transfer
CO2	Compute temperature distribution and heat transfer rate in steady and unsteady state heat conduction
CO3	Interpret and analyse natural and forced convective heat transfer with dimensional analysis
CO4	Analyse the performance of heat exchangers under different flow conditions using LMTD and NTU method.
CO5	Analyse radiative heat transfer between two or more black/gray bodies

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Subject Name: Theory of Machine
Subject code: 23090504
Course outcome:

CO1	Explain Kinematic Chain, Mechanisms and their Inversions; analyze velocity and acceleration of various mechanisms.
CO2	Solve problem-related to friction. Explain the principle and applications of clutch and brake.
CO3	Explain the principle and applications of a gyroscope.
CO4	To understand different types of Flywheels.
CO5	To study about different types Governors and their force analysis.

Subject Name: Control Engineering
Subject code: 23090505
Course outcome:

CO1	Understand basic concepts of control system
CO2	Modelling of Translational and rotational, mechanical, electrical and thermal system.
CO3	To understand time response analysis and state space analysis.
CO4	To understand different types of hydraulic and pneumatic control systems.

Subject Name: Case Study
Subject code: 23000027
Course outcome:

CO1	By analysing case studies, students develop strategies to address complex problems.
CO2	Students enhance their ability to gather, assess, and learn how to conduct thorough investigations into specific issues.
CO3	Students learn to evaluate and synthesize information from various sources.
CO4	Presenting findings and writing reports.
CO5	Engaging in discussions are integral parts of case studies, helping students improve their ability to articulate their analysis and recommendations clearly.

Subject Name: Intellectual Property Rights
Subject code: 12300005
Course outcome:

CO1	Evaluate strength and limitation of cloud computing
CO2	Analyze different cloud depoly and services architecture model
CO3	Understand various enterprise application in cloud computing
CO4	Apply the virtualization concepts
CO5	Analyze data security mechanism and SLA management in cloud

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Semester VI

Subject Name: Dynamics of Machinery
Subject code: 23090601
Course outcome:

CO1	To understand about Balancing of Rotating Mass and Reciprocating Engines
CO2	To describe free and forced vibration of systems.
CO3	To derive equations of motion for two degree system and multidegree system.
CO4	Introduction and understanding of vibration measurement and analysis devices/
CO5	Dynamic analysis of force-closed cam follower.

Subject Name: Fluid Power Engineering
Subject code: 23090602
Course outcome:

CO1	To understand about Balancing of Rotating Mass and Reciprocating Engines
CO2	To describe free and forced vibration of systems.
CO3	To derive equations of motion for two degree system and multidegree system.
CO4	Introduction and understanding of vibration measurement and analysis devices/
CO5	Dynamic analysis of force-closed cam follower.

Subject Name: Production Technology
Subject code: 23090603
Course outcome:

CO1	To understand basic principle of metal cutting and handson training on lathe machine.
CO2	Understanding of Thermal aspects in machining, Gear and thread manufacturing techniques.
CO3	Classification of presses, Jigs and fixtures and their applications.
CO4	To study about different non-conventional machining techniques.
CO5	Use appropriate instruments and techniques to measure the cutting forces during turning, milling and drilling

Subject Name: Refrigeration air Conditioning
Subject code: 23090604
Course outcome:

CO1	Analyse the reversed Carnot cycle and vapour compression refrigeration cycle (VCR).
CO2	Select the air-refrigeration systems for aircraft, and vapour absorption refrigeration system for rural and remote areas
CO3	Identify the Psychrometric processes for different applications and design the parameters of air-conditioning system as per standards.
CO4	Understand the human comfort, ASHRAE chart and concept of effective temperature.
CO5	Estimate cooling load and heating load considering human comfort and optimize the air conditioning system as per requirements.

Subject Name: Industrial Engineering
Subject code: 23090605
Course outcome:

CO1	To understand location, selection of plant layout.
CO2	Describe production planning and control.
CO3	To demonstrate productivity, applications, work and motion study.
CO4	To understand job evaluation, wage plan, industrial legislation and statistical quality control.

Subject Name: Seminar
Subject code: 23000026
Course outcome:

CO1	Present the latest technologies and recent advancements in technical field.
CO2	Identify grey areas of his/ her interpersonal skills by critical evaluation of presentation techniques and further
CO3	Communicate effectively verbally and or non-verbally for knowledge enhancement.
CO4	Use the internet, books, resource persons and library effectively to retrieve the required information.
CO5	Cite the references of the originating sources of concept, data and information.

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Subject Name: Computer Aided Design & Manufacturing
Subject code: 23090701
Course outcome:

CO1	To analize 1-D concept, Trusses and beams.
CO2	To visualize the role of computer in manufacturing, types of manufacturing and CIM.
CO3	To understand different types of NC/CNC machine tools.
CO4	To understand concept of Group Technology and CAPP
CO5	To describe component of FMS and need of FMS.

Subject Name: Power Plant Engineering
Subject code: 23090702
Course outcome:

CO1	Discuss the load duration curves, site selection and economics of power plants.
CO2	Describe the effect of various components and steam conditions on the performance of steam power plant.
CO3	Analyse the performance of Steam turbine power plant under various operating and geographical conditions.
CO4	To describe working of different types of nozzles, turbines, condensors and cooling towers.
CO5	To study about nuclear power plant and gas turbine power plant.

Subject Name: Operation Research
Subject code: 23090703
Course outcome:

CO1	To understand requirement of Linear programming, assumptions in LP.
CO2	To solve problems related to Game theory and transportation problems.
CO3	To solve problems related to replacement theory and Queing theory.
CO4	To implement CPM and PERT in industry.
CO5	To solve problems based on Decision theory.

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Subject Name: Machine Design
Subject code: 23090704
Course outcome:

CO1	Identify the factors for engineering components design and analyze various members subjected to direct stress.
CO2	Design various members such as beams, levers, laminated springs for bending and stiffness.
CO3	Design various machine components under torsion such as shafts, shaft couplings, and keys.
CO4	Design various threaded fasteners and power screw components.
CO5	Design curved machine components.

Subject Name: Metal Forming Analysis
Subject code: 23090712
Course outcome:

CO1	Explain and interpret the basics of various forming processes.
CO2	Explain and apply the yield criteria and governing equations of plasticity.
CO3	Apply the slab method of metal forming process analysis.
CO4	Apply the Slip-line field theory of metal forming process analysis.
CO5	Apply the upper and lower bound techniques of metal forming process analysis.

Subject Name: Project -1
Subject code: 23000023
Course outcome:

CO1	Define a problem and review literature to identify the gaps, objectives & scope of the work.
CO2	Analyse the problems of mechanical engineering to formulate objectives of project.
CO3	Design a system, component, or process to meet the desired needs of social and sustainability.
CO4	Demonstrate the techniques, skills, and modern engineering tools necessary for engineering practice.
CO5	Prepare a professional report as per recommended format and defend the work.

Subject Name: Project - II
Subject code: 23000025
Course outcome:

CO1	Define a problem and review literature to identify the gaps, objectives & scope of the work.
CO2	Analyse the problems of mechanical engineering to formulate objectives of project.
CO3	Design a system, component, or process to meet the desired needs of social and sustainability.
CO4	Demonstrate the techniques, skills, and modern engineering tools necessary for engineering practice.
CO5	Prepare a professional report as per recommended format and defend the work.

Subject Name: Industrial Training
Subject code: 23000028
Course outcome:

CO1	Participate in the projects in industries during his or her industrial training.
CO2	Describe use of advanced tools and techniques encountered during industrial training and visit.
CO3	Interact with industrial personnel and follow engineering practices and discipline prescribed in industry.
CO4	Develop awareness about general workplace behavior and build interpersonal and team skills.
CO5	Prepare professional work reports and presentations.

Subject Name: Energy Conservation and Management
Subject code: 23000023
Course outcome:

CO1	Describe the basics of energy management, energy demand management and energy auditing.
CO2	Highlight the need for energy conservation and describe the resource development for sustainability.
CO3	Identify the need for energy management in different sectors.
CO4	Forecast the energy demand for different sectors and integrate different energy resources to meet the energy demand.
CO5	Describe various renewable energy resources and their management for cleaner production.

B.TECH CIVIL ENGINEERING

SEMESTER 3rd

Course: Maths - III

Subject code: 2300015

Course outcome:

CO 1	Apply Fourier series to analyze and represent periodic functions.
CO 2	Apply Laplace transforms to solve differential equations and system problems.
CO 3	Apply methods such as integrating factor, Bernoulli equations, and linear differential equations.
CO 4	Apply series solutions to solve differential equations and analyze the convergence and divergence of series solutions.
CO 5	Apply the method of separation of variables to solve PDEs to analyze solutions in cylindrical and spherical polar coordinates.

Course: Surveying

Subject code: 23030301

Course outcome:

CO 1	Illustrate the application of Plane table and Theodolite
CO 2	To know about the basic principles of linear, angular and levelling.
CO 3	Theodolite traversing and plotting of traverse by applying corrections in Gale's traverse table
CO 4	Setting out simple circular curve by different methods
CO 5	Setting out combined curve (Transition - Circular – Transition)

CO 6	Analyse the uses of different other modern tools in survey projects
CO 7	Computation of area of submergence and storage volume from contour maps for reservoir projects.

Course: Building Construction

Subject code: 23030302

Course outcome:

CO 1	Understand to sub surface soil strata investigation.
CO 2	Construct various types of shallow foundation.
CO 3	Execute various types of masonry.
CO 4	Construct various structural and non-structural building components.
CO 5	Erect various temporary works for new and existing buildings.
CO 6	Apply special treatments like water resistance, thermal insulation acoustical construction.
CO 7	Select appropriate method of construction.
CO 8	Explain causes of failure and remedial measures for foundations
CO 9	Explain the green buildings and suggest how to convert existing building in to green building.

Course: Concrete Technology

Subject code: 23030303

Course outcome:

CO 1	Students have learned the fundamentals concrete and how the properties of concrete are affected by the properties of the ingredients of concrete.
CO 2	Students were trained to get selected in reputed companies and for pursuing higher education.
CO 3	Students expressed keen interest in doing research in the area of concrete specially SCC, eco-friendly and smart concretes & bacterial concrete.

Course: Strength of Material

Subject code: 23030304

Course outcome:

CO 1	Apply fundamental principles of mechanics & principles of equilibrium to simple and practical problems of engineering.
CO 2	Apply principles of statics to determine reactions & internal forces in statically determinate beams.
CO 3	Determine centroid and moment of inertia of a different geometrical shape and able to understand its importance.
CO 4	Know basics of friction and its importance through simple applications.
CO 5	Understand the different types of stresses and strains developed in the member subjected to axial, bending, shear & torsional effects.
CO 6	Know behaviour & properties of engineering materials.

Course: Fluid Mechanics

Subject code: 23030305

Course outcome:

CO 1	Understand the basic concept of fluid mechanics.
CO 2	Calculate to statics, dynamics and various approaches to fluid mechanics.
CO 3	To know about the fundamentals of flow through pipes
CO 4	Classify the different types of flow and it characteristics
CO 5	Correlate fundamentals of fluid mechanics with various mechanical systems

SEMESTER 4ᵀᴴ

Course: Maths-IV

Subject code: 23000018

Course outcome:

CO 1	Apply methods to handle approximations, errors, and significant figures.
CO 2	Analyze and solve engineering problems using root-finding techniques.
CO 3	Solve systems of linear equations using Gauss elimination, Gauss–Seidel methods, and their applications.
CO 4	Apply least squares linear and polynomial regression for data fitting.
CO 5	Apply numerical integration techniques such as the trapezoidal rule and Simpson's rules to solve engineering problems involving numerical integration through case studies
CO 6	Apply Euler's method and Runge-Kutta methods to solve ordinary engineering problems involving ODEs through case studies.
CO 7	Apply moving averages and predict future trends and calculate confidence intervals and assess statistical significance.

Course: Theory of Structure-I

Subject code: 23030401

Course outcome:

CO 1	Apply principles of statics to determine reactions & internal forces in statically determinate structures.
CO 2	Determine displacements of statically determinate structures.
CO 3	Determine stresses due to axial & eccentric loading.
CO 4	Determine buckling load for columns & struts with different end conditions.
CO 5	Determine strain energy stored in a body.
CO 6	Determine stresses in thin cylinders and spherical vessels

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Course: Applied Fluid Mechanics

Subject code: 23030402

Course outcome:

CO 1	Analyze fluid flow through pipes in series, parallel and pipe networks under laminar and turbulent flow conditions.
CO 2	Analyze and design streamlined objects considering boundary layer effects.
CO 3	Analyze open channel flow and design optimal sections; calculate forces on sluice gates considering specific energy and momentum principle.
CO 4	Understand, analyze and study the performance characteristics of hydraulic machine
CO 5	Carry out model studies for fluid flow problems

Course: Geotechnics and Applied Geology

Subject code: 23030403

Course outcome:

CO 1	Know soil formation, types of soils, types of soils found in various parts of India.
CO 2	Determine the index properties and interrelationships between various soil parameters.
CO 3	To know the different types of soil classification systems and Classify field soils as per particle size and atterberg's indices.
CO 4	Students will be made familiar with the internal structure of the Earth, its properties, and processes.
CO 5	Know types of soil water found in nature, its permeability characteristics and seepage determination.
CO 6	Understand about forces acting upon the surface of the Earth. To appreciate processes and geological agents involved in the shaping surface of the earth, and will learn about the Landforms produced because of these processes.
CO 7	To know about hazards due to volcanic and seismic activity.
CO 8	To identify major mineral and rock types in hand-specimen.
CO 9	To predict the likely engineering behavior of rocks under specified geologic conditions.

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Course: Building and Town Planning

Subject code: 23030404

Course outcome:

CO 1	Understand and interpret civil engineering drawings.
CO 2	To know principles of planning, building Bye laws, town planning and perspective drawing.
CO 3	Produce various civil engineering drawings.
CO 4	Develop architectural design of building by applying bye laws and principle of planning.

Course: Advanced Surveying

Subject code: 23030406

Course outcome:

CO 1	To know about tachometry and geodetic survey.
CO 2	Examine the principles of theory of errors for correction of measurements.
CO 3	Examine the knowledge of astronomy for solving civil engineering problems.
CO 4	Explain use of aerial camera, aerial photographs, and procedure of aerial survey.
CO 5	Utilize stereoscope and parallax bars.
CO 6	Utilize total station and other modern survey instruments.
CO 7	Apply GIS in solving engineering problems

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SEMESTER 5TH

Course: Highway Engineering

Subject code: 23030501

Course outcome:

CO 1	Design a flexible pavement for a highway
CO 2	Select a suitable alignment for a highway
CO 3	Evaluate a highway link in terms of its impact on the existing network
CO 4	Forecast future traffic flows along highway links
CO 5	Demonstrate an understanding of the appraisal process for a highway
CO 6	Analyze highway links and intersections in terms of their capacity
CO 7	Geometrically design the alignment of a highway
CO 8	Plan an earthworks programme
CO 9	Describe different highway structures, the methods by which they are analysis and constructed
CO 10	Design a highway drainage system

Course: Environmental Engineering

Subject code: 23030502

Course outcome:

CO 1	Know the role of microorganisms in various components of environments
CO 2	Understand the quality and characteristics of waste water
CO 3	Understand and design solid waste management system
CO 4	Understand various types of pollution
CO 5	Understand various environmental Acts.
CO 6	Determine various water/air quality parameters

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Course: Theory of Structure-II

Subject code: 23030503

Course outcome:

CO 1	Apply equilibrium and compatibility equations to determine response of statically determinate and indeterminate structures.
CO 2	Determine displacements and internal forces of statically indeterminate structures by classical, iterative and matrix methods.
CO 3	Determine internal forces and reactions in determinate and indeterminate structures subjected to moving loads.

Course: Geotechnical Engineering

Subject code: 23030504

Course outcome:

CO 1	To know various index (preliminary) and engineering properties of soil, its determination through various methodology and application for design of shallow and deep foundation Systems for various civil engineering structures.
CO 2	Give Knowledge of various topics like compaction, shear strength, consolidation, earth Pressure, stress distribution which gives insight to students to analyses soil parameters based on application and need of project site.
CO 3	The course will also develop understanding about soil testing procedures, experimentation techniques and related issues. Simulation of mechanics on soil as a material to understand its Behaviours before failure and estimating its permissible values.
CO 4	The course also discusses details of foundations, its selection procedures as per soil conditions and various modifications available for various degrees of loads.

Course: Hydrology and Water Resource Engineering

Subject code: 23030505

Course outcome:

CO 1	Compute mean precipitation from a catchment
CO 2	Compute mean precipitation from a catchment

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CO 3	Calculate runoff from a catchment
CO 4	Compute peak flood flow
CO 5	Compute reservoir capacity using mass curve
CO 6	Compute dependable flow using flow duration curve for the requirement of irrigation, power generation etc.
CO 7	Basic idea about reservoir sedimentation and its control
CO 8	Compute the capacity of well
CO 9	Estimation of design flood for the design of hydraulic structure
CO 10	Measures of water conservation to battle drought

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SEMESTER 6TH

Course: Water and Waste Water Engineering

Subject code: 23030601

Course outcome:

CO 1	Design the water supply and wastewater treatment systems.
CO 2	Determine the treatment efficiency of treatment units

Course: Design of Reinforced Concrete Structure

Subject code: 23030602

Course outcome:

CO 1	Design and draw reinforced concrete Cantilever and Counterfort Retaining Walls
CO 2	Design and draw flat slab as per code provisions
CO 3	Design and draw reinforced concrete and steel water tanks
CO 4	Apply the concept of earthquake-resistant design in the building.
CO 5	Assess loads, prepare layout, analyse, design and detail of various structural elements for RC framed structure up to G+3.
CO 6	Identify the typical failure modes of RC building, retaining walls, water tanks, flat slabs & prestressed concrete sections.

Course: Railway Bridge and Tunnel Engineering

Subject code: 23030603

Course outcome:

CO 1	Identify the components of railway tracks.
CO 2	Maintain the railway tracks.
CO 3	The students will gain an experience in the implementation of Railway, Bridge and Tunnel Engineering on engineering concepts which are applied in field of Transportation Engineering.
CO 4	Diagnose the condition of bridge.

CO 5	Maintain different types of railway bridges and their components.
CO 6	Maintain different types of tunnels.

Course: Advanced Construction Equipment

Subject code: 23030604

Course outcome:

CO 1	Supervise the heavy construction sites.
CO 2	Understand the working principle and use of various equipments
CO 3	Select appropriate construction equipments for desired construction works.
CO 4	Execute the operations of Demolition of structures with safety.
CO 5	Erect the false work for Bridges and form work for Heavy structures

Course: Professional Practice and Valuation

Subject code: 23030605

Course outcome:

CO 1	Calculate the estimated cost of any proposed civil engineering structure and The value of any old structure
CO 2	Apply the software for working out quantities of items of civil works.

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SEMESTER 7TH

Course: Design of Steel Structure

Subject code: 23030701

Course outcome:

CO 1	Prepare structural layout of Industrial steel structures, plate girder, foot-over bridge.
CO 2	Determine the loads acting on it and identify the typical failure modes.
CO 3	Apply the principles, procedures and current Indian codal provisions to the analysis and design of Industrial structures, plate girder & foot-over bridges.
CO 4	Apply the principles of plastic design in steel beams & portal frames.

Course: Irrigation Engineering

Subject code: 23030702

Course outcome:

CO 1	Calculate the pressure at key points of sheet piles and floor thickness for a weir/barrage using Khosla's theory
CO 2	Concepts of irrigation and different hydraulic structures.
CO 3	How to estimate the quantity of water required by crops.
CO 4	Be able to plan and design irrigation projects.
CO 5	Design channels and other irrigation structures required for irrigation, drainage, soil conservation, flood control and other water-management projects.

Course: Urban Transportation Engineering

Subject code: 23030703

Course outcome:

CO 1	Know about the transportation system planning in new or existing town or city.
CO 2	Analyze the issues related to congestion and inconvenience due to Urban transportation.
CO 3	To understand and evaluate current scenarios of traffic management and improve it.

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Course: Ground Improvement Techniques

Subject code: 23030704

Course outcome:

CO 1	To know various index (preliminary) and engineering properties of soil, its determination through various methodology and application for design of shallow and deep foundation systems for various civil engineering structures.
CO 2	Give Knowledge of various topics like compaction, shear strength, consolidation, earth pressure, stress distribution which gives insight to students to analyses soil parameters based on application and need of project site.
CO 3	The course will also develop understanding about soil testing procedures, experimentation techniques and related issues. Simulation of mechanics on soil as a material to understand its behavior before failure and estimating its permissible values.
CO 4	The course also discusses details of foundations, its selection procedures as per soil conditions and various modifications available for various degrees of loads.

Course: Remote Sensing and GIS

Subject code: 23030705

Course outcome:

CO 1	Ability to develop Orthographic and Contour maps using aerial photographs and Remote sensing Images
CO 2	Ability to develop maps using Total Station, GIS, GPS and Scanners
CO 3	Ability to create GIS application referencing Spatial features with Attribute data

Course: Earthquake Engineering

Subject code: 23030706

Course outcome:

CO 1	Determine the response of SDOF & MDOF structural system subjected to vibration including earthquake. Determine the loads acting on it and identify the typical failure
CO 2	Apply the concept of Earthquake Resistant Design & concept of lateral load distribution on buildings.
CO 3	Determine the lateral forces generated in the structure due to earthquake.
CO 4	Apply the concept of ductile detailing in RC structures.

SEMESTER 8TH

Course: Construction Project Management

Subject code: 223030801

Course outcome:

CO 1	Execute all type of managerial tasks in construction projects.
CO 2	Use software for construction projects management.

