

# **Automobile Engineering**

## UG Program

- **Department Name :- Automobile Engineering**
- **UG Program Name :- Automotive Technology & Mechanical Engg. Automobile**
- **Vision and Mission :-**

<b>Vision</b>	To offer programs of global repute with an emphasis on academics, research and innovation to provide competent and efficient human resources in the field of automotive engineering to fulfill the needs of the society.
<b>Mission</b>	<ol style="list-style-type: none"> <li>1. To design and enrich the curricula based on changing needs of industry and society.</li> <li>2. To develop a center of excellence to promote automotive research and attract industry assignments.</li> <li>3. To provide an excellent academic environment for development of competent automotive professionals to meet industry expectations.</li> <li>4. To ensure participation of every stakeholder to enhance effectiveness of the programs being offered</li> </ol>

<b>Sr. No.</b>	<b>Program Outcomes</b>
1.	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
2.	Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences
3.	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
4.	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems
5.	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
6.	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
7.	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
8.	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
9.	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings
10.	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
11.	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
12.	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change

Sr. No.	Program Specific Outcomes
1.	Diagnose the automotive system failures and repair / replace the components / systems so as to bring the vehicle in original condition.
2.	Perform the role of motor claim approver and loss assessor with confidence and competence.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1	III	AT 221	Thermodynamics	Interpret energy interaction
				Apply laws of thermodynamics to engineering systems
				Apply entropy increase principle for thermodynamic processes
				Examine phase change of pure substance
				Analyze the performance of thermodynamic cycles
2	III	AT 2051	Fluid Mechanics and Machinery	Compare various properties of fluids at rest and in transit
				Analyze fluid systems using equations such as Bernoulli's equation and Continuity equation
				Examine energy losses in pipes to enable drawing energy gradient lines
				Solve viscous and boundary layer flow problems.
				Evaluate the performance characteristics of hydraulic turbines
				Evaluate the performance characteristics of hydraulic pumps
3	III	AT 223	Automotive Materials	Classify the engineering materials
				Describe various engineering alloys, non-metallic & modern materials
				Select suitable material for automotive application
				Explain material testing procedure
4	III	AT 2031	Engineering Mechanics	Calculate resultant force of coplanar force system
				Analyze engineering problems applying conditions of equilibrium
				Determine centroid & moment of inertia of the geometrical plane lamina
5	III	ATMD 201	Automobile Systems	Explain constructional details and operation of the automotive systems
				Interpret the influence of various technical parameters on the behavior of the automotive systems
				Configure the systems and its elements for integrating into drivetrain/chassis systems appropriate for given automotive application
				Present in detail the technological advancements of the automotive systems
6	III	AT 2111	Engineering Mechanics Lab.	Verify law of polygon of forces, law of triangle of forces and principle of moment
				Verify Lami's theorem

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				Compare coefficient of friction of various surfaces in contact
				Correlate theoretical and practical results of support reactions and Centroid of plane lamina
				Analyze a simple truss
7	III	AT 2171	Machine Drawing Lab.	Represent mechanical elements and materials with their conventions
				Draw free-hand sketches of machine components in proportion
				Draw part and assembly drawing for given machine elements
				Prepare production drawing as per given requirements
				Draw interpenetration of solids as per given requirements
8	III	AT 225	Fluid Mechanics & Thermal Engg. Lab.	Verify and apply Bernoulli's theorem
				Determine coefficient of discharge of venturimeter & orifice
				Calculate major and minor losses in pipe-fittings
				Calibrate notches, orificemeter
				Determine properties of lubricants
				Evaluate COP of refrigeration and air conditioning system
9	III	AT 2131	C++ Programming Lab.	Identify elements and features of object-oriented Programming
				Implement various object-oriented concepts with the help of programs
				Apply the object-oriented concepts in real time problem solving
				Use constructors and destructors in programming
				Implement inheritance concept in programming
10	III	AT 2191	Technical Aptitude - I	Comprehend the knowledge gained in the course work
				Demonstrate problem-solving ability
11	IV	AT 222	Mathematics for Automotive Technology	Solve mechanical engineering problems using Linear Differential Equations
				Apply Partial Differential Equations to various engineering problems
				Solve Engineering problems using Laplace Transform
				Apply knowledge of vector differentiation to find directional derivatives, curl, and divergence of vector fields
				Evaluate Fourier transforms and apply them to solve heat conduction problems in engineering
12	IV	AT 224	Theory of Machines	Determine velocity and acceleration of various links of a mechanism
				Generate profile of the cam to get required follower motion for any application
				Plot characteristics of centrifugal governors of various types
				Analyze kinematic parameters of gears in mesh for typical power transmission application

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				Analyze rotating and reciprocating components of machines to compute the magnitude and direction of balancing mass
				Formulate mathematical models of systems to determine natural frequency and damping of undamped and damped free vibrations of single degree freedom systems
13	IV	AT 226	Manufacturing Technology	Describe casting, machining & forming processes for automotive applications
				Explain various gear manufacturing processes
				Select suitable sheet metal and joining process for the application
				Explain the steps and techniques involved in manufacturing using powder metallurgy
14	IV	AT 2041	Mechanics of Materials	Apply elementary knowledge of stresses and strains
				Select appropriate beam section for mechanical applications
				Apply stiffness criteria for beam analysis
				Analyze the circular shaft subjected to pure torsion
				Apply energy method for structural analysis of solid body
15	IV	ATMD 202	I. C. Engines	Perform a primary thermodynamic analysis of Otto and diesel cycle engines
				Select appropriate engine for specific application
				Select proper fuel system for IC engine
				Conduct performance test of IC engine and portray operating characteristics of engine
				Identify abnormal combustion in engine and remedy over it
				Select proper lubrication, intake, exhaust, cooling system for engine
16	IV	AT 228	Theory of Machines Lab.	Design a gear tooth profile for given engineering application
				Determine Gyroscopic couple and verify Gyroscopic law
				Plot polar diagram based on the experimental readings on Hook's joint
				Design a cam profile for given application
				Plot characteristic curves for centrifugal governors
				Determine moment of inertia of rigid bodies
				Apply balancing methods to balance rotating and reciprocating masses
				Analyze vibration characteristics of single degree of freedom systems
				Determine critical speed of shafts
17	IV	SH 2174	Environmental Science	Apply interdisciplinary knowledge in environmental science by integrating concepts and principles from various fields of science and engineering to address environmental issues
				Evaluate environmental impacts of human activities on ecosystems and on the environment
				Use scientific approach to identify and solve environment related problems

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				Design sustainable solutions to address environmental challenges by considering renewable energy sources, waste management strategies conservation measures, and environmental policies
				Participate in group work to become acquainted with the importance of teamwork, collaboration
				Develop presentation and report writing skills
18	IV	AT 2201	Technical Aptitude - II	Comprehend the knowledge gained in the course work
				Demonstrate problem-solving ability
19	V	AT 301 MA 335	Automotive Power Technology	Know the fundamentals of automotive power plants for selection for appropriate application
				Perform a primary thermodynamic analysis of automobile power plant
				Choose appropriate systems for automobile power plant
				Conduct performance testing of the automotive power plant to portray operating characteristics
				Identify abnormal behavior of power plant and remedy over it
				Select appropriate lubricant and lubrication system for engine
20	V	AT 303 MA 337	AI and ML for Automotive Applications	Demonstrate fundamental understanding of artificial intelligence (AI) and expert systems
				Evaluate the impact of AI on society
				Describe various applications of AI in automotive sector
				Discuss standardizations in AI & ML for automotive
21	V	AT 305 MA 339	Theory of Machines	Determine velocity and acceleration of various links of a mechanism
				Generate profile of the cam to get required follower motion for any application
				Explain the gyroscopic effect on naval ship, aero plane etc
				Analyze kinematic parameters of gears in mesh for typical power transmission application
				Analyze rotating and reciprocating components of machines to compute the magnitude and direction of balancing mass
				Formulate mathematical models of systems to determine natural frequency and damping of undamped and damped free vibrations of single degree freedom systems
22	V	AT 307 MA 341	Design of Machine Elements	Illustrate the fundamental concepts of machine design
				Design joints for different loading conditions
				Design shaft, keys, and couplings to transmit the required amount of torque
				Design gears using different design considerations
				Design springs and levers for various applications
23	V	AT 309	Automotive Product Design and Development	Describe the product development process in general
				Develop the specifications for the proposed product
				Generate, screen and test concepts for proposed product
				Demonstrate application of product development tools and techniques while developing a new product

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				Analyse commercial aspects of a typical product development project
24	V	AT 321 MA 355	Automotive Power Technology Lab.	Demonstrate the fuels supply, lubrication, cooling systems
				Conduct the test on single cylinder and multi-cylinder petrol & diesel engines
				Plot the engine performance characteristics curves and interpret the curves
				Calculate B.P., I.P., F.P., air/fuel ratios, and various engine efficiencies
				Conduct the test and prepare heat balance sheet
25	V	AT 323 MA 3251	Theory of Machines Lab	Design a gear tooth profile for given engineering application
				Determine Gyroscopic couple and verify Gyroscopic law
				Plot polar diagram based on the experimental readings on Hook's joint
				Design a cam profile for given application
				Plot characteristic curves for centrifugal governors
				Determine moment of inertia of rigid bodies
				Apply balancing methods to balance rotating and reciprocating masses
				Analyze vibration characteristics of single degree of freedom systems
Determine critical speed of shafts				
26	V	AT 325 MA 357	MATLAB Simulation	Explain user interface of MATLAB SIMULINK
				Develop appropriate MATLAB simulation model using available blocksets
				Simulate the developed model and interpret the results
27	V	AT 327	Automotive Metrology & Measurement Lab.	Measure surface finish by using Autocollimeter
				Measure the angle of tapered components, template and thread form using tool makers microscope, sine bar and with standard balls and rollers
				Measure pressure, force velocity, etc. using various instruments
				Calibrate the measuring instrument
28	V	AT 329 MA 3291	Technical Aptitude-III	Comprehend the knowledge gained in the course work
				Demonstrate problem-solving ability
29	V	SH 3033	Scholastic Aptitude-I	Develop a logical approach towards solving Aptitude and Reasoning problems
				Analyze usage of basic aptitude terms of percentages, averages, ratios and applications of business aptitude terms of profits and interests
				Develop a bridge in analogies, series and visualizing directions
				Apply various short cuts & techniques to manage speed and accuracy to get equipped for various competitive and campus recruitment exams
30	V	AT 331 MA 359	Summer Internship-I	Acquaint with garage environment and processes to be carried out
				Handle various tools and equipments used in garages
				Diagnose minor faults of vehicle

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				Communicate and present his ideas/work in front of peers and superiors
31	V	SH 3011	Indian Constitution	Create awareness about law depiction and importance of Constitution
				Define Fundamental Rights and Fundamental Duties of the Indian Citizen to instill morality, social values, honesty, dignity of life, and their social Responsibilities
				Create Awareness of their Surroundings, Society, Social problems, and their suitable solutions while keeping rights and duties of the citizen keeping in mind
				Recognize distribution of powers and functions of Local Self Government
				Comprehend the National Emergency, Financial Emergency, and their impact on Economy of the country
32	VI	AT 302 MA 328	Automotive System Design	Illustrate the fundamental concepts of system design.
				Design automotive clutch system for given automotive applications.
				Design gearbox for automotive application
				Design leaf spring and coil spring for automotive suspension
				Design braking system (Internal expanding shoe type) for a vehicle
				Design front axle, differential, propeller shaft & final drive for automotive application
33	VI	MA 330	Heat Transfer	Compute temperature distribution using steady-state and unsteady-state heat conduction
				Analyze heat transfer through extended surfaces
				Analyze forced and free convection heat transfer situations
				Apply the principles of radiation heat transfer to engineering problems
				Design heat exchangers using LMTD and NTU methods
34	VI	AT 312 MA 338	Alternative Fuels and systems	Interpret and understand the essential properties, manufacturing techniques and use of liquid fuels in petrol and diesel engines.
				Analyze the properties, characteristics and the implementation limits of gaseous fuels like LPG, CNG, and HYDROGEN in I.C engines.
				Apply the concepts and methods to use alternate fuel and energy system.
				Suggest the modifications required to use alternative fuels in I.C engines.
35	VI	OE 3023	Reliability Engineering	Demonstrate an awareness about the concepts of Reliability, Availability and Maintainability
				Build system reliability models for different configurations.
				Evaluate the reliability of simple and complex systems
				Apply the appropriate methodologies to determine time and strength based reliabilities.
				Implement strategies for improving reliability of repairable and non-repairable systems



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36	VI	OE 3043	Renewable Energy Sources	Identify the need of requirement of renewable energy source
				Summarize the various available energy sources.
				Illustrate different technologies essential for conversion of renewable energy sources
				Evaluate the performance of energy conversion systems for maximum efficiency
				Compare the various renewable energy technologies.
				Select appropriate renewable energy technology for specific application
37	VI	SH 3021	Biology for Engineers	Apply biological engineering principles, procedures needed to solve real-world problems
				Describe the functions of biological systems
				Analyze biological phenomena and compute work done at microscale
				Explain working of different biomedical instruments
				Select the sensors for given biological applications
38	VI	AT 304 MA 344	Automotive Body & Safety	Explain relevant aspect of movement control process
				Prepare vehicle body outline on the basis of type and application.
				Apply principles of aerodynamics, aesthetics, and ergonomic to design an automotive body
				Select appropriate materials and manufacturing method for automotive body
				Understand the basics of vehicle collision and its effects
				Apply various safety systems to make safe vehicles
39	VI	AT 318 MA 346	Vehicle Testing Laboratory	Apply safety standards and safety testing of automotives
				Analyze performance of two and four wheelers using on road and laboratory testing methods
				Determine noise level in automotive systems using noise measurement systems
				Use vibration measurement system to determine vibration characteristics of automotive systems and components
				Analyze emission characteristics of petrol and diesel engines
40	VI	AT 320 MA 348	CAE Lab.	Select appropriate sensor for performance evaluation of vehicle and vehicle components
				Explain user interface of software and FEM
				Develop appropriate model required for analysis
				Carryout 1D analysis using appropriate element
				Develop 2D and 3D meshing
41	VI	AT 322 MA 3201	Automotive Diagnostic Lab.	Apply different post processing techniques to interpret the results
				Identify the problems with their causes and remedies by dismantling the given clutch assembly and gear box assembly
				Measure backlash and run out of differential unit and assess the fault
				Service the transaxle and rear axle assembly, brake system, identify the faults and service the same

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				Service the steering gear boxes, and measure the turning circle radius and check wheel balancing and set wheel alignment parameters of a given vehicle
				Align the head lamp of the given vehicle
42	VI	AT 324 MA 3241	Technical Aptitude-IV	Comprehend the knowledge gained in the course work
				Demonstrate problem-solving ability
43	VI	AT 326 MA 3261	Capstone Project Phase -I	Carry out literature survey and identify as well as select a problem
				Comprehend and analyze an engineering problem and report findings to provide an appropriate solution
				Design an experimental setup or develop an analytical model to analyze the system under consideration
				Communicate problem, methodology and outcomes systematically and effectively in the form of a technical report
				Work as a member and a team leader in engineering teams / multidisciplinary teams
				Demonstrate an ability to use different tools and techniques to solve the given problem
				Demonstrate ethical behavior while completing the project work within given constraints and while delivering the expected outcomes
44	VI	SH 304	Psychology for Engineers	Interpret human behavior as a system from a psychological perspective
				Appraise the various factors affecting human behavior at work
				Apply behavioural theories to manage/lead people and emotions at work
45	VI	SH 3063	Scholastic Aptitude - II	Develop a logical approach towards solving Aptitude and Reasoning problems
				Analyze usage of basic aptitude terms of percentages, averages, ratios and applications of business aptitude terms of profits and interests
				Develop a bridge in analogies, series and visualizing directions
				Apply various short cuts & techniques to manage speed and accuracy to get equipped for various competitive and campus recruitment exams
46	VII	MA 401	<b>Automotive System Design</b>	Design automotive clutch system for given automotive applications
				Design gearbox for automotive application
				Design leaf spring and coil spring for automotive suspension
				Design braking system (Internal expanding shoe type) for a vehicle
				Design front axle, differential, propeller shaft & final drive for automotive application
47	VII	MA 4031	<b>Vehicle Dynamics</b>	Evaluate vehicle acceleration performance & stability of vehicle over the range of operating conditions
				Determine braking performance of a vehicle when provided with specifications

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				Evaluate the response of tires for various operating conditions
				Evaluate handling characteristics of a vehicle for a given set of data
				Apply ride concepts while designing a suspension system for a vehicle
48	VII	MA 423	<b>Automation &amp; Robotics</b>	Explain robot anatomy and functions
				Develop basic robot programs
				Perform robot economic analysis
				Explain need and basic elements of industrial automation
				Perform quantitative analysis of transfer lines and Assembly lines
49	VII	MA 433	<b>Automotive Aerodynamics</b>	Apply basic principles of aerodynamics for the design of vehicle body
				Calculating lift and drag of automotive models
				Describe the physics of fluid flow over vehicle body and its optimization techniques
				Use of wind tunnels in testing the vehicles
				Apply computational fluid dynamics (CFD) tool for aerodynamics study
50	VII	MA 441	Vehicle Performance Evaluation & Emission Testing Laboratory	Analyze performance of two and four wheelers using on road and laboratory testing methods
				Determine noise level in automotive systems using noise measurement systems
				Use vibration measurement system to determine vibration characteristics of automotive systems and components
				Analyze emission characteristics of petrol and diesel engines
				Select appropriate sensor for performance evaluation of vehicle and vehicle components
51	VII	MA 451	<b>Automation and Robotics Lab.</b>	Demonstrate/select proper types of sensors/transducers for given task
				Design signal conditioning circuits for various signal conditioning processes like signal level change, signal form change, filters, bridge circuits etc
				Demonstrate ability of control and automation of simple devices such as motors, cylinders using PLC
				Demonstrate the ability to create microcontroller programs and properly interface them to input and output devices
52	VII	MA 443	CAE Software Proficiency	Formulate the automotive engineering problems for simulating its functional design.
				Simulate real life problems using modern software tools,
				Interpret the simulation results for modification in design.
				Optimize engineering problems using software tools.
				Present the technical and non-technical issues encountered during completion of simulation project.
53	VII	MA 457	<b>Capstone Project Phase-II</b>	Demonstrate the ability to develop creative and original solutions to engineering problems of significant complexity

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				Work as an individual member of a team, with support from a supervisor, formulating solutions to day-to-day problems by integrating knowledge and experience gained during the course and beyond that
				Demonstrate the ability to produce a formal engineering report
				Describe experimental apparatus and/or models, and analysis procedures in a clear, complete and unambiguous manner making best use of latest information technology
				Communicate and present his ideas / work in front of peers and superiors
54	VIII	OE 4381	<b>Finance for Engineers (Online Course)</b>	Discuss the fundamental aspects of accounting and finance
				Apply rules of accounting while recording transactions
				Prepare financial statements and analyze financial position of the firm by applying various techniques
				Describe the various long term sources of finance available for the business organization
55	VIII	OE 4361	<b>Engineering Management &amp; Economics (Online Course)</b>	Develop administrative, organizational and planning skills to execute engineering project
				Develop bar chart/mile stone chart for the project
				Analyze profit/cost data and carry out economic analysis to take optimal decision
				Calculate depreciation as per various methods
56	VIII	IP 4023	<b>Internship &amp; Project</b>	<b>Internship</b>
				Examine the functioning of the company on the terms of inputs, transformation process and the outputs (products and services)
				Develop an attitude to adjust with the company culture, work norms, code of conduct
				Recognize and follow the safety norms, Code of conduct
				Demonstrate the ability to observe, analyse and document the details as per the industry practices
				Interpret the processes, systems and procedures and to relate to the theoretical concepts- studies
				Develop the leadership abilities, communication
				Demonstrate project management and finance sense
				<b>Project</b>
				Identify the project/problem in the domain of a program relevant for the company
				Compile the information to the pertaining to the problem identified
				Analyse the information using the statistical tools/ techniques
				Develop the feasible solution for given problem
				Analyse the impact of the project on the performance of company/department
57	VIII	RE 4043	<b>Research Project</b>	Investigate the technical literature
				Recognize and evaluate theories, practices, and/or research on a chosen topic by conducting a thorough

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				literature review and submitting a written integrative, critical summary of the current literature
				Design a research problem and develop a methodology
				Develop and implement an advanced original research or creative project
				Develop the ability to explain the conceptual viability of the project and describe the major components involved
				Develop the ability to explain how the project will impact the relevant body of work
				Develop advanced discipline-relevant skills and competencies
				Construct an accurate record of research performed
				Write a research report and paper
58	VIII	ED 4103	<b>Project Management</b>	Prepare business Plan for selected business
				Make risk analysis& market analysis of selected project
				Make risk analysis& market analysis of selected project
				Make financial appraisal of selected project
59	VIII	ED 4043	<b>Commercial Aspects of the Project</b>	Interpret basic Financial Terminologies
				Prepare & analyze financial statements
				Prepare financial Plan for venture
				Apply basic principles of marketing for various products
				Prepare market survey
				Apply knowledge of marketing management for selected business
60	VIII	ED 4063	<b>Entrepreneurship Development Program (EDP)</b>	Apply knowledge of engineering, economics, marketing and finance for formulation of business plan, starting & managing new business
61	VIII	ED 4083	<b>Entrepreneurship Development Project</b>	Apply knowledge of engineering, economics, marketing and finance for preparation of project report
				Make commercial, technical and financial appraisal of project

# **Civil Engineering**

## UG Program

- **Department Name :-Civil Engineering**
- **UG Program Name :-Civil Engineering**

<b>Vision</b>	To be an outstanding department devoted to provide high end research and technical education in Civil engineering which will produce socially aware professionals to provide solutions to global community
<b>Mission</b>	<p>To design curriculum based on changing needs of stakeholders &amp; provide excellence in delivery &amp; assessment to ensure holistic development of civil engineering students.</p> <p>To enhance research &amp; consultancy resulting in solving problems related to civil engineering infrastructure as well as society at large.</p> <p>To mentor students in pursuit of higher education, entrepreneurship and global professionalism.</p>

<b>Sr. No.</b>	<b>Program Outcomes</b>
13.	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
14.	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
15.	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
16.	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
17.	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
18.	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
19.	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
20.	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
21.	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

22.	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
23.	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
24.	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Sr. No.	Program Specific Outcomes
1	Enhance employability and/or entrepreneur skills through in-house and onsite training.
2	Provide solutions/procedures to societal and rural development problems through research and innovative practices.