Course: Prestressed Concrete

Subject code: 223030802

Course outcome:

CO 1	Apply concepts & methods for pre stressing systems for different materials.
CO 2	compute stresses in beams due to transverse loads & prestressing.
CO 3	Determine the losses in beams due to prestress, short- and long-term deflection, flexural and shear strength of beam.
CO 4	Analyze and design substructure, foundation and adjoining elements.

Course: Foundation Engineering

Subject code: 223030803

Course outcome:

CO 1	On choosing suitable foundation system (shallow/Deep) for different structures, that satisfy the allowable bearing capacity and settlement requirements based on soil properties
CO 2	Design deep foundation satisfying bearing capacity and settlement requirements.
CO 3	Design and analysis of retaining walls and sheet piles under static loads.
CO 4	Students will have the ability to select type of foundation required for the soil at a place and able to design shallow, foundation, deep foundation and retaining structures.

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Course: Air Pollution and Control

Subject code: 223030804

Course outcome:

CO 1	Select the most appropriate technology to purify and/or control emission of particulate emission.
CO 2	Suggest the applicable technology to prevent, control or scrub the oxide of sulfur from the gas and design the control equipment.
CO 3	Apply the best technologies for control of NOx.
CO 4	Propose measures to control the emission from mobile sources.
CO 5	Devise the techniques to control gases and vapors from industries using concepts of absorption, adsorption, and condensation.

Course: Dock Harbour and Airport Engineering

Subject code: 223030805

Course outcome:

CO 1	To understand the various elements of Harbour and Airport.
CO 2	To understand the fundamentals of planning and design of various marine structures.
CO 3	To make the students aware about the operations in Harbour.
CO 4	To give knowledge of maintenance techniques at Harbour.
CO 5	To understand the fundamentals of planning and design of Airport structures.
CO 6	To make students aware of design of runway and taxiways at Airport.
CO 7	To make students aware of the operations at Airport.

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SWARRNIM INSTITUTE OF TECHNOLOGY

M.TECH STRUCTURAL ENGINEERING

SEMESTER 1ST

Course: English for Research Paper Writing (Audit Course)

Subject code: 26080101

Course outcome:

CO 1	Prepare structural layout of Industrial steel structures, plate girder, foot-over bridge.
CO 2	Determine the loads acting on it and identify the typical failure modes.
CO 3	Apply the principles, procedures and current Indian codal provisions to the analysis and design of Industrial structures, plate girder & foot-over bridges.
CO 4	Apply the principles of plastic design in steel beams & portal frames.

Course: Research Methodology and IPR

Subject code: 26080102

Course outcome:

CO 1	Conduct a quality literature review and find the research gap.
CO 2	Identify an original and relevant problem and identify methods to find its solution
CO 3	Validate the model
CO 4	Present and defend the solution obtained in an effective manner in written or spoken form.

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CO 5	Fol1 research ethics
CO 6	Understand IPR protection for further research and better products

Course: Advanced Structural Analysis

Subject code: 26080103

Course outcome:

CO 1	Analyze skeleton structures using stiffness method
CO 2	Analyze skeleton structures having secondary effects using stiffness method
CO 3	Derive element properties and analyze structure using finite element method
CO 4	Solve realistic engineering problems through computational simulations using finite element code

Course: Advanced Concrete Design of Structures

Subject code: 26080104

Course outcome:

CO 1	Carry out load calculation, analysis, design and detailing of Slender Column, Corbel, Deep beams, flat slabs, water tanks, bunker and silos, Shear Walls as per relevant IS code of practice.
CO 2	Analysis and design of raft foundation, strip footing and pile caps
CO 3	Ensure serviceability criteria for reinforced concrete structural elements

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Course: Analytical and Numerical methods for Structural Engg. (Elective 1)

Subject code: 26080106

Course outcome:

CO 1	Solve algebraic equations
CO 2	Obtain numerical solution of ordinary and partial differential equations
CO 3	Apply integration method/s for structural analysis
CO 4	Carry out interpolations and curve fitting
CO 5	Obtain solution of Eigen value problems and Fourier series for structural analysis
CO 6	Apply iterative and transformation methods in structural engineering

Course: Theory and applications of Cement Composites (Elective 1)

Subject code: 26080107

Course outcome:

CO 1	Formulate constitutive behaviour of composite materials –Ferrocement & FiberReinforced Concrete - by understanding their strain- stress behaviour
CO 2	Classify the materials as per orthotropic and anisotropic behaviour
CO 3	Estimate strain constants using theories applicable to composite materials
CO 4	Analyse and design structural elements made of cement composites

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Course: Theory of structural stability (Elective 1)

Subject code: 26080108

Course outcome:

CO 1	Determine stability of columns and frames
CO 2	Determine stability of beams and plates
CO 3	Use stability criteria and concepts for analyzing discrete and continuous systems

Course: Theory of Thin plates & shells (Elective 2)

Subject code: 26080109

Course outcome:

CO 1	Use analytical methods for the solution of thin plates and shells.
CO 2	Use analytical methods for the solution of shells
CO 3	Apply the numerical techniques and tools for the complex problems in thin plates
CO 4	Apply the numerical techniques and tools for the complex problems in shells.

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Course: Advanced Solid Mechanics (Elective 2)

Subject code: 26080110

Course outcome:

CO 1	Understanding the basic concepts and solve simple problems of elasticity and plasticity
CO 2	Solve the advanced practical problems related to the theory of elasticity, concepts of stress and strain, strain energy, and failure criteria
CO 3	Propose materials and structural elements to the analysis of complex structures
CO 4	Apply numerical methods to solve continuum problems.

Course: Structural Optimization (Elective 2)

Subject code: 26080111

Course outcome:

CO 1	Understand optimization techniques,
CO 2	Classify the optimization problems
CO 3	Derive response quantities corresponding to design variable
CO 4	Apply optimization techniques to trusses, beams and frames

Course: Disaster Management (Audit Course)

Subject code: 26080105

Course outcome:

CO 1	learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response
CO 2	critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives
CO 3	develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations
CO 4	Critically understand the strengths and weaknesses of disaster management approaches, planning, and programming in different countries, particularly their home country or the countries they work in.

Course: Advanced Steel Design

Subject code: 26080201

Course outcome:

CO 1	Design steel structures/ components by different design processes.
CO 2	Analyze and design beams and columns for stability and strength, and drift.
CO 3	Design welded and bolted connections.
CO 4	Apply unified code philosophy to steel building design
CO 5	Apply plastic method for design of beams and frames
CO 6	Design & detail Industrial building, steel stacks & composite structures as per the IS code

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Course: Structural Dynamics

Subject code: 26080202

Course outcome:

CO 1	Analyze and Interpret dynamics response of single degree freedom system using fundamental theory and experiments
CO 2	Analyze and Interpret dynamics response of Multi degree freedom system using fundamental theory and experiments
CO 3	Differentiate the effects of various types of dynamic loads
CO 4	Use structural engineering software for dynamic analysis
CO 5	Perform & interpret the results of various experiments on models to understand structural behavior of symmetrical & un-symmetrical structures in plan & elevation

Course: Structural Design Project

Subject code: 26080203

Course outcome:

CO 1	Use computational tool for modeling, analyzing & designing structures using relevant codes.
CO 2	Prepare site visit reports
CO 3	Prepare detailed design report
CO 4	Prepare structural drawings which may be Good for construction.

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Course: Design of Formwork

Subject code: 26080204

Course outcome:

CO 1	Use computational tool for modeling, analyzing & designing structures using relevant codes.
CO 2	Prepare site visit reports
CO 3	Prepare detailed design report
CO 4	Prepare structural drawings which may be Good for construction.

Course: Design of 3 rise Structures

Subject code: 26080205

Course outcome:

CO 1	Analyze, design and detail tall structures under different loading conditions by static and dynamic method of analysis
CO 2	Use of computational software for analysis and design of 3-rise structures
CO 3	Apply codal provisions for tall structures.
CO 4	Choose & apply appropriate structural systems for different size & height of structure
CO 5	Develop design basis report

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Course: Design of Masonry Structures

Subject code: 26080206

Course outcome:

CO 1	Distinguish from a wide range of materials for their suitability to arrive at feasible and optimal solutions for masonry constructions
CO 2	Apply knowledge of structural masonry for advanced research and construction procedures
CO 3	Justify the design of masonry buildings for sustainable development
CO 4	Check the stability of walls

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Course: Structural Health Monitoring & Retroffiting of Structures

Subject code: 26080207

Course outcome:

CO 1	Diagnose the distress and the cause of distress in the structure.
CO 2	Detect the changes in the characteristics of the structure
CO 3	Assess the remaining performance capacity
CO 4	Choose & apply the appropriate repair and retrofitting techniques for damaged structures.

Course: Design of Bridge Structures

Subject code: 26080208

Course outcome:

CO 1	Analyze and design small to 2 span of reinforced concrete slab culverts, T beam bridges as per IRC specifications
CO 2	Apply design principles of pre-stressed concrete T beam bridges, box girder bridges, balanced cantilever bridges
CO 3	Use of computational software for analysis & design of bridges
CO 4	Choose & apply appropriate structural form for different span of bridges
CO 5	Develop design basis report

Course: Soil Structure Interaction

Subject code: 26080209

Course outcome:

CO 1	Apply various theories applicable to SSI and will have capacity to idealize soil response in order to analyze and design rigid and flexible foundation elements subjected to different loadings
CO 2	Calculate Contact pressure and settlement under shal1 foundations, mat foundation, pile-raft foundation, settlement computation from constitutive laws.
CO 3	Analyise retaining structures through various analytical and graphical approaches, and design supporting structures for excavations
CO 4	Analyse sub-structural and super-structural element using various SSI tools based on hybrid models, discrete models and FEM approach and elastic theory approach
CO 5	Analyise vertical piles, laterally loaded piles and pile-raft system and foundations subjected to dynamic forces/seismic forces

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Course: Industrial Safety

Subject code: 26080301

Course outcome:

CO 1	Understand Importance of Safety and Important related Acts.
CO 2	Apply Maintenance techniques as per requirements and able to compare for with different technique for better performance
CO 3	Understand wear and corrosion, its causes and remedial actions for preventions
CO 4	Demonstrate fault tracing, its methods and application

Course: Operation Research

Subject code: 26080302

Course outcome:

CO 1	Students should able to apply the Liner programming techniques to solve problems of real-life applications and carry out post optimality analysis.
CO 2	Students should able to apply the concepts of non-linear programming and apply them for real life problems
CO 3	Students should able to obtain quantitative solutions in business decision making under conditions of certainty, risk and uncertainty.
CO 4	Students should able to implement various scientific tools and models that are available in the subject to take decisions in a complex environment.

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Course: Composite Materials

Subject code: 26080303

Course outcome:

CO 1	Understanding the Composite Material
CO 2	Apply Different materials as per requirements and able to compare for with different technique for better performance
CO 3	Analyze different search techniques in Casting
CO 4	Develop material basis report

Course: Design of Prestressed Concrete Structures (Program Elective-V)

Subject code: 26080304

Course outcome:

CO 1	Apply principle of prestressing, determination of losses, deflections and cable profile
CO 2	Analyze and design pre-tensioned and post-tensioned prestressed concrete beam with limit state design method
CO 3	Apply principles of prestressing to slab, column, beam-column, pipes & cylindrical water tank
CO 4	Apply prestressing techniques to composite structures like Prestressed concrete beam over cast-in-situ slab.
CO 5	Apply design principles of partial prestressing, prestressing of few special structures like folded plates, cylindrical shell and poles.

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Course: Earthquake Resistant Design of Structures (Program Elective-V)

Subject code: 26080305

Course outcome:

CO 1	Apply the concept of Earthquake Resistant Design & appraise the effect of structural & architectural irregularities of buildings
CO 2	Determine the lateral loads on SDOF & MDOF structural system subjected to earthquake
CO 3	Analyze RCC framed structures through Equivalent static force method - Response spectrum method for determining the lateral forces generated due to earthquake. Design & detailing of Multi-storey RC building using the available software
CO 4	Appraise the concepts of ductile detailing for various structural elements in RC structures
CO 5	Classify & describe various control systems & apply to framed structures

Course: Advanced Design of foundations Systems (Program Elective-V)

 Subject code: 26080306

Course outcome:

CO 1	Apply various design approaches, selection of proper foundation system as per sub-soil conditions based on codal provisions and theoretical practice fol1ed
CO 2	Analyze and design rigid and flexible foundation systems using elastic theories based on numerical and analytical approaches through software including soil structure interaction effect
CO 3	Design temporary and permanent soil retaining structures, excavation supports, foundations in water bodies and 3 embankments
CO 4	Apply conceptual knowledge of special foundations such as batter piles, shell foundations and sheet pile walls for various applications such as resisting 3 lateral loads.

3rd semester

Course Name: - Occupational Safety and Health Principles

Subject Code: -23110303.

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Choosing** the right control approaches should be based on the control hierarchy.
CO2	**Identify** relevant regulatory and national consensus standards along with best practices that are applicable.
CO3	**Analyze** injury and illness data for trends.
CO4	**Evaluate** workplace to determine the existence of occupational safety and health hazards.

Course Name: - Environmental chemistry

Subject Code: -23110301

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	An **understanding** of chemical methods employed for environmental problem solving.
CO2	**Developed** expertise relevant to the professional practice of chemistry, environmental science and engineering.
CO3	Experience in some scientific methods **employed** in environmental chemistry.
CO4	Developed skills in procedures and instrumental methods **applied** in analytical tasks of environmental chemistry.
CO5	**Developed** skills in the scientific method of planning, developing, conducting, reviewing and reporting experiments.

Course Name: - Unit Operations and Processes

Subject Code: -23110304

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Understand** the chemical engineering processes in chemical processes.
CO2	**Identify** unit operations & processes of chemical engineering processes.
CO3	**Determine** the chemical engineering processes' pollutant sources.
CO4	**Discuss** health & safety related issues of chemical engineering processes.

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4ᵗʰ semester

Course Name: - Environmental Microbiology and Bioremediation

Subject Code: -23110401

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Identify** techniques to enumerate microbes.
CO2	**Explain** the structure of microbes and how they relate to the environment.
CO3	**Compare** the physical & chemical agents for control of microbes.
CO4	**Discuss** the principles of bioremediation for treatment of soil, wastewater & ground water.

Course Name: - Basics of Environmental Hydraulics

Subject Code: -23110402

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Relate** the properties of fluids with context of environmental hydraulics.

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CO2	**Examine** the application of hydrostatics, kinematics, dynamics and flow measurement techniques.
CO3	**Solve** the problem relate to flow through pipes and channels for conveyance.
CO4	**Identify** filed application of orifices, weir and notches in environmental.

Course Name: - Fundamentals of Wastewater Quality

Subject Code: -23110403

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Solve** the numerical based on the concept of equilibrium chemistry.
CO2	**Apply** the concept of physical chemistry and colloidal chemistry to solve the environment problem.
CO3	**Correlate** the concept of organic chemistry with the environment and the biodegradation of organic matter.
CO4	**Identify** filed application of orifices, weir and notches in environmental.

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Course Name: - Advanced Environmental Instrumentation

Subject Code: -24100501

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Show** that you can use a high-tech analytical instrument to measure contaminants at the micro level.
CO2	**Demonstrate** the ability to use and calibrate analytical tools such as an Ion selective meter and TOC analyzer.
CO3	**Analyze** the data using statistical methods.
CO4	**Apply** the instrumental analysis method.

Course Name: - Physico - Chemical Treatment Technologies

Subject Code: -24100502

Learning Outcomes:

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CO	After the completion of the course the student should be able to
CO1	**Choose** the most effective amount of chemical coagulation and disinfectants.
CO2	**Relate** the parameter with types of treatment required and identify the type of treatment required.
CO3	**Identify** the physical and chemical treatment units.
CO4	**Evaluate** the removal efficiency of physic-chemical treatment units.
CO5	**Justify** the type of disinfection process for treatment of water.

Course Name: - Municipal and Industrial Solid Waste Management

Subject Code: -24100503

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Understand** solid waste's predicament and the useful component of a system for managing hazardous and solid waste.
CO2	**Classify** the sources, types, composition and quantities of solid waste.

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CO3	**Identify** the physical, biological and chemical properties of solid waste.
CO4	**Take** measure to collection, transfer, transport, separated and process of solid and hazardous waste.
CO5	**Evaluate** the issues and aspects of solid waste recycling and composting.
CO6	**Use** of incineration for disposal of solid waste. Design aspect related to land disposal and hazardous waste.

Course Name: - Municipal Engineering

Subject Code: -24100504

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Identify** the source of water and evaluate resource in term of quantity and quality.
CO2	**Identify** the type of sewers and sewer appurtenances.
CO3	**Determine** the water demand by projecting future population growth.
CO4	**Plan** the components of water supply scheme including pipe network, distribution system, valves and fitting.
CO5	**Determine** the amount of storm and sanitary sewage.

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CO6	**Design** the components of sewer system.	

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Course Name: - Biological Processes For Wastewater Treatment

Subject Code: -24100601

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Apply** fundamental concepts of microbiology in biological treatment process of waste water.
CO2	**Develop** the reaction rate kinetics for biological treatment.
CO3	**Determine** the size of the biological treatment units.
CO4	**Determine** the amount of organic pollutants that are found in waste water.
CO5	**Give** differences between aerobic and anaerobic treatment, process suspended growth and attached growth process.
CO6	**Create** a system on-site that includes pack edge treatment plants and a septic tank.

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Course Name: - Environmental Resources

Subject Code: -24100604

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Utilize** and arrange environmental resources sustainably and optimally.
CO2	Disseminates learnt **information** related to subject orally and in written from through presentation and report.
CO3	**Utilize** population theories and various population forecasting formulas to project the population.
CO4	**Discuss** the concern and appreciate importance of depletion of resource and their sustainability.

Course Name: - Ground water contamination

Subject Code: -24100605

Learning Outcomes:

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CO	After the completion of the course the student should be able to
CO1	**Explain** the groundwater conservation mechanisms.
CO2	**Apply** the laws of ground water hydraulic and solve the difference equation for different types of aquifer.
CO3	**Identify** the resource of ground water contaminate and suggest the remedial and preventive measures to overcome ground water contaminate.
CO4	**Utilize** the groundwater flow models and implement them to reduce or eliminate contamination of groundwater and its conveyance.

Course Name: - Fundamentals of air pollution

Subject Code: -24100603

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Relate** the various atmospherics stability condition with different plume behaviors.
CO2	**Relate** historic air pollution events, air quality legislation and relevant international protocols.
CO3	**Develop** plans to monitor, control, and reduce pollution.

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CO4	**Examine** the effects of air pollution on materials, vegetation, and human health.
CO5	**Determine** the relative concentrations of various air pollutants in ambient air and stack gases.
CO6	**Calculated** the atmospheric dispersion of discharge from both point and area side sources.

Course Name: - Design of water treatment unit

Subject Code: -24100602

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Choose** the flow measuring device.
CO2	**Identify** the source of water and select the treatment scheme based on the source selected.
CO3	**Identify** the different type of aeration system, rapid mixers, and flocculation and choose the relevant type for water treatment.
CO4	Decide the layout and hydraulic profile of water treatment plants.
CO5	**Design** sedimentation tank, clariflocculator, and filtration system and disinfection units for conventional water treatment plan.

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CO6	Prepare a detailed working drawing of the **designed** units and **Design** treatment units for special water treatment.	

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Course Name: - Resource and energy Recovery from waste

Subject Code: -2410704

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Understand** the fundamental principle of existing and emerging technologies for the treatment of waste to recover of materials and generated of energy from waste.
CO2	**Understand** the process of generation of energy from waste through biochemical conversion.
CO3	**Understand** the process of thermo-chemical conversion of waste to energy.
CO4	**Analysis** and describe the potential of solid waste as a secondary raw material and the associated problem and possibilities in sustainable society.

Course Name: - Advanced wastewater treatment technology

Subject Code: -2410701

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Compare** the most appropriates types of membrane processes for advanced treatment of wastewater.
CO2	**Discuss** method of advanced treatment technologies for pollutant removal particularly nitrogen & phosphorous from wastewater.
CO3	**Recommend** advanced oxidation process and electrochemical processes to treat concentrated wastewater.
CO4	**Explain** the concept of advance treatment processes like adsorption, ion exchange for removal of pollutants.

Course Name: - Design of Air Pollution Control Equipment

Subject Code: -2410702

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Learnt** about Major sources of air pollution in India.
CO2	**Describe** in detail the tools and principles for enhancing indoor air quality.

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CO3	Give a detailed explanation of the air pollution control systems' impact on human health and the environment.
CO4	**Classification** and characteristics of air pollutants.
CO5	**Design** and operation of particulate control devices (cyclones, electrostatic precipitators, bag houses).

Course Name: - Environmental Risk Assessment and Management

Subject Code: -2410703

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Learn** about strategies for engaging stakeholders and communicating risks effectively.
CO2	The importance of environmental risk assessment and management in environmental engineering is **explained** in detail.
CO3	**Evaluate** community resilience and vulnerabilities in the Indian context.
CO4	**Evaluated** Role of EIA in assessing and managing environmental risks.
CO5	**Analysis** the Public awareness and participation in risk management in India.
CO6	**Explain** EIA processes and practices in India.

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Course Name: - Cleaner Production and Waste Utilization

Subject Code: -2410705

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Learn** about the different types and sources of waste produced by different processes and industries.
CO2	**Explain** the procedures for characterizing and measuring waste.
CO3	**Describe** the fundamentals of resource efficiency and cleaner production.
CO4	**Identifying** opportunities for waste reduction and improved efficiency.
CO5	**Describe** the concepts of life cycle assessment and how they contribute to cleaner production.
CO6	**Explain** the Conducting LCA and interpreting results for decision-making in India.

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Course Name: - Environmental Impact Assessment

Subject Code: -2410801

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Understand** the different steps within environmental impact assessment.
CO2	**Explain** the effects of the current institutional and jurisdictional setups on environmental impact assessments..
CO3	**Understand** how to liaise with and the importance of stakeholders in the EIA process.