### S. Y. B. Tech Civil

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1.	III	CE231	Mathematics for Civil Engineer	Solve problems on linear differential equations (LDE) and linear partial differential equations (PDE).
				Apply linear differential equations (LDE) to deflection of beams and columns
				Determine Fourier series of given functions.
				Compute Karl Pearson's coefficient of correlation and to fit regression lines.
				Solve problems on probability distributions.
2.	III	CE2214	Building Planning and Design	Suggest appropriate materials for building construction applications.
				Prepare a functional design of components of the building.
				Explain building finish materials and procedures.
				Design and draw residential building plan using AutoCAD software.
				Prepare plumbing and electrification plan for the building.
3.	III	CE2074	Surveying	Calculate reduced levels and identify the characteristics of contours.



Sr. No.	Semester	Course Code	Course Name	Course Outcome
				Determine the angular and linear measurements by using theodolite.
				Calculate the data for design of curve and area-volumes.
				Describe the principles of surveying with advanced techniques.
4.	III	CE2034	Engineering Mechanics	Calculate resultant force of coplanar force system.
				Analyze engineering problems applying conditions of equilibrium
				Determine centroid & moment of inertia of the geometrical plane lamina.
5.	III	SH2174	Environmental Science	Apply interdisciplinary knowledge from various fields of science and engineering to address environmental issues.
				Evaluate environmental impacts of human activities on the environment.
				Use scientific approach to identify and solve environment related problems.
				Design sustainable solutions to address environmental challenges.
				Participate in group work to become acquainted with the importance of teamwork, collaboration
				Develop presentation and report writing skills.
6.	III	ATMD201	Automobile Systems	Explain constructional details and operation of the automotive systems.
				Interpret the influence of various technical parameters on the behavior of the automotive systems.
				Configure the systems and its elements for integrating into drivetrain/chassis systems appropriate for given automotive application.
				Present in detail the technological advancements of the automotive systems.
7.	III	CEMD201	Building Construction and Planning	Suggest appropriate materials for building construction applications.
				Prepare a functional design of components of the building.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				Design and draw residential building using principles of planning and by-laws.
				Prepare plumbing and electrification plan for the building.
				Explain properties of building finishing materials and application procedure.
8.	III	CEMD201	Introduction to Data Structures	Compare between linear and nonlinear data structures
				Describe the characteristics of various data structure such as stacks, queues, trees, graphs and Hash tables.
				Analyze various searching and sorting algorithms and apply it to solve particular problem.
				Determine a suitable data structure and algorithm to solve a real world problem
9.	III	EEMD201	Electrical Power Generation	List the main components of different power plants
				Describe the operation of various power plants used for electrical power generation.
				Explain working principles of various power plants
				Compare different power plants based on advantages, limitations and future prospects
				Draw layout of electrical power plants.
				Explore alternate electrical energy resources for future needs and challenges.
10.	III	ECMD201	Electronics Devices and Applications	Describe the fundamental concepts of electronics and working principles of different devices.
				Analyze different analog and digital electronics circuits.
				Design digital electronics circuits with truth table and logic diagram.
11.	III	CEMD201	Data Structures	Describe the basic terminologies of data structures.
				Examine the linear data structure array with its types.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				Demonstrate the working of stack, queue performed on data structures.
				Illustrate the working of linked list.
				Discuss Tree terminologies and their Applications.
				Elaborate Graph terminologies with their types.
12.	III	MEMD201	Materials and Applications	Describe crystal structures and crystal imperfections.
				Illustrate plotting of Equilibrium diagrams from Cooling Curves and its fundamentals.
				Explain different Ferrous, Nonferrous alloys, their properties and applications by referring equilibrium diagrams.
				Explain properties and applications of Smart Materials, Magnetic Materials and Electronic materials.
				Explain properties and applications of Powder Metallurgy
				Select suitable material for given engineering application.
13.	III	CEMD201	Fundamentals of Mechatronics	Identify various elements of mechatronics systems.
				Select appropriate sensor/Actuator/controller/control algorithm for different applications.
				Develop PLC/ microcontroller-based applications.
14.	III	AIMD201	Object Oriented Programming	Understand the basic object oriented programming concepts and apply them in problem solving.
				Illustrate inheritance concepts for reusing the program.
				Implement program using loops, decision statements and functions in Python.
				Plot data using appropriate Python visualization libraries.
15.	III	CE2234	Building Planning and	Design and draw the different types of staircases for a building using AutoCAD.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
			Drawing Laboratory	Prepare submission and working drawings of a residential building using AutoCAD.
16.	III	CE2114	Surveying Laboratory	Determine the reduced levels by using dumpy level.
				Measure the angular and linear measurements by using theodolite and tachometry.
				Perform the setting out of the simple curves.
				Prepare topographical map by using total station and software.
17.	III	CE2134	Engineering Mechanics and Materials Testing Laboratory	Verify law of polygon of forces, principle of moment, Lami's theorem.
				Compare coefficient of friction of various surfaces in contact.
				Correlate theoretical and practical results of support reactions and Centroid of plane lamina.
				Analyze a simple truss.
				Identify various types of stresses in various structural elements.
				Determine various strengths of different construction materials
18.	III	CE233	Building Interior Design & Drawing	Design and draw the furniture, plumbing and electrification details of a building using AutoCAD.
				Design and draw the flooring and ceiling details of a building using AutoCAD.
19.	III	SH2634	Professional Leadership Skills	Explain the traits of a leadership through real life examples.
				Exhibit the ability to work effectively in team.
				Prepare a presentation as per the audience and context requirements.
20.	III	SH2614	Interpersonal Skills	Exhibit interpersonal communication skills.
				Demonstrate decision-making skills.
				Apply conflict resolution styles appropriate in different situations.
				Demonstrate skills to manage balance in work and life.
21.	III	SH2694		Explain structured approach to define

Sr. No.	Semester	Course Code	Course Name	Course Outcome
			Innovation Tools and Methods for Entrepreneurs	the problem with every possible detail, identify conflicts and solve them
				Apply User Journey Map to the selected problem to show user interaction at various stages
				Analyze the solutions provided by competitors for effectiveness and gaps if any.
22.	III	SH2594	Personal Effectiveness and Body Language	Develop skills to build self-esteem and positive attitude.
				2. Develop interpersonal skills characterized by effective communication and conflict resolution.
				3. Demonstrate responsiveness towards time, stress, and health issues.
				4. Interpret the non-verbal behaviour of a person.
23.	III	SH2734	German Language - Level III	Interpret the language if the next person is speaking slowly and clearly.
				Make use of the language in routine life with the routing topics like family, shopping, work etc.
				Demonstrate the language by self-introduction in German with simple sentences.
24.	III	SH2644	German Language - Level IV	Interpret the language if the next person is speaking slowly and clearly.
				Make use of the language in routine life with the routing topics like family, shopping, work etc.
				Demonstrate the language by self-introduction in German with simple sentences.
25.	III	SH2714	Japanese Language - Level III	Make use of basic conversations in various situations.
				Identify the sentence patterns.
				Explain insights about the communication required for living in Japan.
				Interpret Japanese work ethics required in their professional career.
26.	III	SH2624	Japanese Language - Level IV	To be able to make basic conversations in various situations.
				To recognize the sentence patterns.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				To improve Japanese Language proficiency.
				To give students insights about the communication required for living in Japan.
				To expose students to the Japanese work ethics required in their professional careers.
27.	III	CE232	Strength of Material	Analyze the section for various types of stresses and strains.
				Construct shear force and bending moment diagrams for determinate beams.
				Determine stresses (bending, shear and torsional) developed in the beam cross section.
				Evaluate strain energy stored in a body due to various loading conditions.
28.	IV	CE2044	Concrete Technology	Explain properties of various materials used in the manufacture of different kinds of concretes and role played by them in developing strong, durable concretes.
				Select materials for the manufacturing concretes for a given requirement.
				Explain procedures for conducting various quality control tests on fresh and hardened concrete as per standard codes.
				Design concrete mixes of given grade using mix design procedures recommended by IS and ACI codes of practices.
29.	IV	CE2064	Fluid Mechanics	Analyze different physical properties of fluid.
				Calculate various forces acting on submerged and floating bodies.
				Discriminate fluid kinematics and fluid dynamics.
				Illustrate flow through pipe and flow through open channels.
				Analyzes dimensional homogeneity using Buckingham's $\pi$ theorem
30.	IV	CE234		Analyze the intricate processes involved in the water cycle and its

Sr. No.	Semester	Course Code	Course Name	Course Outcome
			Water resources and Irrigation Engineering	impact on the distribution of water resources.
				Utilize advanced techniques to evaluate and interpret rainfall data for making well-informed decisions in water management.
				Develop and assess various irrigation methods tailored to the specific water requirements and efficiency of different crops.
				Evaluate the structural stability criteria for gravity dams and identify potential vulnerabilities in earthen dam constructions.
				Apply statistical flood estimation methods to determine flood discharge and devise effective flood control measures.
31.	IV	CE236	Highway Engineering	Design the geometric components of highway.
				Determine traffic volume for design of road.
				Perform different tests on highway materials.
				Design the highway pavement.
				Explain about construction and maintenance of highways.
32.	IV	ATMD202	I. C. Engines	Perform a primary thermodynamic analysis of Otto and diesel cycle engines.
				Select appropriate engine for specific application.
				Select proper fuel system for IC engine.
				Conduct performance test of IC engine and portray operating characteristics of engine.
				Identify abnormal combustion in engine and remedy over it.
				Select proper lubrication, intake, exhaust, cooling system for engine.
33.	IV	CEMD202	Building Estimation and Valuation	Explain the types and basic requirements of the estimate.
				Explain measurement sheet, abstract sheet, and detailed specifications of different construction items.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				Prepare detailed estimate of load bearing structure and framed structure.
				Prepare rate analysis and bar bending schedule of different construction items.
				Explain the tenders and contracts.
				Describe basic terms of valuation.
34.	IV	CSMD202	Problem Solving using JAVA	Understand the basic object oriented programming concepts and apply them in problem solving.
				Apply concept of inheritance for code reusability.
				Develop Programs using multithreading.
				Develop data-centric applications using JDBC.
				Design the basics of java console and GUI based programming
35.	IV	EEMD202	Power System	Write the basic working principles of different generating sources.
				Analyze different types of loads
				Explain importance of power factor and tariffs in power system.
				Identify various components in power transmission and distribution system.
				Select substation equipments as per requirement.
36.	IV	ECMD202	Electronics Communication Systems	Describe different communication systems.
				Explain applications of analog and digital modulation techniques.
				Analyze different modulation and demodulation techniques.
				Explain the use of satellite communication.
37.	IV	CIMD202	Computer Algorithms	Analysing asymptotically the performance of algorithms.
				Compare and analyse searching and sorting algorithms.
				Apply different algorithm design techniques to solve problems like job sequencing, knapsack, TSP, finding shortest path etc.
				Apply backtracking method to solve problems like N-queens, graph coloring, sum of subsets etc.