Course Name: - Anaerobic Biological Treatment Technologies

Subject Code: -2410802

Learning Outcomes:

CO	After the completion of the course the student should be able to

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CO1	**Understand** Historical development and key challenges in India.
CO2	Give a thorough **explanation** of microbial ecology in anaerobic processes..
CO3	**Recognizing** anaerobic systems (such as anaerobic lagoons, CSTR, and UASB).
CO4	Biogas utilization for energy generation and its **applications** in India.
CO5	**Understanding** Anaerobic treatment in various industrial sectors (e.g., agro-processing, food, and beverage).
CO6	**Evaluation** of the viability and economics of anaerobic digestion initiatives in India.

Course Name: - Industrial Wastewater Pollution and Control

Subject Code: -2410803

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Understand** Significance of industrial wastewater pollution control in environmental engineering.
CO2	**Remembering** Types and characteristics of industrial wastewater.
CO3	**Choosing** treatment methods according to the properties of wastewater.

CO4	**Understand** the regulatory requirements in India for the pre-treatment of industrial wastewater.
CO5	**Identify** Wastewater pollution and control practices in various industrial sectors (e.g., chemical, textile, food and beverage).
CO6	An **outline** of the standards and laws pertaining to the management of industrial wastewater.

Course Name: - Preventive Environmental Management

Subject Code: -2410804

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	**Recognizing** India's historical development and major issues.
CO2	**Identify** the Environmental risk assessment methodologies and tools.
CO3	**Applying** the EIA's role in evaluating and controlling possible environmental effects.
CO4	An **outline** of the standards and laws pertaining to the prevention of environmental degradation.
CO5	**Illustrate** to EMS and ISO 14001 standards.

**Course Name: -
Environmental**

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legislation and audit

Subject Code: -2410805

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	Show that you **understand** the environmental protection provisions of the constitution.
CO2	**Identify** the Assistance the industries receive in order to comply with environmental regulations and laws.
CO3	**Discuss** the industries in obtaining the clearance for starting new project.
CO4	**Apply** the knowledge of ISO 14000 for obtaining certificating.
CO5	**Discuss** the environmental audit of the industries as per the requirement of current environmental laws.

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B.TECH CHEMICAL ENGINEERING

SEM 3rd

Course: Organic Chemistry and Unit Process

Subject code: 23020303

Course outcome:

No.	Outcome
CO1	Understand the fundamentals and **define** the mechanism for the reaction types like substitution, addition, elimination, condensation, hydrolysis, oxidation and reduction
CO2	**Understand** the impact of organic chemistry in the fields of chemical industries, pharmaceutical industries and its impacts on the global economy
CO3	To **build** a basic knowledge of the Fundamental structure of Organic molecules and know the synthesis, properties and applications of organic compounds.
CO4	Comprehend and **analyze** organic molecule by performing different test and also acquire the knowledge of material safety data for the same.
CO5	To analyze scientific concepts and think critically and to understand and **explain** the reactions in Organic molecules
CO6	To **discuss** the same as per their utility in field of Chemical Engineering.

Course: Fluid Flow Operations

Subject code: 23020304

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Course outcome:

No.	Outcome
CO1	**Define** principles of fluid mechanics operations
CO2	**Explain** the theoretical importance and relevance of fluid flow in chemical process industry
CO3	**Identify and apply** the theoretical concept of fluid flow in chemical process industry
CO4	**Comprehend and analyze** fluid mechanics problems with the application of conservation principles of mass, energy and the momentum
CO5	**Evaluate** fluid mechanics problems with the application of conservation principles of mass, energy, momentum.
CO6	**Design** fluid transportation systems such as pumps, compressors and pipe network etc, and choose the fluid transportation devices for process applications.

Course: Process Calculation

Subject code: 23020301

Course outcome:

No.	Outcome
CO1	**Recall** and choose the correct unit conversions and dimensions for different variables for chemical calculations
CO2	**Relate** the stoichiometry in material and energy balances for different unit operations and processes
CO3	**Solve** the material balances of process system with and w/o reactions including recycle / bypass operations
CO4	**Examine** the system and estimate the different forms of energy available and make energy balances
CO5	**Assess** the combustion process and decide the air requirement and estimate the heating

	values of fuel
CO6	**Elaborate** the understanding of a chemical process and build the mass and energy requirements of the process.

Course: Chemical Process Industries-I

Subject code: 23020302

Course outcome:

No.	Outcome
CO1	**Define** and select basic raw materials used for processes carried out in chemical industry.
CO2	**Illustrate** process flow diagrams/process block diagrams for the manufacture of various chemicals from process description.
CO3	**Identify** different unit operations and unit processes involved in a process.
CO4	**Analyze** the technological methods in problem solving in process plant.
CO5	Recognize the **importance** of process economics in the industry.
CO6	**Discuss** the impact of the professional engineering solutions for societal benefits.

SEM 4th

Course: Physical and Inorganic Chemistry

Subject code: 23020402

Course outcome:

No.	Outcome
CO1	

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CO2	**Explain** the different reactions & kinetics of reaction
CO3	To **build** a basic knowledge of the structure of Physical and inorganic chemistry.
CO4	To **analyze** scientific concepts and think critically.
CO5	To review the **importance** and relevance of chemistry in our everyday life.
CO6	To be able to utilize the methods of chemical science as a logical means of problem solving

Course: Chemical Engineering Thermodynamics-I

Subject code: 23020403

Course outcome:

No.	Outcome
CO1	**Choose** and apply of laws of Thermodynamics and its application to different processes.
CO2	**Explain** the Pressure-Volume-Temperature relationship and equilibrium condition in pure fluid and fluid mixtures.
CO3	**Solve** ideal work, lost work, thermal efficiency and/or thermodynamic efficiencies of processes.
CO4	**Analyze** thermodynamic properties, partial properties of a mixture in the ideal-gas state.
CO5	**Evaluate** molar volume, compressibility factor, density, using different cubic equation of states and models.
CO6	**Estimate** fugacities and fugacity coefficients of pure species from *PVT* data or generalized correlations.

Course: Process Heat Transfer

Subject code: 23020404

Course outcome:

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No.	Outcome
CO1	**Define** the basic principles of heat transfer operations, related to different mode of heat transfer.
CO2	**Explain** the principles of heat transfer operations involving conduction, convection, radiation including phase change.
CO3	**Apply** principles of heat transfer operations involving conduction, convection, radiation including phase change.
CO4	**Analyze** the problems related to conduction, convection and radiation involving heat exchanger, evaporators and condensers.
CO5	**Justify** the applications of theory learned in industrial practices regarding conduction, convection and radiation involving heat exchanger, evaporators and condensers.
CO6	**Design** heat transfer equipments based upon the conditions given in the problem statement.

Course: Chemical Process Industries-II

Subject code: 23020401

Course outcome:

No.	Outcome
CO1	To **define** a basic knowledge of the process carried out in chemical industry.
CO2	To **understand** the fundamentals of manufacturing different kinds of chemicals
CO3	To be able to **utilize** the technological methods in problem solving in process plant.
CO4	To review the practical **importance** and relevance of process takes place in chemical industry.
CO5	To **explain** the salient features of the processes.
CO6	To **build** a bridge between theoretical and practical concepts used in industry.

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Course: **Chemical Engineering Thermodynamics-II**

Subject code: 23020501

Course outcome:

No.	Outcome
CO1	**Define** bubble point, dew point, Azeotrope and flash condition in vapour -liquid system
CO2	Compute phase equilibrium data and **interpret** P-x-y, T-x-y diagram for ideal vapour-liquid systems.
CO3	**Identify** dew point and bubble point surfaces, the critical locus, and pure species vapor-pressure curves that make up a vapor/liquid phase envelope when presented in a *PT xy* diagram.
CO4	**Analyze** phase equilibrium using activity coefficient models and/or Equation of state models.
CO5	**Determine** equilibrium composition of a mixture of gases undergoing one or more chemical reactions
CO6	**Estimate** equilibrium conversion in reversible reactions and solve problems related to reaction equilibria.

Course: **Mass Transfer Operation-I**

Subject code: 23020502

Course outcome:

No.	Outcome
CO1	**Define** the basic principles of diffusion, mass transfer theories and interphase mass transfer
CO2	**Explain** the principles of diffusion and mass transfer operations like distillation, absorption and stripping

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CO3	**Apply** principles related to diffusion, distillation, absorption and stripping.
CO4	**Analyze** the problems related to diffusion, distillation, absorption and stripping
CO5	**Justify** the applications of theory learned in industrial practices regarding diffusion, distillation and absorption.
CO6	**Design** columns related to diverse mass transfer operations like distillation, absorption and stripping.

Course: <u>Instrumentation and Process Control</u>

Subject code: 23020503

Course outcome:

No.	Outcome
CO1	**Defining** and identifying dynamical processes and their block diagram representation using transfer functions
CO2	**Explain** Laplace transforms, inverse Laplace transforms of various signals, and, expressing response of first and second order processes using Laplace transformation
CO3	**Develop** the knowledge of Process control with Instrumentation with main focus on various sensors such as flow, pressure and temperature sensors.
CO4	Integrating complex block diagram systems to a simple form and **examining** the controller actions such as Proportional (P), Proportional-integral (PI) and Proportional-integral-derivative (PID).
CO5	**Explaining** the stability of control processes and estimating the stability by Routh's test and tuning of controllers using stability criterion
CO6	Measuring frequency response problems and **predicting** stability in frequency domain by means of Bode plots.

Course: <u>Mechanical Operation</u>

Subject code: 23020504

Course outcome:

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No.	Outcome
CO1	**Choose** the techniques of mechanical operations to meet the need of chemical Industries.
CO2	**Understanding** fluid flow through packed and fluidized beds.
CO3	Able to **identify** the different types of mixing, agitation and conveying of solids and estimating the power requirement.
CO4	Ability to **classify** suitable size reduction equipment and solid-solid separation method.
CO5	**Determination** of the static and dynamic principles of separation for ores in chemical industries.
CO6	**Design** of filtration equipment by considering constant and variable pressure governing equations.

Course: **Fundamental of Chemical Engineering Unit Operation (Elective 1)**

Subject code: 23020504

Course outcome:

No.	Outcome
CO1	**Define** chemical process industries, the roles of chemical engineers and their ethical practices.
CO2	**Understand** the concepts of various unit operation, their mode of operation and applications.
CO3	**Application** of computational tools (excel/c programming) to solve problems pertaining to process industries.
CO4	Systematically **analyze** the process flow diagrams and piping& instrumentation diagrams of industry.
CO5	**Evaluation** of problems relevant to ideal and real gases.
CO6	**Estimation** of various physico-chemical properties using appropriate mathematical

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approaches.

SEM 6th

Course: Mass Transfer Operation-II

Subject code: 23020602

Course outcome:

No.	Outcome
CO1	**Define** the basic principles of mass transfer operations like extraction, adsorption, humidification, dehumidification and drying.
CO2	**Explain** the principles of mass transfer operations like extraction, adsorption, humidification, dehumidification and drying.
CO3	**Apply** principles related to extraction, adsorption, humidification, de-humidification and drying.
CO4	**Analyze** the problems related to extraction, adsorption, humidification, de-humidification and drying.
CO5	**Justify** the applications of theory learned in industrial practices regarding extraction, adsorption, humidification, and dehumidification and drying.
CO6	**Design** mass transfer equipments based upon the conditions given in the problem statement.

Course: Process Equipment Design-I

Subject code: 23020601

Course outcome:

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No.	Outcome
CO1	**Define** the basics of chemical process equipment design
CO2	**Explain** the sizing calculations of pipes, heat transfer and mass transfer equipment
CO3	**Apply** the fundamental understanding the complexity of the design
CO4	**Analyze** critically the design criteria for the optimum design
CO5	**Recommend** the international standards, fabrication and testing methods
CO6	**Design** the various equipments used in chemical process industries.

Course: Pollution Control and Safety Management

Subject code: 23020604

Course outcome:

No.	Outcome
CO1	**Define** the safety principles & standards, loss statistics, toxic substance & hazard and industrial hygiene.
CO2	**Classify** measures to diminish risk and execution of safety and industrial hygiene.
CO3	**Apply** knowledge in risk analysis through FTA, ETA, QRA, LOPA and BTA.
CO4	**Examine** industrial safety & hygiene identification, evaluation and control
CO5	**Assess** characteristic sources of risk in a process plant by learning from case studies
CO6	**Estimate** fire & explosion hazard and their evaluation and prevention & control.

Course: Chemical Reaction Engineering - I

Subject code: 23020605

Course outcome:

No.	Outcome

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CO1	**Relate** to the basics of kinetics and basic theories to get the underlying mechanisms
CO2	**Interpret** and evaluate the rate data and get the kinetics parameters
CO3	**Select** proper design equations and perform reactor sizing for ideal reactors
CO4	**Examine** the suitable combinations of ideal reactors for optimal performance
CO5	**Decide** the reactor sequencing for single and multiple reactions towards desired products
CO6	**Design** ideal reactor systems based on experimental data and optimize its performance.

Course: Advanced Separation Techniques

Subject code: 23020606

Course outcome:

No.	Outcome
CO1	**Define** the basic principles of different separation processes.
CO2	**Explain** the complete details including problem-solving approach and the applications of theory learned regarding SFE, Membrane Separation, Surfactant Based separation and other separation processes.
CO3	**Apply** the principles of separation processes like SFE, Membrane Separation, Surfactant Based separation and other separation processes.
CO4	**Analyze** the problems related to SFE, Membrane Separation, Surfactant Based separation and other separation processes.
CO5	**Estimate** desired separation from the give separation processes.
CO6	**Design** separation modules based upon the conditions given in the problem statement.

Course: Biochemical Engineering

Subject code: 23020603

Course outcome:

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No.	Outcome
CO1	**Define** various mass transfer and reaction engineering aspects of enzyme inhibition and immobilization
CO2	**Illustrate** the different mechanism of separation of soluble and insoluble biochemical products
CO3	**Identify** and outline the various modelling strategies to express the kinetics of enzyme catalyzed reaction.
CO4	**List** the various applications of biochemical engineering in allied chemical and energy sector
CO5	**Determine** the various reactor configurations as well as to implement the design fundamentals of bioreactors.
CO6	**Discuss** the conversion processes of the various industrially important biochemical products.

SEM 7th

Course: Process Equipment Design-II

Subject code: 24020701

Course outcome:

No.	Outcome
CO1	**Define** mass transfer, heat transfer and unit operation subjects which are learned in the previous semester
CO2	Create **understanding** of equipment design with mechanical concept.
CO3	**Build** a bridge between theoretical and practical concepts used for designing the

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	equipment in any process industry.
CO4	Analyze the various physical properties, design parameters and solutions for designing of equipments
CO5	Review the **importance** of design concepts in process industry.
CO6	Design process equipment and **modify** the design of existing equipment to new process conditions or new required capacity

Course: Chemical Reaction Engineering-II

Subject code: 24020702

Course outcome:

No.	Outcome
CO1	**Relate** to the basics of non ideality and characteristics of residence time distributions
CO2	**Interpret** the RTD profiles and experimental data to model the non ideal reactors
CO3	**Select** proper reaction mechanism and design the catalytic reactor by rate data analysis
CO4	**Compare** the reactor performance with or w/o internal of external mass transfer limitations
CO5	**Appraise** the performance of different reactors in multi phase systems
CO6	**Design, Develop and/or Modify** reactor systems for specific purpose of real life problems

Course: Energy Technology (Elective-I)

Subject code: 24020706

Course outcome:

No.	Outcome
CO1	**List** the available renewable and non-renewable energy resources and relate to fulfill global energy demand.

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CO2	**Summarize** the various characterization techniques used in solid and liquid fuels
CO3	Execute the effective **utilization** of potential conventional energy source by advanced conversion technologies
CO4	**Analyze** the potential utilization of biomass and bio-fuels as a substitute for the fossil fuel applications
CO5	**Assess** the available non-conventional (renewable) energy resources and techniques to utilize them effectively.
CO6	Facilitate the **design** and applications of related devices using renewable energy sources.

Course: Computer Aided Process Synthesis

Subject code: 24020703

Course outcome:

No.	Outcome
CO1	**Choose** and apply blocks and streams from a simulators library to make a process flow sheet
CO2	Understand, create, **select**, and describe computer tools for chemical process simulation
CO3	**Apply** stream and block parameters to a chemical unit operation for computer simulation
CO4	**Analyze** process intensification and construct Heat exchanger networks and develop the pinch design approach to develop a network
CO5	**Determine** flow sheeting solution by using design specification and sensitivity analysis approach
CO6	**Solve** process design and simulation calculations of various unit operations using Aspen software

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Course: Plant Design and Project Engineering

Subject code: 24020704

Course outcome:

No.	Outcome
CO1	**Choose** appropriate process for a project and to learn basic economic concept, to understand and apply this concepts in the project works undertaken and to chemical engineering situation by solving problem
CO2	**Understand** piping and instrumentation diagram.
CO3	**Organize** the primary techno-economic feasibility of project.
CO4	**Categorize** the equipment and able to prepare specification sheet.
CO5	**Evaluate** the project cost including capital investment, product cost, breakeven point, depreciation cost for equipment and the total project cost.
CO6	**Plan** the control and schedule of the project using CPME/PERT technique, calculations, problem on profitability and replacement analysis.

SEM 8th

Course: Solid Fluid Operation

Subjectcode: 24020805

Course outcome:

No.	Outcome
CO1	**Define** solid fluid operations in chemical industries.

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CO2	To **understand** the principles behind different solid - fluid operations.
CO3	**Apply** knowledge to make students understand the global scenario and requirement of solid fluid operations and advancement in the same field.
CO4	To **analyze** the variety of application of solid fluid operations in chemical industries.
CO5	To make student realize the **importance** of design related problems in solid-fluid operations in chemical industries
CO6	**Modify** the design or can suggest the changes required for better operation in terms of economy and efficiency

Course: Fertilizer Technology

Subject code: 24020804

Course outcome:

No.	Outcome
CO1	**Choose** reactions and unit operations steps in manufacturing of various fertilizers
CO2	**Classify** fertilizers on the basis of different properties
CO3	**Identify** engineering problems in fertilizer manufacturing.
CO4	**Categorize** the equipment used for storage and handling of fertilizers
CO5	**Explain** the need and importance of fertilizer
CO6	**Discuss** the initiatives and schemes of Central/State Governments towards fertilizers

Course: Chemical System Modeling

Subject code: 24020803

Course outcome:

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No.	Outcome
CO1	**Choose** process models based on conservation principles and process data.
CO2	**Explain** the chemical processes, different parts of the processes and unit operations.
CO3	Have an understanding of computational techniques to **solve** the process models.
CO4	Use economics to derive an objective function and **analyze** principles of engineering to develop equality and inequality constraints.
CO5	**Choose** various optimization techniques as a tool in process design and operation for optimizing important industrial processes
CO6	Get familiar with the preferred software packages and optimization techniques ASPEN PLUS, GAMS, HYSIS, CHEMCAD and MATLAB to **solve** linear programming and nonlinear programming problems which will make them ready for industry..

Course: Petroleum Refining & Petrochemicals

Subject code: 24020802

Course outcome:

No.	Outcome
CO1	**Choose** purification and fractionation process of crude oil
CO2	**Outline** the crude composition, properties and characterization methods of different petroleum fractions.
CO3	**Identify** the process technology of product upgradation units and Hydrogen processes.
CO4	**Compare** the different conversion processes of the heavier fractions by cracking and coking technology
CO5	**Interpret** the treatment processes for preparing finished products using chemical or physical separation
CO6	**Design** the process technology of various important petrochemicals products.

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Course: <u>Process Simulation & Optimization</u>

Subject code: 24020803

Course outcome:

No.	Outcome
CO1	**Relate** the important physical phenomena from the problem statement, various types of models such as empirical models, hybrid models etc.
CO2	**Translate** chemical process systems into mass balance, energy balance and momentum balance formulations
CO3	**Develop** model equations for the given system, demonstrate the model solving ability for various processes/unit operations, develop various models for various systems such as reactor, distillation column, heat exchangers and analyze their behavior.
CO4	Be able to theoretically **examine** different types of optimization problems.
CO5	**Assess** the utilization of different optimization techniques.
CO6	Ability to **solve** various multivariable optimization problems.

Course: <u>Nano-Technology (Elective-I)</u>

Subject code: 24020707

Course outcome:

No.	Outcome
CO1	**Define** the nano-materials
CO2	**Classify** the appropriate nano-materials
CO3	**Choose** various synthesis and processing methods for nano-materials
CO4	**Analyze** and Identify nano-materials for engineering applications

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CO5	**Explain** the role of nanotechnology in various engineering disciples
CO6	**Develop** new techniques for the synthesis of nanomaterials

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SWARRNIM STARTUP & INNOVATION UNIVERSITY

SWARRNIM INSTITUTE OF TECHNOLOGY

ENVIRONMENTAL ENGG

M.TECH

1st semester

Course Name: - Application based system for transport of water & wastewater

Subject Code:-24020101

Learning Outcomes:

CO	After the completion of the course the student should be able to
CO1	The student will be able to choose from a variety of pipe materials for the main water supply, distribution network, and sewer after completing the course.
CO2	The student will be able to design the main water supply, distribution network, and sewer for a variety of field scenarios upon completion of the course.
CO3	On Completion of the Course the student will Troubleshooting in water and sewage transmission be able to use various computer software for the design of water and sewage network.

Course Name: - Environmental Chemistry And Microbiology

Subject Code:-24020102

Learning Outcomes:

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CO	After the completion of the course the student should be able to
CO1	Master a broad set of chemical knowledge concerning the fundamentals in the basic areas of the discipline (organic, inorganic, analytical, physical and biological chemistry).
CO2	Demonstrate that microorganisms have an indispensable role in the environment, including elemental cycles, biodegradation, etc.