Sr. No.	Semester	Course Code	Course Name	Course Outcome
38.	IV	MEMD202	Design and Drawing of Machine Components	Produce the production drawing of simple mechanical assemblies.
				Design the machine components subjected to static loading.
				Design of spur gear and selection of roller bearing.
				Design components against fluctuating load.
39.	IV	MCMD202	Industrial Fluid Power	Describe the structure and function of common hydraulic and pneumatic components such as cylinders, valves, pumps, and motors etc.
				Model and analyze common hydraulic and pneumatic components such as cylinders, valves, pumps, and motors.
				Create & simulate basic hydraulic and pneumatic circuit diagrams for different applications.
40.				Design, develop & analyze simple hydraulic and pneumatic systems for given task.
41.	IV	AIMD202	Data structure & Algorithms	Compare between linear and nonlinear data structures
				Describe the characteristics of various data structure such as stacks, queues, trees, graphs and Hash tables.
				Analyze various searching and sorting algorithms and apply it to solve particular problem.
				Determine a suitable data structure and algorithm to solve a real world problem
42.	IV	CE2184	Concrete Technology Laboratory	Explain standard procedures for testing properties of various ingredients of concrete and concrete mixes/specimens
				Perform tests on ingredients of concrete and on fresh and hardened concrete to determine their properties using standard procedures
				Design the concrete mix for a given grade of concrete using guidelines of IS code

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				Evaluate the quality of concrete specimens / elements using NDT equipment
43.	IV	CE2164	Fluid Mechanics Laboratory	Determine fluid properties.
				Design most economical open channel section.
				Measure velocity of flow using wind tunnel.
44.	IV	CE238	Highway Materials Testing Laboratory	Perform quality control tests on aggregate and bitumen.
				Suggest suitable material for road construction.
				Perform quality control tests on bituminous pavement.
45.	IV	CE240	Practical Aspects of Construction Supervision	Read the working drawings and perform the inspection of different work items of building construction as per the given detailing and specifications.
				Judge the quality of on-site construction materials and the different work items of building construction.
				Perform independently the supervision work of any building as per the provided drawings and detailed specifications

#### T. Y. B. Tech Civil

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1.	V	CE 3013	Design of Steel Structures	Refer and use design codes and hand book for design of steel structural elements.
				Analyze steel structural members.
				Design steel structural members.
2.	V	CE3033	Geotechnical Engineering	Classify types of soil using different index properties of soil.
				Calculate permeability of various types of soil using different methods.
				Analyze compressibility phenomenon of soil using Laboratory and field considerations.
				Determine settlement, shear strength and bearing capacity of soil.
3.	V	CE3053	Irrigation and Hydraulic Structures	Explain hydrological cycle and ground water flow.
				Calculate various surface and ground water hydrology parameters

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				Estimate water requirement of crops.
				Design canal and canal regulator structures.
4.	V	CE3073	Environmental Engineering	Analyze water and wastewater for various parameters.
				Identify and value the effect of pollutants on the environment: atmosphere, water and soil.
				Prepare layout of water and wastewater treatment process.
				Design water and wastewater Treatment Plant.
				Interpret the impact of humans on environment.
5.	V	CE3093	Transportation Engineering	Design of geometric components of highway
				Determine traffic volume for design of road infrastructure
				Perform pavement design and different tests on highway materials
				Design geometrically rail transportation system.
6.	V	CE3113	Geotechnical Engineering Laboratory	Determine index and engineering properties of soil.
				Classify soil based on its index properties.
				Analyze field conditions through Laboratory tests
7.	V	CE3133	Environmental Engineering Laboratory	Analyse water and wastewater characteristics.
				Prepare a layout of water treatment plant and design.
				Prepare a layout of wastewater treatment plant and design.
8.	V	CE3153	Transportation Engineering Laboratory	Characterize the pavement materials
				Perform quality control tests on pavement materials
				Design bituminous mixes for flexible pavement
				Design concrete mix for rigid pavement
				Calculate thickness of different layers of pavement
9.	V	SH 3033	Scholastic Aptitude I	Develop a logical approach towards solving Aptitude and Reasoning problems.
				Analyze usage of basic aptitude terms of percentages, averages, ratios and applications of business aptitude terms of profits and interests.
				Develop a bridge in analogies, series and visualizing directions.
				Apply various short cuts & techniques to manage speed and accuracy to get equipped for various competitive and campus recruitment exams.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
10.	V	SH 3011	Constitution of India	Create awareness about law depiction and importance of Constitution
				Define Fundamental Rights and Fundamental Duties of the Indian Citizen to instill morality, social values, honesty, dignity of life and their social Responsibilities.
				Create Awareness of their Surroundings, Society, Social problems and their suitable solutions while keeping rights and duties of the citizen keeping in mind.
				Recognize distribution of powers and functions of Local Self Government.
				Comprehend the National Emergency, Financial Emergency and their impact on Economy of the country.
11.	V	CE 3193	Structural Analysis	Analyze pin jointed truss for deflection by strain energy method.
				Analyze and design thin and thick shells under various loading.
				Evaluate stresses in curved bars and springs.
				Determine bending stresses in beams due to unsymmetrical bending.
				Evaluate principal strains of a loaded element.
				Predict failure of structure by using various theories of failure.
12.	V	CE 3213	Composite Materials	Explain the methods of manufacturing, properties and applications of various composites materials.
				Determine stresses and strains in composites.
				Apply failure criteria and critically evaluate the results.
				Explain mechanical behavior of composites due to variation in temperature and moisture.
13.	V	CE 3233	Construction Safety Management	Apply various quality improvement techniques.
				Diagnose problems in the quality improvement process
				Suggest safety precautions to be taken during the execution of various construction works
				Analyze possible hazards and accidents in construction projects
				Interpret various legal aspects of safety in construction.
14.	V	CE 3253	Construction Techniques	Develop method statements for construction techniques.
				Select construction techniques for particular activities.
				Justify application of construction technique for particular tasks.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				Justify construction safety needs and management on projects.
15.	V	CE 3273	Advanced Water Treatment	Explain need of water treatment for sustainable development.
				Explain importance of water analysis in water treatment
				Prepare layout of water treatment plant
				Design Water Treatment Plant and water Supply Scheme for rural/urban area
				Calculate efficiency of water treatment plant
16.	V	CE 3293	Tunnel Docks and Harbors Engineering	Compare tunnel construction technologies
				Decides a safety and ventilation system for tunnels
				Suggest appropriate location for construction of docks and harbours
				Select dredging method for particular operation.
17.	V	CE 3313	Urban Transportation Systems	Categorize the transportation problems in urban area
				Perform the transportation survey in urban area to predict the travel demand
				Explain different urban transportation planning methods
				Predict route and schedule for mass transit system
				Explain different methods of preparation of transportation plan
18.	VI	CE 3023	Theory of Structures	Analyze indeterminate structures using force methods- Consistent deformation method and three moment equation.
				Analyze indeterminate structures using displacement methods- Slope-deflection equation and moment distribution method.
				Analyze indeterminate beam and portal frame using matrix methods of analysis- Stiffness and flexibility matrix method.
19.	VI	CE 3043	Estimation & Contracts	Apply standard requirements to prepare detailed estimate
				Prepare detailed estimate of building,
				Determine Rates for construction items,
				Prepare tenders and contracts documents
20.	VI	CE 3063	Construction Management	Perform valuation of property.
				Apply the functions & principles of management.
				Develop and analyze the network diagram for civil engineering projects.
				Use various project monitoring and controlling methods.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				Demonstrate AON Concept and its applications.
				Explain principles of work study & apply it to real-time construction projects
				Apply various techniques for inventory control.
21.	VI	SH 3021	Biology for Engineers	Apply biological engineering principles, procedures needed to solve real-world problems
				Describe the functions of biological systems
				Analyze biological phenomena and compute work done at microscale.
				Explain working of different biomedical instruments
				Select the sensors for given biological applications
				Explain relevant aspect of movement control process.
22.	VI	CE 3083	Estimation & Contracts Laboratory	Explain mode of measurement and current market rates of civil engineering materials and labours.
				Prepare detailed estimate of different structures like building, road, canal, culvert and factory shed etc.
				Prepare bar bending schedule of different RCC items.
23.	VI	CE 3103	Design of Steel Structures Laboratory	Analyze and design steel industrial shed using STAAD-Pro software.
				Interpret the results obtained from the software.
				Prepare structural drawing of steel industrial shed.
24.	VI	SH304	Psychology for Engineers	Interpret human behavior as a system from a psychological perspective.
				Appraise the various factors affecting human behavior at work.
				Apply behavioral theories to manage/lead people and emotions at work.
25.	VI	CE 3143	Capstone Project Phase-I	Function efficiently as an individual and in a group with the capacity to be a leader
				Identify gap and analyze the social, cultural, global and environmental issues related to civil engineering.
				Design and conduct experiments and interpret data.
				Develop technical material through oral presentations and reports and commit to professional ethics and responsibilities in civil engineering practice.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				Develop interest to carry out research in civil engineering.
26.	VI	SH 3063	Scholastic Aptitude -II	Develop a logical approach towards solving Aptitude and Reasoning problems.
				Analyze usage of basic aptitude terms of percentages, averages, ratios and applications of business aptitude terms of profits and interests.
				Develop a bridge in analogies, series and visualizing directions.
				Apply various short cuts & techniques to manage speed and accuracy to get equipped for various competitive and campus recruitment exams.
27.	VI	CE 3163	Design of Industrial Structures	Design industrial buildings, beam columns
				Design open web sections
				Design steel towers, water tanks, truss bridge
28.	VI	CE 3183	Repair and Rehabilitation of Structures	Diagnose the causes of distress and deterioration of concrete structure
				Describe the procedures of various repair techniques or methods.
				Suggest appropriate materials and techniques for repair and strengthening of structures/elements
				Prepare a report on condition assessment of buildings based on observations
29.	VI	CE 3203	Construction Economics and Finance	Identify appropriate economic alternatives.
				Calculate depreciation and taxes for economic analysis.
				Select appropriate alternative related to equipment.
				Discuss methods of estimate.
				Discuss basics of financial management.
30.	VI	CE 3223	Disaster Management	Analyze effects of natural and manmade disasters.
				Demonstrate disaster management program.
				Analyze vulnerable conditions and risk assessment.
				Construct layout for sanitary landfill site and composting site
31.	VI			Describe stakeholder's role in disaster response.
32.	VI	CE 3243	Air Quality Monitoring and Modelling	Illustrate structure of the atmosphere Air Pollution, Scales of air pollution
				Interpret impact of air pollution on natural and artificial elements.
				Analysis of air quality parameters by using air quality monitoring methods