Course Name: - Water &wastewater technology

Subject Code:-24020104

Learning Outcomes:

CO-1:Water's properties will be possible to be analyzed by students.

CO-2: To able design intake structure for collection of water from various sources of water.

CO-3: The ability to design aeration, sedimentation, coagulation, and filtration tanks will be granted by students.

CO-4: The ability to design units for de-fluoridation, softening, fluoridation, and disinfection will be granted to students.

CO-5: Research on water treatment at the bench scale and in pilot plants will be assessed by students.

CO-6: It will be possible for students to create different rural water system units.

Course Name: - Environmental impact Assessment

Subject Code:-24020103

Learning Outcomes:

CO-1: Classifying and discussing the composition and roles of ecosystems will be possible for students.

CO-2: Explain synergistic and symbiotic interactions by student.

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CO-3: Demonstrate the significance of biogeocycles. Utilize models of ecosystems.

Course Name: - Advances in environmental laboratories

Subject Code:-24020103

Learning Outcomes:

CO1- Mable to assess quality of environment

2nd semester

Course Name: - Industrial water & wastewater treatment

Subject Code:-24020201

Learning Outcomes:

CO-1 Learn physical/chemical/biological characteristics of and the evaluation technique for various industrial wastewater.

CO2- Understand the theory, engineering application, and design technique for the industrial wastewater treatment unit processes.

Course Name: - Air Pollution and Control

Subject Code:-24020202

Learning Outcomes:

CO-1 Classify sources and effects of air pollution
CO-2 Explain impact of meteorological parameters and various control measures for air pollution
CO-3 Illustrate the working mechanisms of various air pollution control equipment.
CO-4 Make use of various mathematical models for solving problems related to dispersion and control of air pollutants.

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Course Name: - Industries hygiene and safely

Subject Code:-24020203

Learning Outcomes:

At the completion of this course, students should be able to

    CO-1 Management of Safety in work places
    CO -2 Understand the Behavior aspects of workers
    CO-3 Will be able to give Safety education and train the workers.
    CO-4 Able to calculate direct and indirect costs.
    CO-5 Can act as a bridge between Management and Workers

Course Name: - Solid and hazardous waste management

Subject Code:-24020204

Learning Outcomes:

    CO-1 Explain sources, composition & generation rate of solid waste.
    CO-2 Choose proper treatment & disposal for solid waste.
    CO-3 Select appropriate procedures for construction and operation of sanitary landfill.
    CO-4 Explain sources, characteristics & associated risk of the hazardous waste.
    CO-5 Choose proper treatment& disposal for hazardous waste.
    CO-6 Recall the legislative procedures for various solid waste.

Course Name: - Environmental Monitoring

Subject Code:-24020205

Learning Outcomes:

    CO-1 Role of environmental monitoring in environmental engineering.
    CO-2 Types of sampling (grab, composite, continuous).
    CO-3 Selection of appropriate sampling methods and equipment.
    CO-4 Data collection in various environmental media (air, water, soil).
    CO-5 Data storage, analysis, and reporting.

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Course Name: - Membrane technology

Subject Code:-24020206

Learning Outcomes:

CO-1 Definition and significance of membrane technology in environmental engineering.
CO-2 Classification of membranes (microfiltration, ultrafiltration, nanofiltration, reverse osmosis).
CO-3 Membrane materials, properties, and selection criteria.
CO-4 Analysis of real-world projects and applications of membrane technology in India.

Course Name: - Climate change

Subject Code:-24020207

Learning Outcomes:

CO-1 Measure climate factors and how they change.
CO-2 Understand connections between global warming and human activities.
CO-3 Identify effects of climate change on biodiversity and ecosystems in different biomes and aquatic systems.
CO-4 Model possible scenarios for future climate change.
CO-5 Achieve possible ways to deal with climate change.

3rd semester

Course Name: - Treatment process design and drawing

Subject Code:-24020301

Learning Outcomes:

CO-1 Upon successful completion of this course, students will be able to
CO-2 Design various environmental structures like water treatment plants, waste water treatment systems.
CO-3 Design air pollution control equipment

Course Name: - Air Pollution control equipment

Subject Code:-24020302

Course Objectives:

CO-1 Understand the principles and significance of air pollution control in the field of environmental engineering.

CO-2 Demonstrate knowledge of various types of air pollution control equipment and their working principles.

CO-3 Develop skills in the selection, design, and operation of pollution control systems for different pollutants.

CO-4 Analyze and evaluate the performance of air pollution control equipment for specific contaminants.

CO-5 Apply regulatory and compliance standards to design and operate pollution control systems in India.

CO-6 Appreciate the economic and sustainability aspects of air pollution control.

4th semester

Course Name: - Environmental Legislation & management

Subject Code:-24020401

Learning Outcomes:

CO-1 Describe the relevant sections of Indian Penal Code and Criminal Procedure Code for Environmental Protection.

CO-2 Discriminate the power & functions of regulatory agencies.

CO-3 To understand the roles, responsibilities of Air Act.

CO-4 To understand the roles, responsibilities of Environmental Act.

CO-5 Draft writ petitions and Public Interest litigation

Course Name: - Energy Source &their Environmental Impact

Subject Code:-24020402

Course Objectives:

CO-1 Understand the various energy sources and their role in meeting the energy demands in India.

CO-2 Assess the environmental impact of different energy sources, considering air quality, water resources, land use, and climate change.

CO-3 Evaluate the economic, social, and policy implications of energy source choices.

CO-4 Analyze and compare the sustainability and efficiency of renewable and non-renewable energy technologies.

CO-5 Develop the ability to propose environmentally sustainable energy solutions for specific Indian contexts.

CO-6 Comprehend the regulatory and policy framework related to energy sources and environmental impact in India.

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PROGRAM NAME: Bachelor of Technology in Automobile Engineering

<u>**Semester-I**</u>

Subject Name: Maths-I
Subject Code: 23000001
Course Outcomes (COs):

CO1	Analyze and manipulate infinite sequences and series.
CO2	Evaluate limits involving indeterminate forms.
CO3	Understand and apply techniques for improper integrals.
CO4	Analyze functions of several variables and solve optimization problems.
CO5	Solve systems of linear equations using matrices and determinants.
CO6	Analyze eigenvalues and eigenvectors for linear transformations and matrices.

Subject Name: Fundamentals of Computer Programming
Subject Code: 23000004
Course Outcomes (COs):

CO1	Apply fundamental principles of problem solving in software engineering.
CO2	Apply basic programming principles using C language.
CO3	Apply basic C program structure in software development
CO4	Prepare graduates for professional careers in roles including, but not limited to, the following: computer programmer, software engineer, software systems designer, software applications developer, technical software project lead, computer systems analyst, computer systems programmer, software applications tester and maintainer.
CO5	To prepare graduates with the knowledge and skills to do advanced studies and research in computer science and related engineering and scientific disciplines
CO6	To equip graduates with the communication skills, both oral and written, to become an effective team-oriented problem solver as well as an effective communicator with nontechnical stakeholders in computer and software systems development, maintenance and administration.

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Subject Name: Elements of Electrical Engineering

Subject Code: 23000012

Course Outcomes (COs):

CO1	Define electrical current, potential difference, power and energy, sources of electrical energy, resistance and its behavior with temperature.
CO2	Understand the different types of wires, cables, connectors & switches used for wiring Different types of domestic and industrial wiring.
CO3	Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
CO4	Analyze the steady state behavior of single phase and three phase AC electrical circuits.
CO5	Compare various protective devices of working principle, usage and construction such as fuse, MCB, ELCB & Relays.
CO6	Design and development of varies Electrical Wiring and electronics miniproctes.

Subject Name: Elements of Mechanical Engineering

Subject Code: 23000003

Course Outcomes (COs):

CO1	**Discribe** the various sources of energy and basic terminology of Mechanical engineering.
CO2	Make calculations for commonly used working fluids i.e. ideal gases and steam.
CO3	Analyze various heat engine cycles and understand construction and working of IC engines.
CO4	Discuss working and applications of steam boilers and various energy conversion systems.
CO5	Discuss various power transmission elements and properties of various engineering materials with their applications.

Subject Name: Environmental Studies

Subject Code: 23000006

Course Outcomes (COs):

CO1	Describe natural resources, importance of ecosystem and conservation of biodiversity with respect to multiple disciplines.
CO2	Explain causes, effects, solutions for various pollution problems and its minimization strategies.
CO3	Differentiate between requirements of laws and regulations for environmental conservation and applicability of legislations in society and industries.
CO4	Discuss environmental ethics and their implementation for betterment of environment and human life.

Subject Name: Orientation Program in Startuo and Entreprenuirship

Subject Code: 12300001

Course Outcomes (COs):

CO1	Apply the basic principles of entrepreneurship
CO2	Distinguish the concepts of the entrepreneurship ecosystem, entrepreneurship education, and various entrepreneurial opportunities.
CO3	Understanding various individual attributes of entrepreneurial personality traits, entrepreneurial characteristics, behavioural attributes and importance of creativity and innovation.
CO4	Develop an understanding of best techniques for idea generation and opportunities exploration.

Subject Name: Workshop

Subject Code: 23000029

Course Outcomes (COs):

CO1	Understand applications of hand tools and power tools and operations of machine tools.
CO2	Understand the operations of machine tools.
CO3	Select the appropriate tools required for specific operation.
CO4	Comprehend the safety measures required to be taken while using the tools.
CO5	Prepare Fitting, Carpentry, Plumbing, Welding ,and Tin-smithy Jobs.

Subject Name: ENGINEERING PHYSICS

Subject Code: 23000005

Course Outcomes (COs):

CO1	To acquire knowledge of calculus which are integral part of any branch of Physics
CO2	Students learn accurately how to describe motion of objects, planetary motions, gravitation etc. Understand the motion of objects in different frame of references
CO3	To learn about basic concepts of electrical charges and currents and their properties
CO4	Student learn about various types of waves and their propagation.
CO5	To understand the principle of calorimetry
CO6	To know about Radiation and its nature, old quantum theory, concept of wave-particle duality and de Broglie hypethesis.
CO7	To study complex analysis, Cauchy Riemann conditions, Analyticity, Cauchy Integral formula, Laurent and Taylor series expansion and definite integrals using contour integration.

Subject Name: COMMUNICATION SKILLS

Subject Code: 23000008

Course Outcomes (COs):

CO1	Students will become master of four communication skills.
CO2	They feel confident in speaking and writing English language.
CO3	Students will be able to improve the language skills i.e. Listening Skill, Speaking Skill, Reading Skill, and Writing Skill (LSRW).
CO4	To make them learn about life skills and soft skills.

Subject Name: MATHS-II

Subject Code: 23000010

Course Outcomes (COs):

CO1	Understand vectors in RnRn and operations involving linear combinations.
CO2	Identify subspaces and determine basis and dimension and Perform coordinate transformations and understand the change of basis.
CO3	Understand linear transformations and their properties and Represent linear transformations with matrices and explore the concept of similarity.
CO4	Apply inner product spaces to least squares approximation and diagonalization of symmetric matrices and Explore applications of quadratic forms and optimization.
CO5	Apply double and triple integrals over different regions and Utilize Fubini's theorem and change of variables in multiple integrals.
CO6	Apply integration techniques to calculate volumes of various solids.

Subject Name: ENGINEEERING GRAPHICS

Subject Code: 23000011

Course Outcomes (COs):

CO1	**Describe** the fundamental methods of engineering drawing, sketching and drafting.
CO2	**Understanding** the object through orthographic projections.
CO3	**Construct** basic and intermediate geometry and application of engineering curves.
CO4	**Enhance** visualization skills for developing new products.
CO5	**Develop** new products through technical communication skill in the form of communicative drawings.
CO6	**Develop** the theory of orthographic projection and views.

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Subject Name: ELEMENTS OF CIVIL ENGINEERING

Subject Code: 23000015

Course Outcomes (COs):

CO1	Carry out simple land survey to prepare maps with existing details.
CO2	Find out area of irregular shaped plane figures.
CO3	Understand building plan elevation and section.
CO4	Get acquainted with construction materials.
CO5	Get acquainted with hydrological cycle and hydraulic structures.
CO6	Get acquainted with mass transportation systems.

Subject Name: BASIC PROGRAM IN ENTREPRENURESHIP

Subject Code: 12300002

Course Outcomes (COs):

CO1	Develop an understanding of best techniques for idea generation, opportunities exploration, and market research.
CO2	Check technical, market, financial and other types of Feasibility of their business idea
CO3	Develop business model to describe the rationale of how an organization creates, delivers, and captures value
CO4	Conduct the customer's survey to know the need of their business idea.

Subject Name: Maths-3
Subject Code: 23000015
Course Outcomes (COs):

CO1	To have a rigorous understanding of the concept of limit of a function.
CO2	The geometrical properties of continuous functions on closed and bounded intervals.
CO3	Extensively about the concept of differentiability using limits, leading to a better understanding for applications.
CO4	The applications of mean value theorems and Taylor's theorem.
CO5	Employ De Moivre's theorem in a number of applications to solve numerical problems

Subject Name: Mechanics of Solids
Subject Code: 23080301
Course Outcomes (COs):

CO1	Explain the basic concepts of Engineering Mechanics,
CO2	to evaluate the variations of shear force and bending moment in different kinds of beams
CO3	Evaluate the shear stress and angle of deflection in a shaft subjected to torque.
CO4	Evaluate Bending and shear stresses in different shaped channels.
CO5	Determine the buckling in the columns using different theories

Subject Name: Material Science and Metallurgy
Subject Code: 23080302
Course Outcomes (COs):

CO1	Application of knowledge relating the composition, structure and processing of materials to their uses.
CO2	The Study materials that covers metals, ceramics, polymers, and combinations of materials or composites
CO3	Able to investigate the relationship between structure of materials and their properties.
CO4	Able to understand the new developments such as nano-science and nanotechnology e forefront of the studies
CO5	continue to propel materials science and engineering to the forefront of the studies

Subject Name: Manufacturing Process I

Subject Code: 23080303

Course Outcomes (COs):

CO1	Understand classification, scope and applications of manufacturing methods used in industries.
CO2	Explain the different casting methods with their process details, applications and limitations.
CO3	Understand process details of rolling, forging, extrusion and drawing operations.
CO4	Classify and explain in detail different welding methods with brief introduction to brazing and soldering.
CO5	Understand powder metallurgy process with advantages, limitations and industrial applications.

Subject Name: Kinematics of Machines

Subject Code: 23080304

Course Outcomes (COs):

CO1	Classify and solve for mobility of planar mechanisms
CO2	Perform kinematic synthesis and analysis of planar mechanisms
CO3	Construct and analyze cam profiles for a specified motion of the follower
CO4	Analyze different types of gear trains
CO5	Model and analyze planar mechanisms using software package

Subject Name: Electriacal Technology

Subject Code: 23080305

Course Outcomes (COs):

CO1	Understand the basic concepts of DC circuits and Magnetic circuits and also able to solve problems related to DC and magnetic circuits.
CO2	Analysis of Single Phase and three phase AC Circuits and the representation of alternating quantities and also determining the power and other parameters in these circuits
CO3	Explain the construction, basic principle of operation, applications and also determine performance parameters of electrical Machines.
CO4	Practice Electrical Safety Rules & standards and types of electrical wiring and domestic earthing.

Subject Name: Foundation Program in Entrepreneurship
Subject Code: 12300003
Course Outcomes (COs):

CO1	Demonstrate different Python data types and their structures
CO2	CInterpretation of the role of python in steps involved in data science
CO3	Illustrate the use of various operations for data cleansing and transformation
CO4	Analyze data visualization tools for data interpretation and insights of data
CO5	Perform data Wrangling with Scikit-learn applying exploratory data analysis

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Semester-IV

Subject Name: Maths-4
Subject Code: 23000018
Course Outcomes (COs):

CO1	Extract the solution of differential equations of the first order and of the first degree byvariables separable, Homogeneous and NonHomogeneous methods
CO2	Find a solution of differential equations of the first order and of a degree higher than the firstby using methods of solvable for p, x and y
CO3	Compute all the solutions of second and higher order linear differential equations withconstant coefficients, linear equations with variable coefficients.
CO4	Solve simultaneous linear equationswith constant coefficients and Total Differential equations
CO5	Form partial differential equations
CO6	Find the solution of First order partial differential equations for some standard types.

Subject Name: Automobile MEASUREMENT & METROLOGY
Subject Code: 23010401
Course Outcomes (COs):

CO1	Create holistic value based education for the students
CO2	Understand the different tools for student's overall development
CO3	Apply critical thinking
CO4	Analyze soft skills and hard skills
CO5	Understand the values of our country
CO6	Analyze the role models to learn from models who have a lived principle

Subject Name: AUTOMOBILE MANUFACTURING PROCESSES
Subject Code: 23010402
Course Outcomes (COs):

CO1	Understand basic concepts of Manufacturing processes.
CO2	To understand Metal casting process, patterns, defect and its applications.
CO3	To understand different types of welding process, soldering and brazing process.
CO4	To understand metal shaping and forming process.
CO5	Understanding of Plastic, Ceramic and Glass processing techniques.

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Subject Name: ENGINEERING THERMODYNAMICS

Subject Code: 23090401

Course Outcomes (COs):

CO1	Understand the design thinking process
CO2	Design a solution to an engineering problem
CO3	Identify needs and constraints of product development system
CO4	Create a prototype model
CO5	Evaluate the designed solution
CO6	Make economic decision for solution.

Subject Name: MACHINE DESIGN & INDUSTRIAL DRAFTING

Subject Code: 23090403

Course Outcomes (COs):

CO1	Apply the techniques of discrete mathematics for theoretical computer science.
CO2	Design different formal languages and their relationship.
CO3	Classify grammars for different languages .
CO4	Build finite automata, push down automata and turing machine.
CO5	Analyze various concepts of undecidability and Computable Function for problem-solving situation.

Subject Name: INTERMEDIATE PROGRAM IN ENTREPRENEURSHIP

Subject Code: 1230004

Course Outcomes (COs):

CO1	Demonstrate the various features of microprocessor, memory and I/O devices
CO2	Identify the hardware elements of 8085 microprocessor.
CO3	Select appropriate 8085 instructions based on size and functions to write an assembly language program
CO4	Design different interfacing system using concepts of memory and I/O interfacing.
CO5	CO5 :Demonstrate the features of advance microprocessors.

Subject Name: Fluid Mechanics
Subject Code: 23090501
Course Outcomes (COs):

CO1	To understand fluids and its properties.
CO2	Understand laminar and turbulent flow through pipes and parallel plates.
CO3	Understand various types of flow, Mass Momentum and energy conservation and related equations.
CO4	Explain various applications of Bernoulli's Equation, Notches and Weirs, Orifices and Mouthpieces
CO5	Understand different types of flow through pipes, Viscous and turbulent flow.

Subject Name: Heat Transfer
Subject Code: 23090503
Course Outcomes (COs):

CO1	Explain the governing laws and modes of heat transfer
CO2	Compute temperature distribution and heat transfer rate in steady and unsteady state heat conduction
CO3	Interpret and analyse natural and forced convective heat transfer with dimensional analysis
CO4	Analyse the performance of heat exchangers under different flow conditions using LMTD and NTU method.
CO5	Analyse radiative heat transfer between two or more black/gray bodies

Subject Name: Automobile Systems
Subject Code: 23010503
Course Outcomes (COs):

CO1	Understand the various vehicle classification and its layouts.
CO2	Understand the different types of systems.of clutches and brakes
CO3	Understand the different types of systems.of clutches and brakes
CO4	Understand the transmission systems.
CO5	Understand the steering requirements and types of front axle.

Subject Name: Automobile Engines

Subject Code: 23010504

Course Outcomes (COs):

CO1	Understand various components of the engine and its functions
CO2	Gain knowledge on combustion in CI Engine
CO3	Understand the lubrication and cooling system in IC Engines
CO4	Understand the turbo, supercharging and scavenging system in IC Engines
CO5	Understand the combustion in SI Engine

Subject Name: Automotive Electrical Systems

Subject Code: 23010505

Course Outcomes (COs):

CO1	Understand the basic auto electrical systems.
CO2	Understand the layout of wiring and connections of electrical systems in automobiles.
CO3	Understand the working of different electrical components and latest technology used in automobiles.

Subject Name: Automobile Chassis & Body Engineering

Subject Code: 23010506

Course Outcomes (COs):

CO1	Understand and have knowledge about different aspects related to body and chassis
CO2	Understand various safety provisions.
CO3	Design the chassis and able to select the section of same.
CO4	Design the cabin and frame component to transfer the force.
CO5	Optimization from safety and cost point of view.

Subject Name: Intellectual Property Rights

Subject Code: 12300005

Course Outcomes (COs):

CO1	Evaluate strength and limitation of cloud computing
CO2	Analyze different cloud depoly and services architecture model
CO3	Understand various enterprise application in cloud computing
CO4	Apply the virtualization concepts
CO5	Analyze data security mechanism and SLA management in cloud

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Subject Name: MODERN QUALITY TECHNIQUES
Subject Code: 23010601
Course Outcomes (COs):

CO1	Engineering Knowledge: Acquisition of Engineering knowledge on quality systems is essential to accomplish solutions to complex engineering problems in quality management and system
CO2	Engineering Knowledge: Acquisition of Engineering knowledge on fundamentals of leadership is essential to accomplish solutions to complex engineering problems in fundamentals of process planning and management of quality leadership
CO3	Ethics: Apply business ethical principles and ethics management system
CO4	individual and Teamwork: Function effectively as an individual and as a member or leader in teams, and in multidisciplinary settings.
CO5	Engineering Knowledge: Acquisition of Engineering knowledge on fundamentals of management systems is essential to accomplish solutions to engineering problems in QMS

Subject Name: DYNAMICS OF MACHINERY
Subject Code: 23090601
Course Outcomes (COs):

CO1	Introduction to design, material and its properties.
CO2	To design against fluctuating loads, S-N diagram, Soderberg and Gerber criteria.
CO3	To design thin and spherical vessels.
CO4	To understand design procedure of belt and chain drives.
CO5	To understand different types of springs, stresses and different loading condition of spring.

Subject Name: ALTERNATIVE FUEL AND POWER SYSTEMS
Subject Code: 23010603
Course Outcomes (COs):

CO1	To study different type of bio fuels and bio diesel
CO2	To understand the different type of bio gas and CNG Metering System
CO3	Describe layout of Electric system and Hybrid vehicle
CO4	Design the solar powered vehicle and fuel cell

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Subject Name: HYBRID VEHICLE TECHNOLOGY

Subject Code: 23010604

Course Outcomes (COs):

CO1	Described the layout of Hybrid vehicle system and Convernational Vehicle
CO2	To understand the Hybrid electric system and electric Propulsion unit
CO3	To study about the energy storage and super capacitor of electric system
CO4	To Study about the Internal combustion engine

Subject Name: VEHICLE MAINTENANCE & GARAGE PRACTICE

Subject Code: 23010606

Course Outcomes (COs):

CO1	Preventive and maintenance of the vehicle
CO2	Study about the Tools and Instrunment of the garage
CO3	Function the service station and Engine maintenance
CO4	Repair and over hauling of the Cylinder block and cylinder head of the garage
CO5	Maintenance of Fuel Systems and Cooling Systems & Lubrication System Petrol Engine

Subject Name: SPECIAL PURPOSE VEHICLES

Subject Code: 23010605

Course Outcomes (COs):

CO1	Introduction of the SPV
CO2	To study about the earht moving equipment and road making equipment
CO3	Described the Lifitng and machinery and Pto shaft and auxiliary system
CO4	Design the farm equipment and oil tanker and other quipment used in SPV

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Semester-VII

Subject Name: Vehicle Testing & Homologation
Subject Code: 23010701
Course Outcomes (COs):

CO1	Need of vehicle testing and homologation
CO2	To describe the noise and Vibration Harshness Testing
CO3	To Study about the vehicle performance and Energy consuption of the vehicle
CO4	Testing the Road and track and PDI of the engine and Inspetion
CO5	Understanding of some AIS Standards:
CO6	Testing the active and passive safety of the vehicle

Subject Name: Vehicle Dynamics
Subject Code: 23010708
Course Outcomes (COs):

CO1	To study about the Performance Characteristics of Vehicle
CO2	Design the aerodynamics air and air distribution of the vehicle
CO3	Terminology and Axis System of the vehicle
CO4	Calculation of effective spring rate of the supesion system
CO5	Resistance forces acting on motorcycle

Subject Name: Automobile Component Design
Subject Code: 23010703
Course Outcomes (COs):

CO1	Design of standardization in automobile system
CO2	Consideration of the Welding and Casting of the metal
CO3	Selection of bearings from manufacturers catalogue.
CO4	Details Bearing types and their constructional details
CO5	Design of I.C. Engine Components

Subject Name: Two and Three Wheelers

Subject Code: 23010704

Course Outcomes (COs):

CO1	Vehicle body classification and specification
CO2	Analysis Static load, Load due to Acceleration and Braking, Moments and Torque due to driving conditions
CO3	Introduction to electric vehicles & hybrid vehicles.
CO4	Fundamentals of engine electricals, Lighting and Indicators
CO5	To study about the steering system and suspension system and braking system

Subject Name: Noise Vibration Harshness and Safety

Subject Code: 23010707

Course Outcomes (COs):

CO1	The basic terminologies of Noise, Vibration & Harshness – NVH, which is a major focus for high end luxury vehicles manufacturers, in the current times
CO2	basic terminologies of Noise, Vibration & Harshness – NVH, which is a major focus for high end luxury vehicles manufacturers, in the current times
CO3	Understand Application of engineering techniques, tools, for measurement methods in order to learn to control and solve complex Vehicle vibrations behavior /as well as performance problems.
CO4	Application of systematic engineering synthesis and design processes for eliminating or reducing the Vibration, Noise to reduce irritation to occupants and achieve improvement in perception of ride comfort

Subject Name: Project-1

Subject Code: 23000023

Course Outcomes (COs):

CO1	Define a problem and review literature to identify the gaps, objectives & scope of the work.
CO2	Analyze the problems of mechanical engineering to formulate objectives of project.
CO3	Design a system, component, or process to meet the desired needs of social and sustainability.
CO4	Demonstrate the techniques, skills, and modern engineering tools necessary for engineering practice.
CO5	Prepare a professional report as per recommended format and defend the work.

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Subject Name: PROJECT 2

Subject Code: 23000025

Course Outcomes (COs):

CO1	Define a problem and review literature to identify the gaps, objectives & scope of the work.
CO2	Analyze the problems of mechanical engineering to formulate objectives of project.
CO3	Design a system, component, or process to meet the desired needs of social and sustainability.
CO4	Demonstrate the techniques, skills, and modern engineering tools necessary for engineering practice.
CO5	Prepare a professional report as per recommended format and defend the work.

Subject Name: AUTOMOBILE SYSTEM DESIGN

Subject Code: 23010801

Course Outcomes (COs):

CO1	Design of various clutch system components of the master cylinder
CO2	Design the propeller shaft and universal joint, slip joint
CO3	To study about the Axle of the steering system and Turing radius
CO4	Design the Braking system and Disc brake of the vehicle
CO5	Describe the fully floating and Half floating of the vehicle

Subject Name: VEHICLE BODY ENGINEERING

Subject Code: 23010802

Course Outcomes (COs):

CO1	Design of the car body and constrution of the car
CO2	Objective the vehicle aerodynamics
CO3	Construction of the mini bus and articulated layout
CO4	Method of the body trim and mechanicsm

Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1st Year	Semester:	1
Course title:	Maths-I	Course code	23000001
Course type:	Engineering Science	Course credit:	5

CO 1	Analyze and manipulate infinite sequences and series.
CO 2	Evaluate limits involving indeterminate forms.
CO 3	Understand and apply techniques for improper integrals.
CO 4	Analyze functions of several variables and solve optimization problems.
CO 5	Solve systems of linear equations using matrices and determinants.
CO 6	Analyze eigenvalues and eigenvectors for linear transformations and matrices.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1stYear	Semester:	1
Course title:	Fundamentals of Computer Programming	Course code	23000004
Course type:	Engineering Science	Course credit:	4

CO 1	Apply fundamental principles of problem solving in software engineering.
CO 2	Apply basic programming principles using C language.
CO 3	Apply basic C program structure in software development
CO 4	Prepare graduates for professional careers in roles including, but not limited to, the following: computer programmer, software engineer, software systems designer, software applications developer, technical software project lead, computer systems analyst, computer systems programmer, software applications tester and maintainer.
CO 5	To prepare graduates with the knowledge and skills to do advanced studies and research in computer science and related engineering and scientific disciplines
CO 6	To equip graduates with the communication skills, both oral and written, to become an effective team-oriented problem solver as well as an effective communicator with nontechnical stakeholders in computer and software systems development, maintenance and administration.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1st Year	Semester:	1
Course title:	Elements of Electrical Engineering	Course code	23000012
Course type:	Engineering Science	Course credit:	5

CO 1	Define electrical current, potential difference, power and energy, sources of electrical energy, resistance and its behavior with temperature.
CO 2	Understand the different types of wires, cables, connectors & switches used for wiring Different types of domestic and industrial wiring.
CO 3	Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
CO 4	Analyze the steady state behavior of single phase and three phase AC electrical circuits.
CO 5	Compare various protective devices of working principle, usage and construction such as fuse, MCB, ELCB & Relays.
CO 6	Design and development of varies Electrical Wiring and electronics miniproctes.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1st Year	Semester:	1
Course title:	Elements of Mechanical Engineering	Course code	23000003
Course type:	Engineering Science	Course credit:	6

CO 1	Discribe the various sources of energy and basic terminology of Mechanical engineering.
CO 2	Make calculations for commonly used working fluids i.e. ideal gases and steam.
CO 3	Analyze various heat engine cycles and understand construction and working of IC engines.
CO 4	Discuss working and applications of steam boilers and various energy conversion systems.
CO 5	Discuss various power transmission elements and properties of various engineering materials with their applications.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1st Year	Semester:	1
Course title:	Environmental Studies	Course code	23000006
Course type:	Engineering Science	Course credit:	2

CO 1	Describe natural resources, importance of ecosystem and conservation of biodiversity with respect to multiple disciplines.
CO 2	Explain causes, effects, solutions for various pollution problems and its minimization strategies.
CO 3	Differentiate between requirements of laws and regulations for environmental conservation and applicability of legislations in society and industries.
CO 4	Discuss environmental ethics and their implementation for betterment of environment and human life.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1st Year	Semester:	1
Course title:	Orientation Program in Startup and Entrepreneurship	Course code	12300001
Course type:	Engineering Science	Course credit:	3

CO 1	Apply the basic principles of entrepreneurship
CO 2	Distinguish the concepts of the entrepreneurship ecosystem, entrepreneurship education, and various entrepreneurial opportunities.
CO 3	Understanding various individual attributes of entrepreneurial personality traits, entrepreneurial characteristics, behavioural attributes and importance of creativity and innovation.
CO 4	Develop an understanding of best techniques for idea generation and opportunities exploration.

Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1st Year	Semester:	1
Course title:	Workshop	Course code	23000029
Course type:	Engineering Science	Course credit:	4

CO 1	Understand applications of hand tools and power tools and operations of machine tools.
CO 2	Understand the operations of machine tools.
CO 3	Select the appropriate tools required for specific operation.
CO 4	Comprehend the safety measures required to be taken while using the tools.
CO 5	Prepare Fitting, Carpentry, Plumbing, Welding, and Tin-smithy Jobs.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1stYear	Semester:	1
Course title:	Electronics Workshop	Course code	23000002
Course type:	Engineering Science	Course credit:	4

CO 1	Measure different electrical quantities.
CO 2	Understand the requirements and operation of safety devices
CO 3	Select the appropriate tools and components required for the specific operation
CO 4	Wire and trouble shoot of household appliances.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1stYear	Semester:	2
Course title:	Maths-II	Course code	23000010
Course type:	Engineering Science	Course credit:	5

CO 1	Understand vectors in $R^n \times R^n$ and operations involving linear combinations.
CO 2	Identify subspaces and determine basis and dimension and Perform coordinate transformations and understand the change of basis.
CO 3	Understand linear transformations and their properties and Represent linear transformations with matrices and explore the concept of similarity.
CO 4	Apply inner product spaces to least squares approximation and diagonalization of symmetric matrices and Explore applications of quadratic forms and optimization.
CO 5	Apply double and triple integrals over different regions and Utilize Fubini's theorem and change of variables in multiple integrals.
CO 6	Apply integration techniques to calculate volumes of various solids.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1st Year	Semester:	2
Course title:	Engineering Physics	Course code	23000005
Course type:	Engineering Science	Course credit:	5

CO 1	Understand the basic concepts and classification of sound.
CO 2	Analyze applications of superconductors.
CO 3	Understand the fundamentals of laser radiation.
CO 4	Evaluate the applications of optical fibers.
CO 5	Apply dielectric materials in capacitors and transformers.
CO 6	Explore applications of magnetic materials.
CO 7	Explain the synthesis and applications of nonmaterial's.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1stYear	Semester:	2
Course title:	Communication Skills	Course code	23000008
Course type:	Engineering Science	Course credit:	3

CO 1	To improve students' communicative and linguistic approach in English.
CO 2	To provide an ice-breaking technique using LSRW skills and soft skills
CO 3	To learn techniques to improve overall communication abilities and effective use of writing in the field of advertising and public relations.
CO 4	Improve communication skills through practicing debate, discussion and appearing in interview.
CO 5	Use of ethical consideration in order to develop good etiquettes both in online and offline communication.

Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1st Year	Semester:	2
Course title:	Basic Electronics	Course code	23000009
Course type:	Engineering Science	Course credit:	5

CO 1	To study basics of semiconductor & devices and their applications in different areas.
CO 2	Demonstrate the operating principle and output characteristics of pn junction diodes, zener diode, Varactor diode, BJT, rectifiers and different diode circuits
CO 3	Compute and characterization of different biasing techniques to operate transistor FET, MOSFET and operational amplifier in different modes
CO 4	To implementation of basic digital gates using diode and basic family of logic Families

Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1stYear	Semester:	2
Course title:	Engineering Graphics	Course code	23000011
Course type:	Engineering Science	Course credit:	6

CO 1	Describe the fundamental methods of engineering drawing, sketching and drafting.
CO 2	Understanding the object through orthographic projections.
CO 3	Construct basic and intermediate geometry and application of engineering curves.
CO 4	Enhance visualization skills for developing new products.
CO 5	Develop new products through technical communication skill in the form of communicative drawings.
CO 6	Develop the theory of orthographic projection and views.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1st Year	Semester:	2
Course title:	Elements of Civil Engineering	Course code	23000015
Course type:	Engineering Science	Course credit:	6

CO 1	Carry out simple land survey to prepare maps with existing details.
CO 2	Find out area of irregular shaped plane figures.
CO 3	Understand building plan elevation and section.
CO 4	Get acquainted with construction materials.
CO 5	Get acquainted with hydrological cycle and hydraulic structures.
CO 6	Get acquainted with mass transportation systems.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1stYear	Semester:	2
Course title:	BASIC PROGRAM IN ENTREPRENURESHIP	Course code	12300002
Course type:	Engineering Science	Course credit:	3

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

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1st Year	Semester:	2
Course title:	Chemistry	Course code	23020216
Course type:	Engineering Science	Course credit:	4

CO 1	To relate periodic properties such as ionization potential, oxidation states and electro negativity.
CO 2	To analyze microscopic chemistry in terms of atomic and molecular orbital's and inter molecular forces.
CO 3	To describe the importance and relevance of chemistry in our everyday life
CO 4	To select the appropriate chemical material and utilization of it.
CO 5	To interpret the methods of science as a logical means of problem solving.
CO 6	To distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.

Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1stYear	Semester:	2
Course title:	Personality Development	Course code	24190203
Course type:	Engineering Science	Course credit:	3

CO 1	To provide an icebreaking technique using LSRW skills and soft skills
CO 2	To learn techniques to improve overall communication abilities and effective use of writing in the field of advertising and public relations.
CO 3	Improve communication skills through practicing debate, discussion and appearing in interview.
CO 4	Use of ethical consideration in order to develop good etiquettes both in online and offline communication.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1stYear	Semester:	2
Course title:	Web Technology	Course code	24190204
Course type:	Engineering Science	Course credit:	4

CO 1	Write and debug JavaScript to enhance user interactivity and improve the user experience.
CO 2	Understand server-side programming concepts using languages such as Node.js, Python, or PHP.
CO 3	Create responsive and visually appealing web pages using HTML, CSS, and JavaScript.
CO 4	Explain the basic principles of how the web works, including HTTP, URLs, and web servers.
CO 5	Use Git for version control, including branching, merging, and collaboration workflows.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1stYear	Semester:	2
Course title:	Introduction to Cloud Technology	Course code	24190205
Course type:	Engineering Science	Course credit:	3

CO 1	Compare major cloud service providers (e.g., AWS, Azure, Google Cloud) and their offerings.
CO 2	Recognize key security principles and practices in cloud environments, including data protection, compliance, and identity management.
CO 3	Set up and manage basic cloud services, such as virtual machines, storage solutions, and databases.
CO 4	Use cloud management and monitoring tools to oversee cloud resources, optimize performance, and manage costs.
CO 5	Identify emerging trends in cloud technology, such as serverless computing, containerization, and edge computing.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1stYear	Semester:	2
Course title:	Engineering Graphics & Design	Course code	24190206
Course type:	Engineering Science	Course credit:	4

CO 1	Explain the principles of engineering graphics, including the importance of technical drawing in engineering design and communication.
CO 2	Apply geometric construction methods to create and analyze shapes, dimensions, and spatial relationships.
CO 3	Construct and visualize 3D models using CAD software, demonstrating an understanding of spatial relationships and design principles.
CO 4	Analyze and evaluate design concepts for functionality, manufacturability, and aesthetics, using appropriate tools and techniques.
CO 5	Work collaboratively in teams to develop a design project from concept through to presentation, demonstrating project management and teamwork skills.
CO 6	Explain the principles of engineering graphics, including the importance of technical drawing in engineering design and communication.

Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1stYear	Semester:	2
Course title:	Mentoring and Counselling	Course code	24190207
Course type:	Engineering Science	Course credit:	

CO 1	Explain key theories and principles of mentoring and counseling, including various approaches and methodologies.
CO 2	Demonstrate active listening, empathy, and nonverbal communication techniques essential for building rapport with mentees or clients.
CO 3	Foster an inclusive and supportive environment that encourages open communication and trust between the mentor/counselor and the mentee/client.
CO 4	Engage in self-reflection to assess personal strengths and areas for growth as a mentor or counselor, fostering continuous professional development.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	1st Year	Semester:	2
Course title:	Open Project / MOOC	Course code	24190208
Course type:	Engineering Science	Course credit:	

CO 1	Identify and articulate the goals and objectives of their open project, ensuring alignment with personal or community needs.
CO 2	Utilize project management tools and techniques to organize, monitor, and evaluate project progress effectively.
CO 3	Identify, evaluate, and utilize open educational resources (OER) to enhance learning and project outcomes.
CO 4	Engage in self-reflection to assess personal growth, learning experiences, and challenges faced during the project.

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Semester: 3

Program:	Bachelor of Engineering	Branch:	CE AI
Year:	2nd Year	Semester:	3
Course title:	Maths - III	Course code	2300015
Course type:	Engineering Science	Course credit:	5

CO 1	Apply Fourier series to analyze and represent periodic functions.
CO 2	Apply Laplace transforms to solve differential equations and system problems.
CO 3	Apply methods such as integrating factor, Bernoulli equations, and linear differential equations.
CO 4	Apply series solutions to solve differential equations and analyze the convergence and divergence of series solutions.
CO 5	Apply the method of separation of variables to solve PDEs to analyze solutions in cylindrical and spherical polar coordinates.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	2nd Year	Semester:	3
Course title:	Digital Electronics	Course code	23070301
Course type:	Engineering Science	Course credit:	5

CO 1	Have a thorough understanding of the fundamental concepts and techniques used in
CO 2	Apply on Gate of digital electronics.
CO 3	To understand and examine the structure of various number systems and its
CO 4	Application in digital design.
CO 5	The ability to understand, analyze and design various combinational and sequential

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	2nd Year	Semester:	3
Course title:	Data Structure And Algorithm	Course code	23040302
Course type:	Engineering Science	Course credit:	5

CO 1	Learn the basic types for data structure, implementation and application.
CO 2	Know the strength and weakness of different data structures.
CO 3	Use the appropriate data structure in context of solution of given problem..
CO 4	Develop programming skills which require solving given problem.
CO 5	Learn the data structure, implementation and application.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	2nd Year	Semester:	3
Course title:	Database Management System	Course code	23040301
Course type:	Engineering Science	Course credit:	5

CO 1	Understand the basic concepts of database management systems (L2)
CO 2	Apply SQL to find solutions to a broad range of queries (L3).
CO 3	Apply normalization techniques to improve database design (L3)
CO 4	Analyze a given database application scenario to use ER model
CO 5	Conceptual design of the database

Program:	Bachelor of Engineering	Branch:	CE AI
Year:	2nd Year	Semester:	3
Course title:	Computer Network	Course code	23040303
Course type:	Engineering Science	Course credit:	4

CO 1	Understand Basics of Computer Networks and different
CO 2	Transmission Media.
CO 3	Differentiate Protocols which play a major role in providing
CO 4	**Computer** network internet effectively.
CO 5	Understand various protocol layers and inner operations.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	2 Year	Semester:	4
Course title:	Operating System	Course code	23040401
Course type:	Engineering Science	Course Credit	4

CO 1	Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication.
CO 2	Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication.
CO 3	Differentiate Protocols which play a major role in providing
CO 4	Discuss the storage management policies with respect to different storage management technologies
CO 5	Analyze the memory management and its allocation policies

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	2Year	Semester:	4
Course title:	Object Oriented Programming with C++	Course code	23040402
Course type:	Engineering Science	Course Credit	5

CO 1	Codes basic programs in Java programming language.
CO 2	Prints to the screen in Java language.
CO 3	Makes relational operations in Java.
CO 4	Constructs loops in Java.
CO 5	Defines arrays in Java and uses them.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	2Year	Semester:	4
Course title:	System Software	Course code	23040403
Course type:	Engineering Science	Course Credit	4

CO 1	To understand the relationship between system software and machine
CO 2	To understand architecture.
CO 3	To understand the processing of an HLL program for execution on a computer.
CO 4	To understand the process of scanning and parsing.
CO 5	To know the design and implementation of assemblers, macro processor, linker

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	2 Year	Semester:	4
Course title:	Computer Organization and MicroProcessor	Course code	23070401
Course type:	Engineering Science	Course Credit	4

CO 1	To know the background of internal communication of computer
CO 2	To have better idea on how to write assemble language programs
CO 3	To be clear with memory management techniques
CO 4	To better with IO devices communication with processor
CO 5	To notice how to perform computer arithmetic operations

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Semester: 5

Program:	Bachelor of Engineering	Branch:	CE AI
Year:	3 Year	Semester:	5
Course title:	Object Oriented Programming with JAVA	Course code	23040501
Course type:	Engineering Science	Course Credit	6

CO 1	Able to solve real world problems using OOP techniques.
CO 2	Able to understand the use of abstract classes.
CO 3	Able to solve problems using java collection framework and I/o classes.
CO 4	Able to develop multithreaded applications with synchronization.
CO 5	Able to develop applets for web applications.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	3 Year	Semester:	5
Course title:	Theory of Computation	Course code	23040502
Course type:	Engineering Science	Course Credit	6

CO 1	To give an overview of the theoretical foundations of computer science from
CO 2	the perspective of formal languages
CO 3	To illustrate finite state machines to solve problems in computing
CO 4	To explain the hierarchy of problems arising in the computer sciences.
CO 5	To familiarize Regular grammars, context frees grammar

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	3 Year	Semester:	5
Course title:	Information Network & Cyber Security	Course code	23040503
Course type:	Engineering Science	Course Credit	4

CO 1	Identify some of the factors driving the need for network security.
CO 2	Identify and classify particular examples of attacks.
CO 3	Define the terms vulnerability, threat and attack.
CO 4	Identify physical points of vulnerability in simple networks.
CO 5	Identify the need for network security.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	3 Year	Semester:	5
Course title:	Web Technology	Course code	23040504
Course type:	Engineering Science	Course Credit	4

CO 1	Students are able to develop a dynamic webpage by the use of java script and
CO 2	DHTML.
CO 3	Students will be able to write a well formed / valid XML document.
CO 4	Students will be able to connect a java program to a DBMS and perform insert,
CO 5	DHTML update and delete operations on DBMS table.