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				Design Stack height for pollution control.
33.	VI	CE 3263	Railway and Airport Engineering	Design of geometric component of rail transport system.
				Analyze needs of modern rail system.
				Design of runway and taxiway
				Carry out airport planning
34.	VI	CE3283	Foundation Engineering	Investigate soil using different soil exploration methods.
				Compute stress distribution in soil using different theories.
				Design shallow and deep foundation on different types of soil.
				Analyze stability of slope using different slope stability analysis techniques.
				Compute lateral earth pressure for different conditions of soil.
35.	VI	CE3303	Advanced Wastewater Engineering	Explain need of wastewater treatment for sustainable development.
				Explain importance of wastewater analysis in waste treatment
				Prepare layout of wastewater treatment plant
				Design wastewater Treatment scheme for rural/urban area
				Calculate efficiency of wastewater treatment system
36.	VI	OE 3063	Environmental Impact Assessment	Study and apply EIA methods.
				Analyse the all projects by using Environmental Impact assessment tool.
				Provide solution for decision making in Industrial development Problem.
				Prepare EIA report for submission to concerned authority.
37.	VI	OE 3083	Material Management	Plan and control materials for a project,
				Use codification and standardization processes,
				Perform material procurement and material storage,
				Apply inventory control techniques for material management,
				Apply MRP logic and systems for MM.



Sr. No.	Semester	Course Code	Course Name	Course Outcome
1.	VII	CE4013	<b>Design of Reinforced Concrete Structures</b>	Design singly, doubly reinforced and flanged beams using Limit State Method of design.
				Design R.C.C. slab and R.C.C. staircase using Limit State Method of design
				Design R.C.C. columns, isolated pad footing using Limit State Method of design.
2.	VII	CE4033	<b>Construction Equipment and Methods</b>	Plan equipment/plants utilization for construction activities,
				Perform productivity and economic analysis of equipment,
				Develop method statement for construction task,
				Discuss equipment requirement for construction task.
3.	VII	CE4473	<b>Earthquake Engineering</b>	Explain various concept related to engineering seismology
				Evaluate responses for a single degree of freedom system for free and force vibration
				Apply principles of earthquake resistant structural systems for building planning.
				Estimate lateral loads developed due to earthquake force by equivalent static method.
				Design and detail ductile RCC Structural elements.
				Explain different methods to improve earthquake resisting capacity of the structure.
4.	VII	CE4353	PE-III Design of Bridges	Explain various components of bridge hydrology and types of loading on bridge.
				Analyze the sub structure and super structure of R.C.C. bridges.
				Design the sub structure and super structure of R.C.C. bridges.
5.	VII	CE4373	PE-III Design of formwok	Design the form work for Beams, Slabs, columns, Walls and Foundations.
				Design the form work for Special Structures.
				Explain the working of flying formwork.

				Explain the formwork failures through case studies.
6.	VII	CE4393	PE-III Advanced Construction Equipment	Select appropriate equipment for construction task.
				Discuss processes of operation of equipment.
				Develop method statement for construction tasks.
7.	VII	CE4413	PE-III Environmental Management System	Describe an environmental policy for an organization.
				Develop environmental treatment and monitor system.
				Analyze a life cycle assessment for a selected product or service.
				Apply standard environmental, health and safety auditing principles and practices to environmental management systems.
8.	VII	CE4433	<b>PE- III Geographical Information System (GIS)</b>	Explain principles and components of GIS
				Describe types of data used in GIS
				Describe the data editing operations
				Explain various steps used for Disaster Management
9.	VII	CE4453	<b>PE-III Metro Rail Technology</b>	Relate the importance of metro rail infrastructure to the development of India.
				Choose suitable methods for preliminary survey of metro rail.
				Identify rail and signal components in Metro.
10.	VII	CE4093	PE-IV Advanced Structural Design	Design reinforced concrete flat slab, combined footing, raft footing and pile foundation.
				Design cantilever and counterfort retaining wall.
				Design overhead circular water tank with flat base.
11.	VII	CE4113	<b>PE-IV Pre-stressed Concrete Structures</b>	Explain the concept and importance of pre-stressing.

				Analyze the pre-stressed concrete sections
				Design the pre-stressed concrete sections for flexure and shear
				Design an end block for pre-stressed members.
12.	VII	CE4133	<b>PE-IV Project Management</b>	Apply principles of project management for the success of the project
				Analyze impact of time, cost and scope on construction projects.
				Develop pre-feasibility report for construction project.
				Plan the project using various techniques.
				Develop project close out checklist for given project.
				Apply techniques for human resource management
13.		<b>CE4153</b>	<b>PE-IV Rock Mechanics</b>	Classify the various types of rocks based on geological strata and engineering parameters of the rock.
				Analyze the theory of in-situ induced stresses in a rock mass and structurally controlled failure.
				Analyze the rock slope stability and rockfall hazards
				Determine settlement and bearing capacity of rock foundation.
				Apply the concepts of rock mechanics for various subsurface conditions.
14.	VII	CE4173	<b>PE-IV Industrial Waste Management</b>	Explain various techniques of wastewater volume and strength reduction.
				Discuss characteristics of Industrial wastewater.
				Suggest different wastewater treatment options for industrial wastewater.
				Prepare layout of ETP for Industrial Wastewater Management.
				Design Effluent Treatment Plant for Industrial wastewater treatment.

15.	VII	CE4193	<b>PE-IV Pavement Analysis and Design</b>	Select the material based on its specifications and design criteria of pavements.
				Analyze the stresses in flexible and rigid pavements.
				Design of flexible and rigid pavements.
				Compose different steps for construction and strengthening of pavements.
16.	VII	CE4513	<b>PE-IV Advanced Concrete Technology</b>	Evaluate concrete quality based on the microstructural analysis/ properties.
				Recommend appropriate admixture for given concreting applications.
				Examine the mechanisms affecting the properties of fresh and hardened concrete.
				Justify the use of special purpose concretes for a given concreting job.
17.	VII	CE4533	<b>PE-V Advanced Structural Analysis</b>	Construct ILD for indeterminate structures
				Apply energy principles/theorems for analysis of indeterminate structures.
				Construct SFD, BMD and TMD for beam curves in plan.
				Analyze beams on elastic foundations under various loads.
				Evaluate forces in space truss members.
				Analyze building frames using approximate methods of analysis.
18.	VII	CE4553	<b>PE-V Finite Element Analysis</b>	Apply variational approach for solving 1D,2D problems
				Analyze linear springs, bars, beam and truss by FEM
				Describe convergence and compatibility requirement
				Develop element stiffness matrix [K] for isoparametric element
				Formulate element stiffness matrix for 3D and axisymmetric element

19.	VII	CE4573	<b>PE-V Matrix Method of Structural Analysis</b>	Develop stiffness and flexibility matrix of structural members.
				Analyze structure using flexibility and stiffness matrix method
				Apply direct stiffness approach for structural analysis.
				Analyze the structure using the matrix method by application of MATLAB.
20.	VII	CE4593	<b>PE-V Construction Resource Planning and Management</b>	Draft layout for store and material management
				Select vendor for material purchase,
				Build proper inventory management skill,
				Describe employee development and welfare facilities,
				Design performance appraisal matrix
21.	VII	CE4613	<b>PE-V Total Quality Management</b>	Illustrate Quality Management philosophies and the contribution of Quality Gurus in TQM Journey.
				Identify the basic concept and framework of Total Quality management
				Apply the tools and techniques of quality management in manufacturing and services sector.
				Summarize the codal provisions for quality improvement
22.	VII	CE4633	<b>PE-V Air Pollution and Control</b>	Examine structure of the atmosphere air pollution, scales of air pollution
				Interpret on sources of air pollution natural and artificial, air pollution Episodes
				Analyze effect of different air pollutants on man, animals and plants.
				Design Stack height and explain meteorology, transport and control mechanism
				Evaluate effects of noise pollution.

23.	VII	CE4653	<b>PE-V Fundamentals of Urban and Regional Planning</b>	Demonstrate appreciation and knowledge of histories of planning
				Express basic understanding of sociological processes generally as they relate to urban and regional planning
				Analyze planning and policy issues for urban and regional infrastructure
				Develop knowledge of constitutional amendments as they impact urban and regional planning.
				Analyze the nature, form and planning of metropolitan cities and regions in India
24.	VII	CE4673	<b>PE-V Solid and Hazardous Waste Management</b>	Apply basic concepts for management of municipal, biomedical, hazardous, e-waste, industrial wastes.
				Explain different techniques for solid wastes management.
				Assess environmental and health impacts solid waste mis-management
				Design landfill site for different solid waste management
25.	VII	CE4693	<b>PE-V Photogrammetry Surveying</b>	Apply advanced surveying methodologies to conduct topographical survey measurements.
				Calculate the errors in topographical surveying measurements.
				Illustrate the principles of advanced surveying techniques.
26.	VII	CE4713	<b>PE-V Geo-informatics for Engineering</b>	Explain the principles of Geo-informatics
				Describe the Remote Sensing process
				Demonstrate the image interpretation and ground investigation
				Analyze and apply Remote sensing techniques for ground investigation
27.	VII	CE4733	<b>PE-V Docks, Harbour and Airport Engineering</b>	List out various types of docks and harbour based on its selection criteria.
				Identify various component parts of docks and harbour and its constructional aspects.

				Analyze the requirements of airport layout with respect to international regulations
				Summarize concepts for planning of runway, taxiway, apron and terminal building facility.
28.	VII	CE4213	<b>PE-IV Advanced Structural Design Laboratory</b>	Design reinforced concrete flat slab, combined footing, raft footing, pile foundation using appropriate software.
				Design retaining wall and elevated circular water tank using appropriate software.
				Prepare structural drawings of flat slab, combined footing, raft footing, pile foundation, retaining wall and elevated circular water tank.
29.	VII	CE4233	<b>PE-IV Pre-stressed Concrete Structures Laboratory</b>	Design the pre-stressed concrete sections for flexure and shear
				Design an end block for prestressed members.
				Design the pre-stressed concrete beams
30.	VII	CE4253	<b>PE-IV Project Management Laboratory</b>	Develop a project charter for a construction project.
				Analyze feasibility of project.
				Determine optimum time and optimum cost of project through network compression.
				Plan resources required for execution of the project.
31.	VII	CE4273	<b>PE-IV Rock Mechanics Laboratory</b>	Determine the physical and mechanical properties of rock samples
				Classify various types of rock based on observations and laboratory testing
				Prepare the site investigation report.
32.		CE4293	<b>PE-IV Industrial Waste Management Laboratory</b>	Analyze characteristics of Industrial wastewater
				Prepare a water budget for industry.
				Suggest different wastewater treatment options for industrial wastewater treatment.

				Prepare layout of ETP for Industrial Wastewater Management.
				Design Effluent Treatment Plant (ETP) for Industrial wastewater treatment.
33.	VII	CE4313	<b>PE-IV Pavement Analysis and Design Laboratory</b>	Select materials based on its suitability in different layers of pavement
				Evaluate different methods of quality control during pavement construction.
				Design of bituminous mix for flexible pavement.
				Design of concrete mix for rigid pavement.
34.	VII	CE4333	<b>PE-IV Advanced Concrete Technology Laboratory</b>	Evaluate the quality of concrete/ concrete elements based on the data collected during condition assessment of RCC building
				Design the mixes of special concretes using the available guidelines.
				Perform the workability tests on flowable concretes
35.	VII	CE4053	<b>Design of Concrete Structures Laboratory</b>	Determine primary and combination design loads on building referring appropriate standards and handbooks
				Design a two storied building manually and using standard software.
				Prepare structural drawings of slab, beam, column and footing.
36.	VII	CE4493	<b>Capstone Project Phase-II</b>	Analyze the primary/secondary data to solve the problem.
				Interpret results of experimentation/questionnaire survey/ data analysis.
				Perform project work in team.
				Apply the tools/techniques/ knowledge to arrive at a conclusion.
				Develop oral and written presentation skills.
37.	VII	CE4073	<b>Employment Enhancement Skills</b>	Develop technical competency in software in the Civil Engineering field,
				Solve civil engineering problems by using software.



				Develop presentation skills for project/case study.
				Design and interpret data by soft skill Civil Engineering projects.
38.	VIII	OE4381	<b>Finance for Engineers (Online Course)</b>	Discuss the fundamental aspects of accounting and finance
				Apply theoretical knowledge and information for preparing various financial statements.
				Analyze the financial information for solving managerial problems.
				Evaluate financial performance of the organization for effective decision making
39.	VIII	OE4361	<b>Engineering Management &amp; Economics (Online Course)</b>	Develop administrative, organizational and planning skills to execute engineering project.
				Develop bar chart/mile stone chart for the project.
				Analyze profit/cost data and carry out economic analysis to take optimal decision.
				Calculate depreciation as per various methods.
40.	VIII	IP4023	<b>Internship &amp; Project</b>	Examine the functioning of the company on the terms of inputs, transformation process and the outputs (products and services)
				Develop an attitude to adjust with the company culture, work norms, code of conduct.
				Recognize and follow the safety norms, Code of conduct.
				Interpret the processes, systems and procedures and to relate to the theoretical concepts- studies
				Develop the leadership abilities, communication.
				Demonstrate project management and finance sense
				Identify the project/problem in the domain of a program relevant for the company.
				Compile the information to the pertaining to the problem identified.
				Analyse the information using the statistical tools/ techniques

				Develop the feasible solution for given problem.
41.	VIII	OE4381	<b>Finance for Engineers (Online Course)</b>	Discuss the fundamental aspects of accounting and finance.
				Apply theoretical knowledge and information for preparing various financial statements.
				Analyze the financial information for solving managerial problems.
				Evaluate financial performance of the organization for effective decision making.
42.	VIII	OE4361	<b>Engineering Management &amp; Economics (Online Course)</b>	Develop administrative, organizational and planning skills to execute engineering project.
				Develop bar chart/mile stone chart for the project
				Analyze profit/cost data and carry out economic analysis to take optimal decision
				Calculate depreciation as per various methods.
43.	VIII	RE4043	<b>Research Project</b>	Investigate the technical literature
				Recognize and evaluate theories, practices, and/or research on a chosen topic by conducting a thorough literature review and submitting a written integrative, critical summary of the current literature.
				Design a research problem and develop a methodology
				Develop and implement an advanced original research or creative project.
				Develop the ability to explain the conceptual viability of the project and describe the major components involved.
				Develop the ability to explain how the project will impact the relevant body of work.
				Develop advanced discipline-relevant skills and competencies.
				Construct an accurate record of research performed.
				Write a research report and paper.

44.	VIII	ED4103	Project Management	Prepare business Plan for selected business.
				Make risk analysis & market analysis of selected project.
				Make risk analysis & market analysis of selected project
				Make financial appraisal of selected project.
45.	VIII	ED4043	Commercial Aspects of the Project	Interpret basic Financial Terminologies.
				Prepare & analyze financial statements.
				Prepare financial Plan for venture.
				Apply basic principles of marketing for various products.
				Prepare market survey.
				Apply knowledge of marketing management for selected business.
46.	VIII	ED4063	Entrepreneurship Development Program (EDP)	Apply knowledge of engineering, economics, marketing and finance for formulation of business plan, starting & managing new business.
47.	VIII	ED4083	Entrepreneurship Development Project	Apply knowledge of engineering, economics, marketing and finance for preparation of project report.
				Make commercial, technical and financial appraisal of project.

## PG Program

- **Department Name :- Civil Engineering**
- **PG Program Name :- Structural Engineering**

<b>Vision</b>	To be an outstanding department devoted to provide high end research and technical education in Civil engineering which will produce socially aware professionals to provide solutions to global community
<b>Mission</b>	<p>To design curriculum based on changing needs of stakeholders &amp; provide excellence in delivery &amp; assessment to ensure holistic development of civil engineering students.</p> <p>To enhance research &amp; consultancy resulting in solving problems related to civil engineering infrastructure as well as society at large.</p> <p>To mentor students in pursuit of higher education, entrepreneurship and global professionalism.</p>

<b>Sr. No.</b>	<b>Program Outcomes</b>
1.	An ability to independently carry out research /investigation and development work to solve practical problems.
2.	An ability to write and present a substantial technical report/document.
3.	Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.
4.	An ability to design civil engineering structures and execute the projects.
5.	An ability to use modern tools and techniques, skills, instrumentation and software packages necessary to predict and solve complex engineering problems.
6.	An ability to perform efficiently with others as part of collaborative and/or multidisciplinary team with ethics.

<b>Sr. No.</b>	<b>Semester</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Course Outcome</b>
1	I	CES1015	<b>Advanced Solid Mechanics</b>	Analyze bodies for stresses and strains
				Analyze prismatic bars and tubes subjected to torsion.
				Analyze beams and thick cylinders for elasto-plastic loading

2				Develop ILD for reactions, S.F. and B.M. for indeterminate structures
3		<b>CES1035</b>	<b>Advanced Structural Analysis</b>	Construct SFD, BMD and TMD for beams curved in plan for various loading and support condition.
				Analyse the beam-column structures
				Analyse the structures by using the stiffness & flexibility matrix method.
				Solve boundary value problems from civil engineering.
4		<b>CES1055</b>	<b>Structural Dynamics and Earthquake Engineering</b>	Analyse the response of single and multi-degree freedom systems by fundamental theory.
				Explain principles of seismology and conceptual design.
				Evaluate lateral loads developed on multi-storeyed structures
5		<b>SHP5511</b>	<b>Technical Communication</b>	Use grammatically correct sentences in different types of technical writings.
				Apply technical writing skills to improve readability of documents.
				Demonstrate professional skills required in job interviews and at workplace
6		<b>CES1075</b>	<b>Computer Aided Design of Steel Structures Lab</b>	Analyze and design of the steel structures such as truss, towers, steel building frame and hoarding board etc. using standard software packages.
				Interpret the results of analysis and design obtained from the software.
				Prepare drawings of detailing of structural elements
7		<b>CES1095</b>	<b>Structural Dynamics Lab</b>	Examine damping effect on beam model.
				Perform testing of various models of structures for dynamic loading
8		<b>CES1115</b>	<b>Mini Project I</b>	Identify research problem.
				Prepare and present statement of Purpose.
				Perform analysis work.

				Communicate with outside agencies.
				Prepare report and present the work carried out.
				Develop self-learning ability
9		<b>CES1135</b>	<b>Theory of Thin Plates and Shells</b>	Analyse various problems using different theories based on plates and shells.
				Derive equilibrium equations related with different theories of plates and shells
10		<b>CES1155</b>	<b>Advanced Concrete Technology</b>	Select binders and admixtures to design strong, durable and sustainable concretes.
				Describe various special processes and techniques involved in various concreting jobs.
				Identify reasons affecting durability of concrete / concrete structures /elements.
				Design concrete mix for special concretes.
				Analyse qualities of concrete elements using appropriate destructive or non-destructive testing methods for evaluating quality
11		<b>CES1175</b>	<b>Analysis and Design of Tall Structures</b>	Evaluate forces on tall structures due to wind load.
				Construct SFD and BMD in building frame by approximate analysis method.
				Design RC shear wall, chimney, bunkers and silos
12		<b>CES1195</b>	<b>Design of Bridges</b>	Evaluate various loadings on bridges.
				Analyse and design of super-structure of various bridges.
				Analyse and design of sub-structure of various bridges
13		<b>CES1213</b>	<b>Structural Health Monitoring</b>	Discuss the concept and various components of SHM
				Identify suitable Sensors and Instruments required in SHM for in-service performance structures.
				Assess the health of structures using different techniques of SHM