Program:	Bachelor of Engineering	Branch:	CE AI
Year:	3 Year	Semester:	5
Course title:	Computer Graphics and Visulization	Course code	23040506
Course type:	Engineering Science	Course Credit	4

CO 1	Understand the basics of computer graphics, different
CO 2	Graphics systems and applications of computer graphics.
CO 3	Discuss various algorithms for scan conversion and
CO 4	Filling of basic objects and their comparative analysis.
CO 5	Use of geometric transformations on graphics objects

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Semester 6

Program:	Bachelor of Engineering	Branch:	CE AI
Year:	3 Year	Semester:	6
Course title:	Wireless Network	Course code	23040601
Course type:	Engineering Science	Course Credit	4

CO 1	Conversant with the latest 3G/4G and Wi-MAX networks and its architecture.
CO 2	Design and implement wireless network environment for any application using latest
CO 3	Wireless protocols and standards.
CO 4	Implement different type of applications for smart phones and mobile devices with
CO 5	latest network strategies

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	3 Year	Semester:	6
Course title:	Compiler Design	Course code	23040602
Course type:	Engineering Science	Course Credit	4

CO 1	Realize basics of compiler design and apply for real time applications.
CO 2	To introduce different translation languages
CO 3	To understand the importance of code optimization
CO 4	To know about compiler generation tools and techniques
CO 5	To learn working of compiler and non compiler applications

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	3 Year	Semester:	6
Course title:	Cloud Computing	Course code	23040603
Course type:	Engineering Science	Course Credit	4

CO 1	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
CO 2	Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.
CO 3	Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
CO 4	Analyze various cloud programming models and apply them to solve problems on the cloud.
CO 5	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	3 Year	Semester:	6
Course title:	Data Mining and Warehousing	Course code	23040604
Course type:	Engineering Science	Course Credit	4

CO 1	Be familiar with mathematical foundations of data mining tools..
CO 2	Understand and implement classical models and algorithms in data warehouses and
CO 3	data mining discovered by association rule
CO 4	Characterize the kinds of patterns that can be discovered by association rule
CO 5	data mining, classification and clustering.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	3 Year	Semester:	6
Course title:	Advance JAVA	Course code	23040606
Course type:	Engineering Science	Course Credit	5

CO 1	Able to solve real world problems using OOP techniques.
CO 2	Able to understand the use of abstract classes.
CO 3	Able to solve problems using java collection framework and I/o classes.
CO 4	Able to develop multithreaded applications with synchronization.
CO 5	Able to develop applets for web applications.

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Program:	Bachelor of Engineering	Branch:	CE AI
Year:	4 Year	Semester:	7
Course title:	Artificial Intelligence	Course code	23040701
Course type:	Engineering Science	Course Credit	5

CO 1	Develop mathematical thinking and problem solving skills associated with research and writing proofs.
CO 2	Get exposure to a wide variety of mathematical concepts used in computer science discipline like probability.
CO 3	Use Graph Theory for solving problems.
CO 4	Acquire basic knowledge of sampling and estimation.
CO 5	Understand basic concepts of hypothesis

Program	Bachelor of Engineering	Branch:	CE AI
Year:	4 Year	Semester:	7
Course title:	Python Programming	Course code	23040702
Course type:	Engineering Science	Course Credit	5

CO 1	Create your first program in Python IDLE
CO 2	Implement OOPs concepts in your programming
CO 3	Use Arrays, and Data structures
CO 4	Create an application with the support of graphics in Python
CO 5	Implement error handling

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Semester: 8

Program:	Bachelor of Engineering	Branch:	CE AI
Year:	4 Year	Semester:	8
Course title:	Programming with XML & JSON	Course code	23040802
Course type:	Engineering Science	Course Credit	6

CO 1	Students are able to develop a dynamic webpage by the use of java script and DHTML.
CO 2	Students will be able to write a well formed / valid XML document. ·
CO 3	Students will be able to connect a java program to a DBMS and perform insert, update.
CO 4	Delete operations on DBMS table.
CO 5	Students will be able to write a server side java application called Servlet to catch form data

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Semester: 1

Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1stYear	Semester:	1
Course title:	Maths-I	Course code	23000001
Course type:	Engineering Science	Course credit:	5

CO 1	Analyze and manipulate infinite sequences and series.
CO 2	Evaluate limits involving indeterminate forms.
CO 3	Understand and apply techniques for improper integrals.
CO 4	Analyze functions of several variables and solve optimization problems.
CO 5	Solve systems of linear equations using matrices and determinants.
CO 6	Analyze eigenvalues and eigenvectors for linear transformations and matrices.

Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1stYear	Semester:	1
Course title:	Fundamentals of Computer Programming	Course code	23000004
Course type:	Engineering Science	Course credit:	4

CO 1	Apply fundamental principles of problem solving in software engineering.
CO 2	Apply basic programming principles using C language.
CO 3	Apply basic C program structure in software development
CO 4	Prepare graduates for professional careers in roles including, but not limited to, the following: computer programmer, software engineer, software systems designer, software applications developer, technical software project lead, computer systems analyst, computer systems programmer, software applications tester and maintainer.
CO 5	To prepare graduates with the knowledge and skills to do advanced studies and research in computer science and related engineering and scientific disciplines
CO 6	To equip graduates with the communication skills, both oral and written, to become an effective team-oriented problem solver as well as an effective communicator with nontechnical stakeholders in computer and software systems development, maintenance and administration.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1st Year	Semester:	1
Course title:	Elements of Electrical Engineering	Course code	23000012
Course type:	Engineering Science	Course credit:	5

CO 1	Define electrical current, potential difference, power and energy, sources of electrical energy, resistance and its behavior with temperature.
CO 2	Understand the different types of wires, cables, connectors & switches used for wiring Different types of domestic and industrial wiring.
CO 3	Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
CO 4	Analyze the steady state behavior of single phase and three phase AC electrical circuits.
CO 5	Compare various protective devices of working principle, usage and construction such as fuse, MCB, ELCB & Relays.
CO 6	Design and development of varies Electrical Wiring and electronics miniproctes.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1stYear	Semester:	1
Course title:	Elements of Mechanical Engineering	Course code	23000003
Course type:	Engineering Science	Course credit:	6

CO 1	Discribe the various sources of energy and basic terminology of Mechanical engineering.
CO 2	Make calculations for commonly used working fluids i.e. ideal gases and steam.
CO 3	Analyze various heat engine cycles and understand construction and working of IC engines.
CO 4	Discuss working and applications of steam boilers and various energy conversion systems.
CO 5	Discuss various power transmission elements and properties of various engineering materials with their applications.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1st Year	Semester:	1
Course title:	Environmental Studies	Course code	23000006
Course type:	Engineering Science	Course credit:	2

CO 1	Describe natural resources, importance of ecosystem and conservation of biodiversity with respect to multiple disciplines.
CO 2	Explain causes, effects, solutions for various pollution problems and its minimization strategies.
CO 3	Differentiate between requirements of laws and regulations for environmental conservation and applicability of legislations in society and industries.
CO 4	Discuss environmental ethics and their implementation for betterment of environment and human life.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1stYear	Semester:	1
Course title:	Orientation Program in Startup and Entrepreneurship	Course code	12300001
Course type:	Engineering Science	Course credit:	3

CO 1	Apply the basic principles of entrepreneurship
CO 2	Distinguish the concepts of the entrepreneurship ecosystem, entrepreneurship education, and various entrepreneurial opportunities.
CO 3	Understanding various individual attributes of entrepreneurial personality traits, entrepreneurial characteristics, behavioural attributes and importance of creativity and innovation.
CO 4	Develop an understanding of best techniques for idea generation and opportunities exploration.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1ˢᵗYear	Semester:	1
Course title:	Workshop	Course code	23000029
Course type:	Engineering Science	Course credit:	4

CO 1	Understand applications of hand tools and power tools and operations of machine tools.
CO 2	Understand the operations of machine tools.
CO 3	Select the appropriate tools required for specific operation.
CO 4	Comprehend the safety measures required to be taken while using the tools.
CO 5	Prepare Fitting, Carpentry, Plumbing, Welding, and Tin-smithy Jobs.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1stYear	Semester:	1
Course title:	Electronics Workshop	Course code	23000002
Course type:	Engineering Science	Course credit:	4

CO 1	Measure different electrical quantities.
CO 2	Understand the requirements and operation of safety devices
CO 3	Select the appropriate tools and components required for the specific operation
CO 4	Wire and trouble shoot of household appliances.

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SEMESTER:-2

Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1stYear	Semester:	2
Course title:	Maths-II	Course code	23000010
Course type:	Engineering Science	Course credit:	5

CO 1	Understand vectors in $R^n \times R^n$ and operations involving linear combinations.
CO 2	Identify subspaces and determine basis and dimension and Perform coordinate transformations and understand the change of basis.
CO 3	Understand linear transformations and their properties and Represent linear transformations with matrices and explore the concept of similarity.
CO 4	Apply inner product spaces to least squares approximation and diagonalization of symmetric matrices and Explore applications of quadratic forms and optimization.
CO 5	Apply double and triple integrals over different regions and Utilize Fubini's theorem and change of variables in multiple integrals.
CO 6	Apply integration techniques to calculate volumes of various solids.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1st Year	Semester:	2
Course title:	Engineering Physics	Course code	23000005
Course type:	Engineering Science	Course credit:	5

CO 1	Understand the basic concepts and classification of sound.
CO 2	Analyze applications of superconductors.
CO 3	Understand the fundamentals of laser radiation.
CO 4	Evaluate the applications of optical fibers.
CO 5	Apply dielectric materials in capacitors and transformers.
CO 6	Explore applications of magnetic materials.
CO 7	Explain the synthesis and applications of nonmaterial's.

Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1stYear	Semester:	2
Course title:	Communication Skills	Course code	23000008
Course type:	Engineering Science	Course credit:	3

CO 1	To improve students' communicative and linguistic approach in English.
CO 2	To provide an ice-breaking technique using LSRW skills and soft skills
CO 3	To learn techniques to improve overall communication abilities and effective use of writing in the field of advertising and public relations.
CO 4	Improve communication skills through practicing debate, discussion and appearing in interview.
CO 5	Use of ethical consideration in order to develop good etiquettes both in online and offline communication.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1stYear	Semester:	2
Course title:	Basic Electronics	Course code	23000009
Course type:	Engineering Science	Course credit:	5

CO 1	To study basics of semiconductor & devices and their applications in different areas.
CO 2	Demonstrate the operating principle and output characteristics of pn junction diodes, zener diode, Varactor diode, BJT, rectifiers and different diode circuits
CO 3	Compute and characterization of different biasing techniques to operate transistor FET, MOSFET and operational amplifier in different modes
CO 4	To implementation of basic digital gates using diode and basic family of logic Families

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1stYear	Semester:	2
Course title:	Engineering Graphics	Course code	23000011
Course type:	Engineering Science	Course credit:	6

CO 1	Describe the fundamental methods of engineering drawing, sketching and drafting.
CO 2	Understanding the object through orthographic projections.
CO 3	Construct basic and intermediate geometry and application of engineering curves.
CO 4	Enhance visualization skills for developing new products.
CO 5	Develop new products through technical communication skill in the form of communicative drawings.
CO 6	Develop the theory of orthographic projection and views.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1stYear	Semester:	2
Course title:	Elements of Civil Engineering	Course code	23000015
Course type:	Engineering Science	Course credit:	6

CO 1	Carry out simple land survey to prepare maps with existing details.
CO 2	Find out area of irregular shaped plane figures.
CO 3	Understand building plan elevation and section.
CO 4	Get acquainted with construction materials.
CO 5	Get acquainted with hydrological cycle and hydraulic structures.
CO 6	Get acquainted with mass transportation systems.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1st Year	Semester:	2
Course title:	BASIC PROGRAM IN ENTREPRENURESHIP	Course code	12300002
Course type:	Engineering Science	Course credit:	3

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

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1st Year	Semester:	2
Course title:	Chemistry	Course code	23020216
Course type:	Engineering Science	Course credit:	4

CO 1	To relate periodic properties such as ionization potential, oxidation states and electro negativity.
CO 2	To analyze microscopic chemistry in terms of atomic and molecular orbital's and inter molecular forces.
CO 3	To describe the importance and relevance of chemistry in our everyday life
CO 4	To select the appropriate chemical material and utilization of it.
CO 5	To interpret the methods of science as a logical means of problem solving.
CO 6	To distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.

Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1stYear	Semester:	2
Course title:	Personality Development	Course code	24190203
Course type:	Engineering Science	Course credit:	3

CO 1	To provide an icebreaking technique using LSRW skills and soft skills
CO 2	To learn techniques to improve overall communication abilities and effective use of writing in the field of advertising and public relations.
CO 3	Improve communication skills through practicing debate, discussion and appearing in interview.
CO 4	Use of ethical consideration in order to develop good etiquettes both in online and offline communication.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1st Year	Semester:	2
Course title:	Web Technology	Course code	24190204
Course type:	Engineering Science	Course credit:	4

CO 1	Write and debug JavaScript to enhance user interactivity and improve the user experience.
CO 2	Understand server-side programming concepts using languages such as Node.js, Python, or PHP.
CO 3	Create responsive and visually appealing web pages using HTML, CSS, and JavaScript.
CO 4	Explain the basic principles of how the web works, including HTTP, URLs, and web servers.
CO 5	Use Git for version control, including branching, merging, and collaboration workflows.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1st Year	Semester:	2
Course title:	Introduction to Cloud Technology	Course code	24190205
Course type:	Engineering Science	Course credit:	3

CO 1	Compare major cloud service providers (e.g., AWS, Azure, Google Cloud) and their offerings.
CO 2	Recognize key security principles and practices in cloud environments, including data protection, compliance, and identity management.
CO 3	Set up and manage basic cloud services, such as virtual machines, storage solutions, and databases.
CO 4	Use cloud management and monitoring tools to oversee cloud resources, optimize performance, and manage costs.
CO 5	Identify emerging trends in cloud technology, such as serverless computing, containerization, and edge computing.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1stYear	Semester:	2
Course title:	Engineering Graphics & Design	Course code	24190206
Course type:	Engineering Science	Course credit:	4

CO 1	Explain the principles of engineering graphics, including the importance of technical drawing in engineering design and communication.
CO 2	Apply geometric construction methods to create and analyze shapes, dimensions, and spatial relationships.
CO 3	Construct and visualize 3D models using CAD software, demonstrating an understanding of spatial relationships and design principles.
CO 4	Analyze and evaluate design concepts for functionality, manufacturability, and aesthetics, using appropriate tools and techniques.
CO 5	Work collaboratively in teams to develop a design project from concept through to presentation, demonstrating project management and teamwork skills.
CO 6	Explain the principles of engineering graphics, including the importance of technical drawing in engineering design and communication.

Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1stYear	Semester:	2
Course title:	Mentoring and Counselling	Course code	24190207
Course type:	Engineering Science	Course credit:	

CO 1	Explain key theories and principles of mentoring and counseling, including various approaches and methodologies.
CO 2	Demonstrate active listening, empathy, and nonverbal communication techniques essential for building rapport with mentees or clients.
CO 3	Foster an inclusive and supportive environment that encourages open communication and trust between the mentor/counselor and the mentee/client.
CO 4	Engage in self-reflection to assess personal strengths and areas for growth as a mentor or counselor, fostering continuous professional development.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	1stYear	Semester:	2
Course title:	Open Project / MOOC	Course code	24190208
Course type:	Engineering Science	Course credit:	

CO 1	Identify and articulate the goals and objectives of their open project, ensuring alignment with personal or community needs.
CO 2	Utilize project management tools and techniques to organize, monitor, and evaluate project progress effectively.
CO 3	Identify, evaluate, and utilize open educational resources (OER) to enhance learning and project outcomes.
CO 4	Engage in self-reflection to assess personal growth, learning experiences, and challenges faced during the project.

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Semester: 3

Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	2nd Year	Semester:	3
Course title:	Maths - III	Course code	2300015
Course type:	Engineering Science	Course credit:	5

CO 1	Apply Fourier series to analyze and represent periodic functions.
CO 2	Apply Laplace transforms to solve differential equations and system problems.
CO 3	Apply methods such as integrating factor, Bernoulli equations, and linear differential equations.
CO 4	Apply series solutions to solve differential equations and analyze the convergence and divergence of series solutions.
CO 5	Apply the method of separation of variables to solve PDEs to analyze solutions in cylindrical and spherical polar coordinates.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	2nd Year	Semester:	3
Course title:	Digital Electronics	Course code	23070301
Course type:	Engineering Science	Course credit:	5

CO 1	Have a thorough understanding of the fundamental concepts and techniques used in
CO 2	Apply on Gate of digital electronics.
CO 3	To understand and examine the structure of various number systems and its
CO 4	Application in digital design.
CO 5	The ability to understand, analyze and design various combinational and sequential

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	2nd Year	Semester:	3
Course title:	Data Structure And Algorithm	Course code	23040302
Course type:	Engineering Science	Course credit:	5

CO 1	Learn the basic types for data structure, implementation and application.
CO 2	Know the strength and weakness of different data structures.
CO 3	Use the appropriate data structure in context of solution of given problem..
CO 4	Develop programming skills which require solving given problem.
CO 5	Learn the data structure, implementation and application.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	2nd Year	Semester:	3
Course title:	Database Management System	Course code	23040301
Course type:	Engineering Science	Course credit:	5

CO 1	Understand the basic concepts of database management systems (L2)
CO 2	Apply SQL to find solutions to a broad range of queries (L3).
CO 3	Apply normalization techniques to improve database design (L3)
CO 4	Analyze a given database application scenario to use ER model
CO 5	Conceptual design of the database

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	2nd Year	Semester:	3
Course title:	Computer Network	Course code	23040303
Course type:	Engineering Science	Course credit:	4

CO 1	Understand Basics of Computer Networks and different
CO 2	Transmission Media.
CO 3	Differentiate Protocols which play a major role in providing
CO 4	**Computer** network internet effectively.
CO 5	Understand various protocol layers and inner operations.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	2 Year	Semester:	4
Course title:	Operating System	Course code	23040401
Course type:	Engineering Science	Course Credit	4

CO 1	Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication.
CO 2	Describe the basics of the operating systems, mechanisms of OS to handle processes, threads, and their communication.
CO 3	Differentiate Protocols which play a major role in providing
CO 4	Discuss the storage management policies with respect to different storage management technologies
CO 5	Analyze the memory management and its allocation policies

Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	2Year	Semester:	4
Course title:	Object Oriented Programming with C++	Course code	23040402
Course type:	Engineering Science	Course Credit	5

CO 1	Codes basic programs in Java programming language.
CO 2	Prints to the screen in Java language.
CO 3	Makes relational operations in Java.
CO 4	Constructs loops in Java.
CO 5	Defines arrays in Java and uses them.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	2Year	Semester:	4
Course title:	System Software	Course code	23040403
Course type:	Engineering Science	Course Credit	4

CO 1	To understand the relationship between system software and machine
CO 2	To understand architecture.
CO 3	To understand the processing of an HLL program for execution on a computer.
CO 4	To understand the process of scanning and parsing.
CO 5	To know the design and implementation of assemblers, macro processor, linker

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	2 Year	Semester:	4
Course title:	Computer Organization and MicroProcessor	Course code	23070401
Course type:	Engineering Science	Course Credit	4

CO 1	To know the background of internal communication of computer
CO 2	To have better idea on how to write assemble language programs
CO 3	To be clear with memory management techniques
CO 4	To better with IO devices communication with processor
CO 5	To notice how to perform computer arithmetic operations

Semester: 5

Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	3 Year	Semester:	5
Course title:	Object Oriented Programming with JAVA	Course code	23040501
Course type:	Engineering Science	Course Credit	6

CO 1	Able to solve real world problems using OOP techniques.
CO 2	Able to understand the use of abstract classes.
CO 3	Able to solve problems using java collection framework and I/o classes.
CO 4	Able to develop multithreaded applications with synchronization.
CO 5	Able to develop applets for web applications.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	3 Year	Semester:	5
Course title:	Theory of Computation	Course code	23040502
Course type:	Engineering Science	Course Credit	6

CO 1	To give an overview of the theoretical foundations of computer science from
CO 2	the perspective of formal languages
CO 3	To illustrate finite state machines to solve problems in computing
CO 4	To explain the hierarchy of problems arising in the computer sciences.
CO 5	To familiarize Regular grammars, context frees grammar

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	3 Year	Semester:	5
Course title:	Information Network & Cyber Security	Course code	23040503
Course type:	Engineering Science	Course Credit	4

CO 1	Identify some of the factors driving the need for network security.
CO 2	Identify and classify particular examples of attacks.
CO 3	Define the terms vulnerability, threat and attack.
CO 4	Identify physical points of vulnerability in simple networks.
CO 5	Identify the need for network security.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	3 Year	Semester:	5
Course title:	Web Technology	Course code	23040504
Course type:	Engineering Science	Course Credit	4

CO 1	Students are able to develop a dynamic webpage by the use of java script and
CO 2	DHTML.
CO 3	Students will be able to write a well formed / valid XML document.
CO 4	Students will be able to connect a java program to a DBMS and perform insert,
CO 5	DHTML update and delete operations on DBMS table.

Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	3 Year	Semester:	5
Course title:	Computer Graphics and Visulization	Course code	23040506
Course type:	Engineering Science	Course Credit	4

CO 1	Understand the basics of computer graphics, different
CO 2	Graphics systems and applications of computer graphics.
CO 3	Discuss various algorithms for scan conversion and
CO 4	Filling of basic objects and their comparative analysis.
CO 5	Use of geometric transformations on graphics objects

Semester 6

Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	3 Year	Semester:	6
Course title:	Wireless Network	Course code	23040601
Course type:	Engineering Science	Course Credit	4

CO 1	Conversant with the latest 3G/4G and Wi-MAX networks and its architecture.
CO 2	Design and implement wireless network environment for any application using latest
CO 3	Wireless protocols and standards.
CO 4	Implement different type of applications for smart phones and mobile devices with
CO 5	latest network strategies

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	3 Year	Semester:	6
Course title:	Compiler Design	Course code	23040602
Course type:	Engineering Science	Course Credit	4

CO 1	Realize basics of compiler design and apply for real time applications.
CO 2	To introduce different translation languages
CO 3	To understand the importance of code optimization
CO 4	To know about compiler generation tools and techniques
CO 5	To learn working of compiler and non compiler applications

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	3 Year	Semester:	6
Course title:	Cloud Computing	Course code	23040603
Course type:	Engineering Science	Course Credit	4

CO 1	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.
CO 2	Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost.
CO 3	Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing.
CO 4	Analyze various cloud programming models and apply them to solve problems on the cloud.
CO 5	Explain the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing.

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Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	3 Year	Semester:	6
Course title:	Data Mining and Warehousing	Course code	23040604
Course type:	Engineering Science	Course Credit	4

CO 1	Be familiar with mathematical foundations of data mining tools..
CO 2	Understand and implement classical models and algorithms in data warehouses and
CO 3	data mining discovered by association rule
CO 4	Characterize the kinds of patterns that can be discovered by association rule
CO 5	data mining, classification and clustering.

Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	3 Year	Semester:	6
Course title:	Advance JAVA	Course code	23040606
Course type:	Engineering Science	Course Credit	5

CO 1	Able to solve real world problems using OOP techniques.
CO 2	Able to understand the use of abstract classes.
CO 3	Able to solve problems using java collection framework and I/o classes.
CO 4	Able to develop multithreaded applications with synchronization.
CO 5	Able to develop applets for web applications.

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Semester 7

Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	4 Year	Semester:	7
Course title:	Artificial Intelligence	Course code	23040701
Course type:	Engineering Science	Course Credit	5

CO 1	Develop mathematical thinking and problem solving skills associated with research and writing proofs.
CO 2	Get exposure to a wide variety of mathematical concepts used in computer science discipline like probability.
CO 3	Use Graph Theory for solving problems.
CO 4	Acquire basic knowledge of sampling and estimation.
CO 5	Understand basic concepts of hypothesis

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Program	Bachelor of Engineering	Branch:	CE CTIS
Year:	4 Year	Semester:	7
Course title:	Python Programming	Course code	23040702
Course type:	Engineering Science	Course Credit	5

CO 1	Create your first program in Python IDLE
CO 2	Implement OOPs concepts in your programming
CO 3	Use Arrays, and Data structures
CO 4	Create an application with the support of graphics in Python
CO 5	Implement error handling

Semester: 8

Program:	Bachelor of Engineering	Branch:	CE CTIS
Year:	4 Year	Semester:	8
Course title:	Programming with XML & JSON	Course code	23040802
Course type:	Engineering Science	Course Credit	6

CO 1	Students are able to develop a dynamic webpage by the use of java script and DHTML.
CO 2	Students will be able to write a well formed / valid XML document. ·
CO 3	Students will be able to connect a java program to a DBMS and perform insert, update.
CO 4	Delete operations on DBMS table.
CO 5	Students will be able to write a server side java application called Servlet to catch form data

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Program Name: Bachelor of Technology in Mechanical Engineering

Semester: I

Subject Name: Maths-I
Subject Code: 23000001
Course Outcomes (COs):

CO1	Analyze and manipulate infinite sequences and series.
CO2	Evaluate limits involving indeterminate forms.
CO3	Understand and apply techniques for improper integrals.
CO4	Analyze functions of several variables and solve optimization problems.
CO5	Solve systems of linear equations using matrices and determinants.
CO6	Analyze eigenvalues and eigenvectors for linear transformations and matrices.

Subject Name: Fundamentals of Computer
Programming Subject Code: 23000004
Course Outcomes (COs):

CO1	Apply fundamental principles of problem solving in software engineering.
CO2	Apply basic programming principles using C language.
CO3	Apply basic C program structure in software development
CO4	Prepare graduates for professional careers in roles including, but not limited to, the following: computer programmer, software engineer, software systems designer, software applications developer, technical software project lead, computer systems analyst, computer systems programmer, software applications tester and maintainer.
CO5	To prepare graduates with the knowledge and skills to do advanced studies and research in computer science and related engineering and scientific disciplines
CO6	To equip graduates with the communication skills, both oral and written, to become an effective team-oriented problem solver as well as an effective communicator with nontechnical stakeholders in computer and software systems development, maintenance and administration.

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Subject Name: Elements of Electrical
Engineering Subject Code: 23000012
Course Outcomes (COs):

CO1	Define electrical current, potential difference, power and energy, sources of electrical energy, resistance and its behavior with temperature.
CO2	Understand the different types of wires, cables, connectors & switches used for wiring Different types of domestic and industrial wiring.
CO3	Apply the concepts of KVL/KCL and network theorems in solving DC circuits.
CO4	Analyze the steady state behavior of single phase and three phase AC electrical circuits.
CO5	Compare various protective devices of working principle, usage and construction such as fuse, MCB, ELCB & Relays.
CO6	Design and development of varies Electrical Wiring and electronics miniproctes.

Subject Name: Elements of Mechanical Engineering
Subject Code: 23000003
Course Outcomes (COs):

CO1	**Discribe** the various sources of energy and basic terminology of Mechanical engineering.
CO2	Make calculations for commonly used working fluids i.e. ideal gases and steam.
CO3	Analyze various heat engine cycles and understand construction and working of IC engines.
CO4	Discuss working and applications of steam boilers and various energy conversion systems.
CO5	Discuss various power transmission elements and properties of various engineering materials with their applications.

Subject Name: Environmental Studies
Subject code: 23000006
Course outcome:

CO1	Describe natural resources, importance of ecosystem and conservation of biodiversity with respect to multiple disciplines.
CO2	Explain causes, effects, solutions for various pollution problems and its minimization strategies.
CO3	Differentiate between requirements of laws and regulations for environmental conservation and applicability of legislations in society and industries.
CO4	Discuss environmental ethics and their implementation for betterment of environment and human life.

Subject Name: Orientation Program in Startup and Entrepreneurship
Subject code: 12300001
Course outcome:

CO1	Apply the basic principles of entrepreneurship
CO2	Distinguish the concepts of the entrepreneurship ecosystem, entrepreneurship education, and various entrepreneurial opportunities.
CO3	Understanding various individual attributes of entrepreneurial personality traits, entrepreneurial characteristics, behavioural attributes and importance of creativity and innovation.
CO4	Develop an understanding of best techniques for idea generation and opportunities exploration.

Subject Name: Workshop
Subject code: 23000029
Course outcome:

CO1	Understand applications of hand tools and power tools and operations of machine tools.
CO2	Understand the operations of machine tools.
CO3	Select the appropriate tools required for specific operation.
CO4	Comprehend the safety measures required to be taken while using the tools.
CO5	Prepare Fitting, Carpentry, Plumbing, Welding, and Tin-smithy Jobs.

Semester-II

Subject Name: ENGINEERING PHYSICS
Subject code: 23000005
Course outcome:

CO1	To acquire knowledge of calculus which are integral part of any branch of Physics
CO2	Students learn accurately how to describe motion of objects, planetary motions, gravitation etc. Understand the motion of objects in different frame of references
CO3	To learn about basic concepts of electrical charges and currents and their properties
CO4	Student learn about various types of waves and their propagation.
CO5	To understand the principle of calorimetry
CO6	To know about Radiation and its nature, old quantum theory, concept of wave-particle duality and de Broglie hypethesis.
CO7	To study complex analysis, Cauchy Riemann conditions, Analyticity, Cauchy Integral formula, Laurent and Taylor series expansion and definite integrals using contour integration.

Subject Name: Communication skills
Subject code: 23000008
Course outcome:

CO1	Students will become master of four communication skills.
CO2	They feel confident in speaking and writing English language.
CO3	Students will be able to improve the language skills i.e. Listening Skill, Speaking Skill, Reading Skill, and Writing Skill (LSRW).
CO4	To make them learn about life skills and soft skills.

Subject Name: Maths II
Subject code: 23000010
Course outcome:

CO1	Understand vectors in RnRn and operations involving linear combinations.
CO2	Identify subspaces and determine basis and dimension and Perform coordinate transformations and understand the change of basis.
CO3	Understand linear transformations and their properties and represent linear transformations with matrices and explore the concept of similarity.
CO4	Apply inner product spaces to least squares approximation and diagonalization of symmetric matrices and Explore applications of quadratic forms and optimization.
CO5	Apply double and triple integrals over different regions and Utilize Fubini's theorem and change of variables in multiple integrals.
CO6	Apply integration techniques to calculate volumes of various solids.

Subject Name: Engineering Graphics
Subject code: 23000011
Course outcome:

CO1	Describe the fundamental methods of engineering drawing, sketching and drafting.
CO2	Understanding the object through orthographic projections.
CO3	Construct basic and intermediate geometry and application of engineering curves.
CO4	Enhance visualization skills for developing new products.
CO5	Develop new products through technical communication skill in the form of communicative drawings.
CO6	Develop the theory of orthographic projection and views.

Subject Name: Elements of Civil Engineering
Subject code: 23000015
Course outcome:

CO1	Carry out simple land survey to prepare maps with existing details.
CO2	Find out area of irregular shaped plane figures.
CO3	Understand building plan elevation and section.
CO4	Get acquainted with construction materials.
CO5	Get acquainted with hydrological cycle and hydraulic structures.
CO6	Get acquainted with mass transportation systems.

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Subject Name: BASIC PROGRAM IN ENTREPRENURESHIP
Subject code: 12300002
Course outcome:

CO1	Develop an understanding of best techniques for idea generation, opportunities exploration, and market research.
CO2	Check technical, market, financial and other types of Feasibility of their business idea
CO3	Develop business model to describe the rationale of how an organization creates, delivers, and captures value
CO4	Conduct the customer's survey to know the need of their business idea.

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Semester: III

Subject Name: Maths III
Subject code: 23000015
Course outcome:

CO1	To have a rigorous understanding of the concept of limit of a function.
CO2	The geometrical properties of continuous functions on closed and bounded intervals.
CO3	Extensively about the concept of differentiability using limits, leading to a better understanding for applications.
CO4	The applications of mean value theorems and Taylor's theorem.
CO5	Employ De Moivre's theorem in a number of applications to solve numerical problems

Subject Name: Mechanics of Solid
Subject code: 23080301
Course outcome:

CO1	Explain the basic concepts of Engineering Mechanics,
CO2	to evaluate the variations of shear force and bending moment in different kinds of beams
CO3	Evaluate the shear stress and angle of deflection in a shaft subjected to torque.
CO4	Evaluate Bending and shear stresses in different shaped channels.
CO5	Determine the buckling in the columns using different theories

Subject Name: Material Science and Metallurgy
Subject code: 23080302
Course outcome:

CO1	Application of knowledge relating the composition, structure and processing of materials to their uses.
CO2	The Study materials that covers metals, ceramics, polymers, and combinations of materials or composites
CO3	Able to investigate the relationship between structure of materials and their properties.
CO4	Able to understand the new developments such as nano-science and nanotechnology e forefront of the studies
CO5	continue to propel materials science and engineering to the forefront of the studies

Subject Name: Manufacturing Process I
Subject code: 23080303
Course outcome:

CO1	Understand classification, scope and applications of manufacturing methods used in industries.
CO2	Explain the different casting methods with their process details, applications and limitations.
CO3	Understand process details of rolling, forging, extrusion and drawing operations.
CO4	Classify and explain in detail different welding methods with brief introduction to brazing and soldering.
CO5	Understand powder metallurgy process with advantages, limitations and industrial applications.

Subject Name: Kinematics of Machines
Subject code: 23080304
Course outcome:

CO1	Classify and solve for mobility of planar mechanisms
CO2	Perform kinematic synthesis and analysis of planar mechanisms
CO3	Construct and analyze cam profiles for a specified motion of the follower
CO4	Analyze different types of gear trains
CO5	Model and analyze planar mechanisms using software package

Subject Name: Electriacal Technology
Subject code: 23080305
Course outcome:

CO1	Understand the basic concepts of DC circuits and Magnetic circuits and also able to solve problems related to DC and magnetic circuits.
CO2	Analysis of Single Phase and three phase AC Circuits and the representation of alternating quantities and also determining the power and other parameters in these circuits
CO3	Explain the construction, basic principle of operation, applications and also determine performance parameters of electrical Machines.
CO4	Practice Electrical Safety Rules & standards and types of electrical wiring and domestic earthing.

Subject Name: Foundation Program in Entrepreneurship
Subject code: 12300003
Course outcome:

CO1	Demonstrate different Python data types and their structures
CO2	Interpretation of the role of python in steps involved in data science
CO3	Illustrate the use of various operations for data cleansing and transformation
CO4	Analyze data visualization tools for data interpretation and insights of data
CO5	Perform data Wrangling with Scikit-learn applying exploratory data analysis

Semester IV

Subject Name: Maths IV
Subject code: 23000018
Course outcome:

CO1	Extract the solution of differential equations of the first order and of the first degree by variables separable, Homogeneous and Non-Homogeneous methods
CO2	Find a solution of differential equations of the first order and of a degree higher than the first by using methods of solvable for p, x and y
CO3	Compute all the solutions of second and higher order linear differential equations with constant coefficients, linear equations with variable coefficients.
CO4	Solve simultaneous linear equations with constant coefficients and Total Differential equations
CO5	Form partial differential equations
CO6	Find the solution of First order partial differential equations for some standard types.

Subject Name: Mechanical Measurement & Metrology
Subject code: 23090402
Course outcome:

CO1	Explain the basics knowledge of measurements, metrology and measuring devices.
CO2	Understand the principle of linear and angular measuring instruments
CO3	Fundamentals of various methods for the measurements of screw threads, surface roughness parameters and working of optical measuring instruments.
CO4	Understand various advanced measuring devices and machine tool metrology
CO5	Understand and able to use various devices for measuring torque, force, strain, stress and temperature.

Subject Name: Manufacturing Process-II
Subject code: 23090404
Course outcome:

CO1	Understand basic concepts of Manufacturing processes.
CO2	To understand Metal casting process, patterns, defect and its applications.
CO3	To understand different types of welding process, soldering and brazing process.
CO4	To understand metal shaping and forming process.
CO5	Understanding of Plastic, Ceramic and Glass processing techniques.

Subject Name: Engineering Thermodynamics
Subject code: 23090401
Course outcome:

CO1	Explain basic concepts, Zeroth and First Laws of Thermodynamics.
CO2	Describe Second Law of Thermodynamics and its corollaries
CO3	Estimate various thermodynamic properties of pure substance, ideal gas and mixture
CO4	Derive various thermodynamic relations such as Joule-Thomson, Clausius Clapeyron, etc.
CO5	Analyse various Vapour power cycles and effect of operating parameters on their performance.

Subject Name: Machine Design and Industrial Drafting
Subject code: 23090403
Course outcome:

CO1	To understand theory of failures.
CO2	Understand fundamentals of Beams and Column.
CO3	To design shafts, keys and couplings.
CO4	To understand design of power screws and threaded joints.
CO5	Basic understanding of Tolerances, Limits and Fits.

Subject Name: Intermediate Program in Entrepreneurship
Subject code: 12300004
Course outcome:

CO1	Demonstrate the various features of microprocessor, memory and I/O devices
CO2	Identify the hardware elements of 8085 microprocessor.
CO3	Select appropriate 8085 instructions based on size and functions to write an assembly language program
CO4	Design different interfacing system using concepts of memory and I/O interfacing.
CO5	Demonstrate the features of advance microprocessors.

Subject Name: Fluid Mechanics
Subject code: 23090501
Course outcome:

CO1	To understand fluids and its properties.
CO2	Understand laminar and turbulent flow through pipes and parallel plates.
CO3	Understand various types of flow, Mass Momentum and energy conservation and related equations.
CO4	Explain various applications of Bernoulli's Equation, Notches and Weirs, Orifices and Mouthpieces
CO5	Understand different types of flow through pipes, Viscous and turbulent flow.

Subject Name: Design of Machine Elements
Subject code: 23090502
Course outcome:

CO1	Introduction to design, material and its properties.
CO2	To design against fluctuating loads, S-N diagram, Soderberg and Gerber criteria.
CO3	To design thin and spherical vessels.
CO4	To understand design procedure of belt and chain drives.
CO5	To understand different types of springs, stresses and different loading condition of spring.

Subject Name: Heat Transfer
Subject code: 23090503
Course outcome:

CO1	Explain the governing laws and modes of heat transfer
CO2	Compute temperature distribution and heat transfer rate in steady and unsteady state heat conduction
CO3	Interpret and analyse natural and forced convective heat transfer with dimensional analysis
CO4	Analyse the performance of heat exchangers under different flow conditions using LMTD and NTU method.
CO5	Analyse radiative heat transfer between two or more black/gray bodies

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Subject Name: Theory of Machine
Subject code: 23090504
Course outcome:

CO1	Explain Kinematic Chain, Mechanisms and their Inversions; analyze velocity and acceleration of various mechanisms.
CO2	Solve problem-related to friction. Explain the principle and applications of clutch and brake.
CO3	Explain the principle and applications of a gyroscope.
CO4	To understand different types of Flywheels.
CO5	To study about different types Governors and their force analysis.

Subject Name: Control Engineering
Subject code: 23090505
Course outcome:

CO1	Understand basic concepts of control system
CO2	Modelling of Translational and rotational, mechanical, electrical and thermal system.
CO3	To understand time response analysis and state space analysis.
CO4	To understand different types of hydraulic and pneumatic control systems.

Subject Name: Case Study
Subject code: 23000027
Course outcome:

CO1	By analysing case studies, students develop strategies to address complex problems.
CO2	Students enhance their ability to gather, assess, and learn how to conduct thorough investigations into specific issues.
CO3	Students learn to evaluate and synthesize information from various sources.
CO4	Presenting findings and writing reports.
CO5	Engaging in discussions are integral parts of case studies, helping students improve their ability to articulate their analysis and recommendations clearly.

Subject Name: Intellectual Property Rights
Subject code: 12300005
Course outcome:

CO1	Evaluate strength and limitation of cloud computing
CO2	Analyze different cloud depoly and services architecture model
CO3	Understand various enterprise application in cloud computing
CO4	Apply the virtualization concepts
CO5	Analyze data security mechanism and SLA management in cloud

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Semester VI

Subject Name: Dynamics of Machinery
Subject code: 23090601
Course outcome:

CO1	To understand about Balancing of Rotating Mass and Reciprocating Engines
CO2	To describe free and forced vibration of systems.
CO3	To derive equations of motion for two degree system and multidegree system.
CO4	Introduction and understanding of vibration measurement and analysis devices/
CO5	Dynamic analysis of force-closed cam follower.

Subject Name: Fluid Power Engineering
Subject code: 23090602
Course outcome:

CO1	To understand about Balancing of Rotating Mass and Reciprocating Engines
CO2	To describe free and forced vibration of systems.
CO3	To derive equations of motion for two degree system and multidegree system.
CO4	Introduction and understanding of vibration measurement and analysis devices/
CO5	Dynamic analysis of force-closed cam follower.

Subject Name: Production Technology
Subject code: 23090603
Course outcome:

CO1	To understand basic principle of metal cutting and handson training on lathe machine.
CO2	Understanding of Thermal aspects in machining, Gear and thread manufacturing techniques.
CO3	Classification of presses, Jigs and fixtures and their applications.
CO4	To study about different non-conventional machining techniques.
CO5	Use appropriate instruments and techniques to measure the cutting forces during turning, milling and drilling

Subject Name: Refrigeration air Conditioning
Subject code: 23090604
Course outcome:

CO1	Analyse the reversed Carnot cycle and vapour compression refrigeration cycle (VCR).
CO2	Select the air-refrigeration systems for aircraft, and vapour absorption refrigeration system for rural and remote areas
CO3	Identify the Psychrometric processes for different applications and design the parameters of air-conditioning system as per standards.
CO4	Understand the human comfort, ASHRAE chart and concept of effective temperature.
CO5	Estimate cooling load and heating load considering human comfort and optimize the air conditioning system as per requirements.

Subject Name: Industrial Engineering
Subject code: 23090605
Course outcome:

CO1	To understand location, selection of plant layout.
CO2	Describe production planning and control.
CO3	To demonstrate productivity, applications, work and motion study.
CO4	To understand job evaluation, wage plan, industrial legislation and statistical quality control.

Subject Name: Seminar
Subject code: 23000026
Course outcome:

CO1	Present the latest technologies and recent advancements in technical field.
CO2	Identify grey areas of his/ her interpersonal skills by critical evaluation of presentation techniques and further
CO3	Communicate effectively verbally and or non-verbally for knowledge enhancement.
CO4	Use the internet, books, resource persons and library effectively to retrieve the required information.
CO5	Cite the references of the originating sources of concept, data and information.

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Subject Name: Computer Aided Design & Manufacturing
Subject code: 23090701
Course outcome:

CO1	To analize 1-D concept, Trusses and beams.
CO2	To visualize the role of computer in manufacturing, types of manufacturing and CIM.
CO3	To understand different types of NC/CNC machine tools.
CO4	To understand concept of Group Technology and CAPP
CO5	To describe component of FMS and need of FMS.

Subject Name: Power Plant Engineering
Subject code: 23090702
Course outcome:

CO1	Discuss the load duration curves, site selection and economics of power plants.
CO2	Describe the effect of various components and steam conditions on the performance of steam power plant.
CO3	Analyse the performance of Steam turbine power plant under various operating and geographical conditions.
CO4	To describe working of different types of nozzles, turbines, condensors and cooling towers.
CO5	To study about nuclear power plant and gas turbine power plant.

Subject Name: Operation Research
Subject code: 23090703
Course outcome:

CO1	To understand requirement of Linear programming, assumptions in LP.
CO2	To solve problems related to Game theory and transportation problems.
CO3	To solve problems related to replacement theory and Queing theory.
CO4	To implement CPM and PERT in industry.
CO5	To solve problems based on Decision theory.

Subject Name: Machine Design
Subject code: 23090704
Course outcome:

CO1	Identify the factors for engineering components design and analyze various members subjected to direct stress.
CO2	Design various members such as beams, levers, laminated springs for bending and stiffness.
CO3	Design various machine components under torsion such as shafts, shaft couplings, and keys.
CO4	Design various threaded fasteners and power screw components.
CO5	Design curved machine components.

Subject Name: Metal Forming Analysis
Subject code: 23090712
Course outcome:

CO1	Explain and interpret the basics of various forming processes.
CO2	Explain and apply the yield criteria and governing equations of plasticity.
CO3	Apply the slab method of metal forming process analysis.
CO4	Apply the Slip-line field theory of metal forming process analysis.
CO5	Apply the upper and lower bound techniques of metal forming process analysis.

Subject Name: Project -1
Subject code: 23000023
Course outcome:

CO1	Define a problem and review literature to identify the gaps, objectives & scope of the work.
CO2	Analyse the problems of mechanical engineering to formulate objectives of project.
CO3	Design a system, component, or process to meet the desired needs of social and sustainability.
CO4	Demonstrate the techniques, skills, and modern engineering tools necessary for engineering practice.
CO5	Prepare a professional report as per recommended format and defend the work.

Subject Name: Project - II
Subject code: 23000025
Course outcome:

CO1	Define a problem and review literature to identify the gaps, objectives & scope of the work.
CO2	Analyse the problems of mechanical engineering to formulate objectives of project.
CO3	Design a system, component, or process to meet the desired needs of social and sustainability.
CO4	Demonstrate the techniques, skills, and modern engineering tools necessary for engineering practice.
CO5	Prepare a professional report as per recommended format and defend the work.

Subject Name: Industrial Training
Subject code: 23000028
Course outcome:

CO1	Participate in the projects in industries during his or her industrial training.
CO2	Describe use of advanced tools and techniques encountered during industrial training and visit.
CO3	Interact with industrial personnel and follow engineering practices and discipline prescribed in industry.
CO4	Develop awareness about general workplace behavior and build interpersonal and team skills.
CO5	Prepare professional work reports and presentations.

Subject Name: Energy Conservation and Management
Subject code: 23000023
Course outcome:

CO1	Describe the basics of energy management, energy demand management and energy auditing.
CO2	Highlight the need for energy conservation and describe the resource development for sustainability.
CO3	Identify the need for energy management in different sectors.
CO4	Forecast the energy demand for different sectors and integrate different energy resources to meet the energy demand.
CO5	Describe various renewable energy resources and their management for cleaner production.

SWARRNIM INSTITUTE OF TECHNOLOGY

DEPARTMENT: MASTER OF TECHNOLOGY (CYBER SECURITY)

Semester: 1

Program:	Master of Engineering	Branch:	CS
Year:	1st	Semester:	1
Course title:	Digital Forensics	Course code	26050101
Course type:	Engineering Science	Course credit:	3

CO 1	Ability to explain key concepts of digital forensics and the digital crime scene, including legal considerations.
CO 2	Demonstrate competence in acquiring and preserving digital evidence using forensic tools and adhering to legal procedures.
CO 3	Ability to use forensic software and hardware tools to recover, analyze, and present digital evidence.
CO 4	Analyze legal cases, apply relevant laws, and follow ethical guidelines while working with digital evidence.
CO 5	Create comprehensive forensic reports and present digital evidence findings in a clear, concise, and legally sound manner.

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Program:	Master of Engineering	Branch:	CS
Year:	1st	Semester:	1
Course title:	Cyber Security	Course code	26050102
Course type:	Engineering Science	Course credit:	4

CO 1	Understand the foundational principles of cyber security and risk management.
CO 2	Analyze and implement security protocols to protect networks and information systems.
CO 3	Evaluate various types of cyber threats and vulnerabilities, and develop mitigation strategies.
CO 4	Design secure systems and applications following best practices and compliance standards.
CO 5	Apply forensic techniques to investigate security breaches and support incident response efforts.

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Program:	Master of Engineering	Branch:	CS
Year:	1st	Semester:	1
Course title:	Cloud Computing	Course code	26050103
Course type:	Engineering Science	Course credit:	3

CO 1	Understand the core concepts of cloud computing, including service and deployment models.
CO 2	Analyze cloud architecture for scalability, reliability, and cost-efficiency.
CO 3	Develop and deploy cloud-based applications using popular cloud platforms.
CO 4	Assess cloud security risks and apply appropriate security measures.
CO 5	Optimize cloud resources for performance and cost management.

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Program:	Master of Engineering	Branch:	CS
Year:	1st	Semester:	1
Course title:	Data Mining and Warehousing	Course code	26050104
Course type:	Engineering Science	Course credit:	3

CO 1	Understand data mining concepts and the role of data warehousing in analytics.
CO 2	Apply data pre-processing techniques for mining.
CO 3	Implement various data mining algorithms for classification, clustering, and association.
CO 4	Evaluate and interpret the results of data mining models.
CO 5	Design and optimize data warehouse systems for efficient querying and reporting.

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Program:	Master of Engineering	Branch:	CS
Year:	1st	Semester:	1
Course title:	Research Skills	Course code	2601001
Course type:	Engineering Science	Course credit:	2

CO 1	Identify and define research problems effectively.
CO 2	Apply appropriate research methodologies and tools.
CO 3	Analyze and interpret research data critically.
CO 4	Develop coherent and well-structured research reports.
CO 5	Demonstrate ethical standards in conducting research.

Program:	Master of Engineering	Branch:	CS
Year:	1st	Semester:	2
Course title:	Network Programming	Course code	26300201
Course type:	Engineering Science	Course credit:	4

CO 1	Understand and implement fundamental concepts of network protocols and communication models.
CO 2	Develop network-based applications using socket programming and APIs.
CO 3	Analyze and troubleshoot network issues and optimize performance.
CO 4	Design secure communication systems with encryption and authentication techniques.
CO 5	Apply advanced techniques in distributed systems and real-time network programming.

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Program:	Master of Engineering	Branch:	CS
Year:	1st	Semester:	2
Course title:	Ethical Hacking	Course code	26300202
Course type:	Engineering Science	Course credit:	5

CO 1	Understand key concepts of ethical hacking and its role in cybersecurity.
CO 2	Analyze vulnerabilities in computer systems and networks.
CO 3	Apply ethical hacking techniques to assess security threats.
CO 4	Implement penetration testing strategies using industry-standard tools.
CO 5	Develop risk mitigation strategies and security policies.

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Program:	Master of Engineering	Branch:	CS
Year:	1st	Semester:	2
Course title:	Cryptography and Biometrics	Course code	26300203
Course type:	Engineering Science	Course credit:	3

CO 1	Understand and apply fundamental encryption techniques and cryptographic protocols.
CO 2	Analyze the security of cryptographic systems and algorithms.
CO 3	Understand biometric recognition principles and techniques.
CO 4	Implement biometric authentication methods for security systems.
CO 5	Assess the privacy and ethical considerations of biometric data usage.

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Program:	Master of Engineering	Branch:	CS
Year:	1st	Semester:	2
Course title:	Soft Computing	Course code	26300204
Course type:	Engineering Science	Course credit:	3

CO 1	Understand the fundamental concepts of soft computing techniques.
CO 2	Apply neural networks and fuzzy logic for problem-solving in real-world scenarios.
CO 3	Design evolutionary algorithms for optimization tasks.
CO 4	Analyze hybrid systems combining neural, fuzzy, and evolutionary models.
CO 5	Implement soft computing tools for engineering and scientific applications.

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Program:	Master of Engineering	Branch:	CS
Year:	1st	Semester:	2
Course title:	Software Project Management	Course code	26300206
Course type:	Engineering Science	Course credit:	3

CO 1	Understand project management principles and their application in software development.
CO 2	Analyze risk management strategies and develop mitigation plans.
CO 3	Apply resource management techniques for optimizing project efficiency.
CO 4	Utilize project scheduling tools for effective project execution and control.
CO 5	Demonstrate leadership and communication skills in managing software project teams.

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Semester: 3

Program:	Master of Engineering	Branch:	CS
Year:	2nd	Semester:	3
Course title:	Machine Learning	Course code	24060301
Course type:	Engineering Science	Course credit:	3

CO 1	Understand the fundamental concepts of machine learning and its applications.
CO 2	Apply supervised learning algorithms for classification and regression tasks.
CO 3	Analyze and implement unsupervised learning techniques like clustering.
CO 4	Evaluate machine learning models using performance metrics and cross-validation.
CO 5	Develop and deploy machine learning solutions for real-world problems.

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Program:	Master of Engineering	Branch:	CS
Year:	2nd	Semester:	3
Course title:	Seminar 1	Course code	24000001
Course type:	Engineering Science	Course credit:	3

CO 1	Demonstrate a sound technical knowledge of their selected seminar topics.
CO 2	Undertake problem identification, formulation and solution.
CO 3	Desing engineering solutions to complex problems utilizing a system approach.
CO 4	Communicate with engineers and the community at large.
CO 5	Demonstrate the knowledge, skills, and attitudes of a professional engineer.

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Program:	Master of Engineering	Branch:	CS
Year:	2nd	Semester:	3
Course title:	Internal Review	Course code	24000002
Course type:	Engineering Science	Course credit:	3

CO 1	To develop presentation skills
CO 2	To understand literature review, report writing skills
CO 3	To understand different software used for research.
CO 4	TO learn any one design and development of software.
CO 5	To enhance reading and writing research paper skills.

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Program:	Master of Engineering	Branch:	CS
Year:	2nd	Semester:	3
Course title:	Dissertation Phase I	Course code	26060104
Course type:	Engineering Science	Course credit:	4

CO 1	Demonstrate the ability to identify and formulate research problems.
CO 2	Apply advanced engineering knowledge to solve complex problems.
CO 3	Design and implement experimental or simulation studies for data analysis.
CO 4	Interpret research findings to develop innovative solutions.
CO 5	Communicate technical information effectively through written and oral presentations.

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Program:	Master of Engineering	Branch:	CS
Year:	2nd	Semester:	4
Course title:	Seminar II	Course code	24000006
Course type:	Engineering Science	Course credit:	3

CO 1	Demonstrate in-depth knowledge on a selected research topic through critical analysis.
CO 2	Develop effective communication and presentation skills for technical subjects.
CO 3	Synthesize relevant literature and research findings to support seminar discussions.
CO 4	Apply research methodologies to identify and address complex engineering problems.
CO 5	Exhibit independent learning and professional ethics in research presentation.

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Program:	Master of Engineering	Branch:	CS
Year:	2nd	Semester:	4
Course title:	External Mid Sem Review	Course code	24000004
Course type:	Engineering Science	Course credit:	5

CO 1	Demonstrate progress and understanding of ongoing project/research work.
CO 2	Apply advanced technical concepts to solve identified problems.
CO 3	Integrate feedback from reviewers for project improvement.
CO 4	Present technical work effectively to a panel of experts.
CO 5	Identify areas for further research or development in the chosen topic.

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Program:	Master of Engineering	Branch:	CS
Year:	2nd	Semester:	4
Course title:	Dissertation Phase II	Course code	24000005
Course type:	Engineering Science	Course credit:	4

CO 1	Demonstrate advanced research capabilities through critical analysis and problem-solving in the chosen topic.
CO 2	Apply specialized knowledge to design and implement innovative engineering solutions.
CO 3	Conduct in-depth experiments and data analysis to validate research findings.
CO 4	Communicate research outcomes effectively through presentations and technical reports.
CO 5	Exhibit project management skills in executing the dissertation within time and resource constraints.

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Semester: 1

Program:	Master of Engineering	Branch:	MLAI
Year:	1st	Semester:	1
Course title:	Digital Forensics	Course code	26060101
Course type:	Engineering Science	Course credit:	3

CO 1	Ability to explain key concepts of digital forensics and the digital crime scene, including legal considerations.
CO 2	Demonstrate competence in acquiring and preserving digital evidence using forensic tools and adhering to legal procedures.
CO 3	Ability to use forensic software and hardware tools to recover, analyze, and present digital evidence.
CO 4	Analyze legal cases, apply relevant laws, and follow ethical guidelines while working with digital evidence.
CO 5	Create comprehensive forensic reports and present digital evidence findings in a clear, concise, and legally sound manner.

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Program:	Master of Engineering	Branch:	MLAI
Year:	1st	Semester:	1
Course title:	Artificial Intelligence	Course code	26060102
Course type:	Engineering Science	Course credit:	3

CO 1	Ability to explain core concepts of Artificial Intelligence, including the history, foundations, and key approaches in the field.
CO 2	Apply AI techniques such as search algorithms, heuristics, and optimization strategies to solve complex problems.
CO 3	Ability to implement machine learning algorithms, including supervised and unsupervised learning methods, and evaluate their performance.
CO 4	Design and develop AI systems using modern tools and frameworks to address real-world problems.
CO 5	Ability to critically evaluate the ethical, legal, and social impacts of AI technologies and apply responsible AI principles.

Program:	Master of Engineering	Branch:	MLAI
Year:	1st	Semester:	1
Course title:	Cloud Computing	Course code	26060103
Course type:	Engineering Science	Course credit:	4

CO 1	Understand the core concepts of cloud computing, including service and deployment models.
CO 2	Analyze cloud architecture for scalability, reliability, and cost-efficiency.
CO 3	Develop and deploy cloud-based applications using popular cloud platforms.
CO 4	Assess cloud security risks and apply appropriate security measures.
CO 5	Optimize cloud resources for performance and cost management.

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Program:	Master of Engineering	Branch:	MLAI
Year:	1st	Semester:	1
Course title:	Data Mining and Warehousing	Course code	26060104
Course type:	Engineering Science	Course credit:	4

CO 1	Understand data mining concepts and the role of data warehousing in analytics.
CO 2	Apply data pre-processing techniques for mining.
CO 3	Implement various data mining algorithms for classification, clustering, and association.
CO 4	Evaluate and interpret the results of data mining models.
CO 5	Design and optimize data warehouse systems for efficient querying and reporting.

Program:	Master of Engineering	Branch:	MLAI
Year:	1st	Semester:	1
Course title:	Research Skills	Course code	26010001
Course type:	Engineering Science	Course credit:	3

CO 1	Identify and define research problems effectively.
CO 2	Apply appropriate research methodologies and tools.
CO 3	Analyze and interpret research data critically.
CO 4	Develop coherent and well-structured research reports.
CO 5	Demonstrate ethical standards in conducting research.

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Program:	Master of Engineering	Branch:	MLAI
Year:	1st	Semester:	2
Course title:	Business Analytics	Course code	24060201
Course type:	Engineering Science	Course credit:	3

CO 1	Apply statistical and analytical methods to derive insights from business data.
CO 2	Utilize data visualization techniques to effectively communicate business insights.
CO 3	Develop predictive models to support data-driven decision-making.
CO 4	Implement machine learning algorithms to optimize business processes.
CO 5	Apply statistical and analytical methods to derive insights from business data.

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Program:	Master of Engineering	Branch:	MLAI
Year:	1st	Semester:	2
Course title:	Neural Networks	Course code	24060202
Course type:	Engineering Science	Course credit:	4

CO 1	Understand the basic concepts of neural networks and their applications in computing.
CO 2	Apply various neural network architectures to solve real-world problems.
CO 3	Analyze and evaluate the performance of different neural network models.
CO 4	Implement and optimize neural networks using modern tools and techniques.
CO 5	Explore advanced topics such as deep learning and their role in artificial intelligence.

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Program:	Master of Engineering	Branch:	MLAI
Year:	1st	Semester:	2
Course title:	Cryptography and Biometrics	Course code	24060203
Course type:	Engineering Science	Course credit:	4

CO 1	Understand and apply fundamental encryption techniques and cryptographic protocols.
CO 2	Analyze the security of cryptographic systems and algorithms.
CO 3	Understand biometric recognition principles and techniques.
CO 4	Implement biometric authentication methods for security systems.
CO 5	Assess the privacy and ethical considerations of biometric data usage.

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Program:	Master of Engineering	Branch:	MLAI
Year:	1st	Semester:	2
Course title:	Soft Computing	Course code	24060204
Course type:	Engineering Science	Course credit:	3

CO 1	Understand the fundamental concepts of soft computing techniques.
CO 2	Apply neural networks and fuzzy logic for problem-solving in real-world scenarios.
CO 3	Design evolutionary algorithms for optimization tasks.
CO 4	Analyze hybrid systems combining neural, fuzzy, and evolutionary models.
CO 5	Implement soft computing tools for engineering and scientific applications.

Program:	Master of Engineering	Branch:	MLAI
Year:	1st	Semester:	2
Course title:	Software Project Management	Course code	24060206
Course type:	Engineering Science	Course credit:	3

CO 1	Understand project management principles and their application in software development.
CO 2	Analyze risk management strategies and develop mitigation plans.
CO 3	Apply resource management techniques for optimizing project efficiency.
CO 4	Utilize project scheduling tools for effective project execution and control.
CO 5	Demonstrate leadership and communication skills in managing software project teams.

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Program:	Master of Engineering	Branch:	MLAI
Year:	2nd	Semester:	3
Course title:	Machine Learning	Course code	24060301
Course type:	Engineering Science	Course credit:	4

CO 1	Understand the fundamental concepts of machine learning and its applications.
CO 2	Apply supervised learning algorithms for classification and regression tasks.
CO 3	Analyze and implement unsupervised learning techniques like clustering.
CO 4	Evaluate machine learning models using performance metrics and cross-validation.
CO 5	Develop and deploy machine learning solutions for real-world problems.

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Program:	Master of Engineering	Branch:	MLAI
Year:	2nd	Semester:	3
Course title:	Seminar 1	Course code	24000001
Course type:	Engineering Science	Course credit:	3

CO 1	Demonstrate a sound technical knowledge of their selected seminar topics.
CO 2	Undertake problem identification, formulation and solution.
CO 3	Desing engineering solutions to complex problems utilizing a system approach.
CO 4	Communicate with engineers and the community at large.
CO 5	Demonstrate the knowledge, skills, and attitudes of a professional engineer.

Program:	Master of Engineering	Branch:	MLAI
Year:	2nd	Semester:	3
Course title:	Internal Review	Course code	24000002
Course type:	Engineering Science	Course credit:	5

CO 1	To develop presentation skills
CO 2	To understand literature review, report writing skills
CO 3	To understand different software used for research.
CO 4	TO learn any one design and development of software.
CO 5	To enhance reading and writing research paper skills.

Program:	Master of Engineering	Branch:	MLAI
Year:	2nd	Semester:	3
Course title:	Dissertation Phase I	Course code	26060104
Course type:	Engineering Science	Course credit:	5

CO 1	Demonstrate the ability to identify and formulate research problems.
CO 2	Apply advanced engineering knowledge to solve complex problems.
CO 3	Design and implement experimental or simulation studies for data analysis.
CO 4	Interpret research findings to develop innovative solutions.
CO 5	Communicate technical information effectively through written and oral presentations.

Program:	Master of Engineering	Branch:	MLAI
Year:	2nd	Semester:	4
Course title:	Seminar II	Course code	24000006
Course type:	Engineering Science	Course credit:	5

CO 1	Demonstrate in-depth knowledge on a selected research topic through critical analysis.
CO 2	Develop effective communication and presentation skills for technical subjects.
CO 3	Synthesize relevant literature and research findings to support seminar discussions.
CO 4	Apply research methodologies to identify and address complex engineering problems.
CO 5	Exhibit independent learning and professional ethics in research presentation.

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Program:	Master of Engineering	Branch:	MLAI
Year:	2nd	Semester:	4
Course title:	External Mid Sem Review	Course code	24000004
Course type:	Engineering Science	Course credit:	4

CO 1	Demonstrate progress and understanding of ongoing project/research work.
CO 2	Apply advanced technical concepts to solve identified problems.
CO 3	Integrate feedback from reviewers for project improvement.
CO 4	Present technical work effectively to a panel of experts.
CO 5	Identify areas for further research or development in the chosen topic.

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Program:	Master of Engineering	Branch:	MLAI
Year:	2nd	Semester:	4
Course title:	Dissertation Phase II	Course code	24000005
Course type:	Engineering Science	Course credit:	5

CO 1	Demonstrate advanced research capabilities through critical analysis and problem-solving in the chosen topic.
CO 2	Apply specialized knowledge to design and implement innovative engineering solutions.
CO 3	Conduct in-depth experiments and data analysis to validate research findings.
CO 4	Communicate research outcomes effectively through presentations and technical reports.
CO 5	Exhibit project management skills in executing the dissertation within time and resource constraints.

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