				Select the appropriate strengthening and retrofitting techniques for regaining the structure strength.
				Design the sensor layouts of SHM for the civil engineering structures
14		<b>SHP5171</b>	<b>Numerical Methods for Engineers</b>	Apply numerical methods for error analysis.
				Compute the roots of the given equations and polynomials
				Apply the relevant numerical method for interpolating the polynomial.
				Develop the equation to be fitted to the given data.
				Solve problems involving linear algebraic equations
15		<b>CES1025</b>	<b>Finite Element Analysis</b>	Describe the finite element method and convergence requirement
				Apply the basic finite element formulation techniques to solve civil engineering problems by 1D, 2D and axisymmetric elements
				Explain shape function and isoparametric element
				Derive element stiffness matrix for thin plate and shell element
				Use commercial software to solve problems related to civil engineering
16	II	<b>CES1045</b>	<b>Design of Concrete Structures</b>	Analyse R.C. slabs using yield line theory.
				Design R.C.C. deep beam and flat slab.
				Design R.C.C. elevated service reservoir, retaining wall
				Design R.C. members for fire resistance
17		<b>CES1065</b>	<b>Research Methodology &amp; Intellectual Property Rights (IPR)</b>	Prepare abstract through literature review.
				Formulate a research problem.
				Prepare and present research proposal/paper by following research ethics.
				Prepare and present report on intellectual property rights

18	CES1085	<b>Computer Aided Design of Concrete Structures Lab.</b>	Analyse and design of the RCC structures such as building, retaining wall, flat slab and foundations using standard software packages.
			Interpret the results of analysis and design obtained from the software.
			Prepare drawings of detailing of structural elements
19	CES1105	<b>Advanced Concrete Technology Lab</b>	Design special concretes using IS 10262-2019.
			Evaluate durability properties of concrete.
			Judge the quality of concrete using NDT.
			Write a technical report on special concreting techniques based on site visit
20	CES1125	<b>Mini Project II</b>	Identify research problem.
			Prepare and present statement of Purpose.
			Perform analysis work.
			Communicate with outside agencies.
			Prepare report and present the work carried out.
21	SHP552	<b>Framework of Indian Constitution</b>	Realize the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.
			Identify the importance of fundamental rights as well as fundamental duties
			Understand the functioning of Union, State and Local Governments in Indian federal system
			Learn procedure and effects of emergency, composition and activities of election commission and amendment procedure.
22	CES1145	<b>Advanced Earthquake Engineering</b>	Design RCC structural elements for ductility requirements as per IS 13920 2016.
			Apply clauses given in IS codes to design of water tanks for earthquake force.



				Apply new techniques for controlling the vibrations of the structures.
				Evaluate natural frequency of continuous elements/systems.
				Apply IS code clauses masonry structures for improving resistance to earthquake forces
23		<b>CES1161</b>	<b>Composite Structures</b>	Design composite structural elements like beams, columns, floors, trusses.
				2.Design of Multi-storeyed commercial and residential composite building.
				3.Design composite girder bridges.
24		<b>CES1181</b>	<b>Maintenance and Rehabilitation of Structures</b>	Diagnose the causes of distress and deterioration of concrete structure
				Describe the procedures of various repair techniques or methods.
				Suggest appropriate materials and techniques for repair and strengthening of structures/elements
				Prepare a report on condition assessment of buildings based on observations
25		<b>CES1205</b>	<b>Design of Pre-stress Concrete Structures</b>	Explain the concept, material requirement and behaviour of the pre-stressed concrete.
				Calculate the losses of pre-stress in pre-tensioning and post-tensioning concrete.
				Analyse & design the statically determinate, indeterminate pre-stressed concrete beams and end block.
				Analyse & design the pre-stressed concrete pipes and tanks
26		<b>CES1225</b>	<b>Design of Steel Structures</b>	Design steel structures and frames by varying methods.
				Design various connectivity of structure as per code provisions
27		<b>CES1240</b>	<b>Design of Foundations</b>	Explain various types of foundations and their design procedures
				Design different types of foundations.

				Perform the analysis and design of various types of foundation using available software's
28		CES2015	Industry Internship	Identify training area.
				Prepare on site work report of training.
				Perform analysis work.
				Communicate with agencies.
				Prepare report and present the work carried out.
29	III	MOE2011	Artificial Intelligence - Machine Learning	Describe central machine learning methods and techniques and how they relate to artificial intelligence
				Differentiate between supervised and unsupervised learning techniques
				Apply the ML algorithms to a real-world problem,
				Optimize the models learned and report on the expected accuracy that can be achieved by applying the models.
				Evaluate a given problem and apply appropriate machine learning technique
30		MOE2021	Creative Thinking: Techniques & Tools	Comprehend importance in tackling global challenges as well as in everyday problem-solving scenarios
				Apply different brainstorming techniques in group activities
				Be proficient in the application of the 6 thinking hats tool in different life scenarios
				Develop a systematic approach to idea generation through the use of morphological analysis
				Innovate on an existing product, service or situation applying the SCAMPER method
				Get confident with the theory of inventive problem solving, called TRIZ
31		MOE2031	MOOC Course	The students who are doing course on MOOC/NPTEL Course /Courses suggested by DPGC should select the course in consultation

				with supervisor and submit the details to Head of Program.
				The course should be minimum 25 hours duration and should have certification facility.
				Student should complete course and get certificate. The certificate copy should be submitted to head of program with supervisor signature
32		MOE2041	<b>Condition Monitoring and Signal Processing</b>	Identify the maintenance scheme, their scope and limitations – apply the maintenance strategies to various problems in the industrial sectors.
				Analyze for machinery condition monitoring and explain how this compliments monitoring the condition.
				Develop an appreciation for the need of modern technological approach for plant maintenance to reduce the maintenance expenditure.
				Emphasizes on case studies that require gathering information using the modern testing equipment and processing it to identify the malfunction in that system.
				Identify vibration measurement, lubrication oil analysis
33		MOE2051	<b>Aircraft Conceptual Design</b>	Analyze the design process of aircraft and decide the aircraft configuration.
				Choose type of power plant as per flight regime.
				Design the fuselage layout as per type of aircraft.
				Design the wing for type of aircraft and its wing loading
				Evaluate lift, drag and mass for design synthesis.
				Examine the influence of various design requirements on the configuration of an aircraft to derive an optimized design

34	MOE2060	<b>Augmented Reality and Virtual Reality</b>	Define the basic concepts of Virtual and Augmented Reality
			Identify the differences in AR/VR concepts and technologies
			Describe the fundamental concepts relating to Virtual Reality such as presence, immersion, and engagement
			Evaluate usability of AR/VR applications and critique their use of AR/VR capabilities
			Design and prototype effective AR/VR applications using UNITY platform for various application
35	MOE2070	<b>Industrial Instrumentation</b>	Elaborate working principal of different transducers.
			Select suitable transducer/sensor for specific application.
			Justify the use of specific measurement technique for specific task.
			Evaluate the Calibration and Interfacing of the transducers.
36	MOE2080	<b>Advanced Mechatronics Systems</b>	Explain Mechatronics System
			Analyze the Mechatronics Based System
			Model, simulate, and verify the mechatronics systems.
			Identify Electrical, Hydraulic and Pneumatic Components.
37	CES2035	<b>Dissertation Phase-I</b>	Identify research problem from literature survey.
			Prepare research design for identified problem.
			Prepare synopsis report.
			Present the work plan to be carried out
38	CES2055	<b>Dissertation Phase-II</b>	Prepare the set up for experimentation/ develop/ learn software.
			Perform experimental/software analysis for validation of research work.
			Generate report of work carried out.

				Present the work carried out
39	IV	CES2025	<b>Dissertation Phase-III</b>	Perform experimental/software analysis for developing research work.
				Generate report work carried out.
				Present the work carried out.
40		CES2045	<b>Dissertation Phase-IV</b>	Perform experimental/software analysis for developing research work.
				Generate report work carried out.
				Publish a research paper in journals/conference.
	Prepare report using total work done as dissertation report.			
	Present the work carried out			

- **Department Name :- Civil Engineering**
- **PG Program Name :- Construction Management**

<b>Vision</b>	To be an outstanding department devoted to provide high end research and technical education in Civil engineering which will produce socially aware professionals to provide solutions to global community
<b>Mission</b>	To design curriculum based on changing needs of stakeholders & provide excellence in delivery & assessment to ensure holistic development of civil engineering students. To enhance research & consultancy resulting in solving problems related to civil engineering infrastructure as well as society at large. To mentor students in pursuit of higher education, entrepreneurship and global professionalism.

<b>Sr. No.</b>	<b>Program Outcomes</b>
7.	An ability to independently carry out research /investigation and development work to solve practical problems.
8.	An ability to write and present a substantial technical report/document.
9.	Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.
10.	An ability to Analyze, evaluate, and select computer applications for the purpose of efficient and effective construction project management.
11.	An ability to Analyze construction projects relative to fundamental aspects of construction management (i.e., cost, schedule, quality, safety, ethics) and develop appropriate solutions
12.	Apply ethical business principles and Demonstrate responsibility for safety planning and productivity in construction management settings.

<b>Sr. No.</b>	<b>Semester</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Course Outcome</b>
1.	I	CCM1010	<b>Construction Planning &amp; Scheduling</b>	Develop project work breakdown structure.
				Estimate activity time durations and define scope of project.
				Prepare and update schedule of a construction project.

			Analyze resource requirement for a construction project.
2.	CCM1030	Construction Equipment	Select equipment/plant for particular task.
			Perform productivity analysis for equipment.
			Design equipment fleet for construction task.
			Perform economic analysis of equipment use.
3.	CCM1050	Construction Practices	Develop method statement for various construction activities.
			Differentiate among various practices used to complete construction activities.
			Choose appropriate technique for particular construction activity.
4.	CCM1070	Quality Assurance and Quality Control in Construction	Differentiate between QA and QC in consideration with different construction activities.
			Apply statistical quality control and monitoring methods.
			Develop quality checks for construction activities.
			Develop guideline in accordance with quality standard codes and quality management system
5.	CCM1095	Management Information System	Demonstrate Information Systems used in organizations for meeting strategic and operational goals.
			Develop skills using current end-user software for communication, data transformation, collaboration, and problem solving
6.	CCM1115	Disaster Management	Summarize effects of natural and man-made disasters.
			Develop disaster management program.
			Analyze vulnerable conditions and risk assessment.
			Prepare plan for post disaster management
			Describe stakeholder's role in disaster response.
7.	CCM1135	Pavement Construction & Management	Conduct highway condition assessment surveys.
			Develop method for pavement management using PMS system.
			Select material as per MORTH and IRC specifications.
			Plan and design pavement structures
8.	CCM1150		Perform Assessment of buildings.

			<b>Repair and Rehabilitation of Structures</b>	Recognize damages in the structure.
				Select proper repair materials.
				Suggest repair or rehabilitation method for particular damage
9.		CCM1175	<b>Bridge Construction</b>	Select location for bridge based on topographical and geotechnical investigation.
				Perform hydrological calculations of design parameters.
				Apply standard loadings and safety consideration for bridge design.
				Select appropriate bridge superstructure elements for bridges
10.		CCM1195	<b>Prefabricated Structures</b>	Choose prefabricated elements for construction.
				Develop detail drawings of prefabricated elements.
				Design prefabricated elements for construction.
				Prepare project report for establishing production unit
11.		CCM1210	<b>Advanced Concrete Technology</b>	Select binders, SCMs and admixtures to design strong, durable and sustainable concretes.
				Analyze the factors affecting properties of fresh concrete.
				Develop quality control plan for a concrete construction.
				Design special purpose concrete mixes using mix design procedures recommended by pertinent codes of practices and handbooks
12.		CCM1235	<b>Construction Waste Management</b>	Develop strategies for construction and demolition waste management and resource efficiency.
				Examine the environmental impact of building materials.
				Design site waste management plans.
				Justify the application of waste minimization techniques on construction site.
13.		CCM1255	<b>Microsoft Project (MSP) Laboratory</b>	Develop Work Breakdown Structure for project.
				Prepare project schedule using Microsoft project.
				Modify construction schedule based on site progress.
				Extract and present various types of reports
14.		CCM1275		Perform data collection using tools.



			<b>Geographic Information System Laboratory</b>	Analyze data using GIS software. Prepare and present maps in GIS
15.		<b>SHP5511</b>	<b>Technical Communication</b>	Acquire skills required for good oral and written communication. Demonstrate improved writing skills and level of readability. Ensure the good quality of technical reports at very first-time submission.
16.		<b>CCM1020</b>	<b>Project Economics &amp; Financial Management</b>	Analyze projects using different techniques. Suggest different sources of finance. Analyze different financial statement with the help of ratio analysis.
17.		<b>CCM1040</b>	<b>Legal Aspects in Construction</b>	Select appropriate type of contract for construction projects. Develop tender document for construction project. Perform comparative analysis of types of contract.
18.		<b>CCM1060</b>	<b>Project Formulation and Appraisal</b>	Perform technical and financial analysis of construction projects. Perform BC ratio analysis. Select project based on appraisal. Develop administration process for project execution.
19.	II	<b>CCM1080</b>	<b>Advanced Construction Techniques</b>	Use modern construction techniques in the high rise structures. Identify the suitable formwork technique used to construct a structure. Justify the concepts used in the construction of special structures
20.		<b>CCM1105</b>	<b>Health and Safety Management</b>	Classify hazards to employees on construction site. Determine safe practices necessary for a project site. Identify the causes of accidents and suggest preventive measures to avoid accident. Prepare safety management plan.
21.		<b>CCM1125</b>	<b>Human Resource Management</b>	Plan manpower for a project. Develop organization for a project. Apply aspects of human behavior to HRM. Select right person to build the team. Discuss solutions for human resource problems
22.		<b>CCM1145</b>		Develop proper plan for form-work.

			<b>Shoring, Scaffolding and Formwork</b>	Select appropriate material and type of form-work. Design form-work for components. Design scaffold for construction task.
23.	<b>SHP5261</b>	<b>Probability and Statistics for Engineers</b>		Apply relevant probability distribution for given problems. Use different methods of sampling and testing in statistical inference. Solve problems on correlation and regression.
24.	<b>CCM1165</b>	<b>Material Management</b>		Apply supplier selection methods. Produce optimal stores layout. Perform codification and classification. Perform material requirement planning. Apply inventory control techniques for materials management.
25.	<b>CCM1180</b>	<b>Advanced Construction Materials</b>		Justify the need of new material development. Choose material for construction process based on material properties.
26.	<b>CCM1200</b>	<b>International Contracting</b>		Prepare tender documents as per international contracting procedures. Apply of various conditions of international contract under the FIDIC document. Understand the labour laws. Act as arbitrator for dispute resolving.
27.	<b>CCM1225</b>	<b>Research Methodology &amp; IPR</b>		Prepare abstract through literature review. Formulate a research problem. Prepare and present research proposal/paper by following research ethics. Prepare and present a report on Intellectual Property Rights.
28.	<b>CCM1245</b>	<b>Fundamentals of BIM Laboratory</b>		Develop drawings as per software requirement. Compute quantities of building items. Develop project schedule using “Revit” application. Prepare schedule plan for construction project. Analyze construction project using primavera. Prepare and present various types of reports.
29.	<b>CCM1285</b>	<b>Mini project</b>		Select mini project problem. Prepare and present statement of purpose. Develop solution to the selected problem.

				Prepare and present report related to project undertaken.
30.		SHP552	Framework of Indian Constitution	Realise the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.
				Identify the importance of fundamental rights as well as fundamental duties
				Understand the functioning of Union, State and Local Governments in Indian federal system
				Learn procedure and effects of emergency, composition and activities of election commission and amendment procedure
31.	III	MOE2011	Artificial Intelligence - Machine Learning	Describe central machine learning methods and techniques and how they relate to artificial intelligence
				Differentiate between supervised and unsupervised learning techniques
				Apply the ML algorithms to a real-world problem,
				Optimize the models learned and report on the expected accuracy that can be achieved by applying the models.
32.	III	MOE2021	Creative Thinking: Techniques & Tools	Evaluate a given problem and apply appropriate machine learning technique
				Comprehend importance in tackling global challenges as well as in everyday problem-solving scenarios
				Apply different brainstorming techniques in group activities
				Be proficient in the application of the 6 thinking hats tool in different life scenarios
				Develop a systematic approach to idea generation through the use of morphological analysis
				Innovate on an existing product, service or situation applying the SCAMPER method
Get confident with the theory of inventive problem solving, called TRIZ				
33.		MOE2031	MOOC Course	The students who are doing course on MOOC/NPTEL Course /Courses suggested by DPGC should select the course in consultation with supervisor and submit the details to Head of Program.
				The course should be minimum 25 hours duration and should have certification facility.

				Student should complete course and get certificate. The certificate copy should be submitted to head of program with supervisor signature
34.	MOE2041	<b>Condition Monitoring and Signal Processing</b>		Identify the maintenance scheme, their scope and limitations – apply the maintenance strategies to various problems in the industrial sectors.
				Analyze for machinery condition monitoring and explain how this compliments monitoring the condition.
				Develop an appreciation for the need of modern technological approach for plant maintenance to reduce the maintenance expenditure.
				Emphasizes on case studies that require gathering information using the modern testing equipment and processing it to identify the malfunction in that system.
				Identify vibration measurement, lubrication oil analysis
35.	MOE2051	<b>Aircraft Conceptual Design</b>		Analyze the design process of aircraft and decide the aircraft configuration.
				Choose type of power plant as per flight regime.
				Design the fuselage layout as per type of aircraft.
				Design the wing for type of aircraft and its wing loading
				Evaluate lift, drag and mass for design synthesis.
Examine the influence of various design requirements on the configuration of an aircraft to derive an optimized design				
36.	MOE2060	<b>Augmented Reality and Virtual Reality</b>		Define the basic concepts of Virtual and Augmented Reality
				Identify the differences in AR/VR concepts and technologies
				Describe the fundamental concepts relating to Virtual Reality such as presence, immersion, and engagement
				Evaluate usability of AR/VR applications and critique their use of AR/VR capabilities
				Design and prototype effective AR/VR applications using UNITY platform for various application
37.	MOE2070	<b>Industrial Instrumentation</b>		Elaborate working principal of different transducers.

				Select suitable transducer/sensor for specific application.
				Justify the use of specific measurement technique for specific task.
				Evaluate the Calibration and Interfacing of the transducers.
38.		<b>MOE2080</b>	<b>Advanced Mechatronics Systems</b>	Explain Mechatronics System
				Analyze the Mechatronics Based System
				Model, simulate, and verify the mechatronics systems.
				Identify Electrical, Hydraulic and Pneumatic Components.
39.		<b>CCM2015</b>	<b>Industry Internship</b>	Relate theory to practice.
				Compile technical data of the project.
				Prepare daily work reports of ongoing activities.
				Prepare and present internship report.
40.		<b>CCM2035</b>	<b>Dissertation Phase-I</b>	Select research problem through literature survey.
				Develop research design for research problem.
				Prepare and present synopsis report.
41.		<b>CCM2055</b>	<b>Dissertation Phase-II</b>	Perform data/experimental data collection for the project.
				Analyze collected data using appropriate tools/techniques/ software.
				Perform experimental/software analysis for validation of research work.
42.				Prepare and present report.
43.		<b>CCM2025</b>	<b>Dissertation Phase-III</b>	Analyze collected data using appropriate tools/techniques/ software's.
				Prepare and present/publish technical paper.
				Prepare and present report
44.	<b>IV</b>	<b>CCM2045</b>	<b>Dissertation Phase-IV</b>	Compile the work done in appropriate sequence.
				Derive conclusion of the work done of the project.
				Analyze proposed system.
				Perform plagiarism analysis of compiled report.
				Prepare and present the final dissertation report in desired format.

**Computer Science  
&  
Engineering**

## UG Program

- **Department Name :- Computer Science & Engineering**
- **UG Program Name :- B.Tech in Computer Engineering**
- **Vision and Mission :-**

<b>Vision</b>	To excel in the computer science engineering discipline through continuous research, innovation and industry-oriented curriculum leading to responsible IT professionals.
<b>Mission</b>	<ol style="list-style-type: none"> <li>1. To inculcate teaching and learning process promoting state-of-the-art IT industry practices in computer science engineering and technology to address global challenges.</li> <li>2. To integrate academics, research and entrepreneurship skills to address present and future challenges of the society and industry.</li> <li>3. To develop professionalism with strong foundations adapting to changing technology.</li> </ol>

Sr. No.	Program Outcomes
25.	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
26.	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
27.	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
28.	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
29.	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
30.	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
31.	Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
32.	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
33.	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

34.	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
35.	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
36.	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Sr. No.	Program Specific Outcomes
1	Apply knowledge of database management systems, data mining and analytics techniques to solve real world problems
2	Apply knowledge of machine learning and intelligence to identify, formulate and solve complex engineering problems.
3	Design, develop and deploy software using emerging IT technologies like open source tools, mobile application development platforms, web technologies and cloud computing.

### SY BTech(CSE)

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1	III	CS2014	Computer Organization and Architecture	1. Perform various arithmetic operations on different number systems.
				2. Apply Boolean algebra to solve logic functions.
				3. Design, implement, and analyze various logic circuits.
				4. Apply the programming techniques in developing the assembly language program for microprocessor system.
				5. Analyze flow chart and apply assembly language programming techniques.
2		CS2034	Data Structure and Algorithms	1. Compare between linear and nonlinear data structures
				2. Describe the characteristics of various data structure such as stacks, queues, trees, graphs and Hash tables.
				3. Analyze various searching and sorting algorithms and apply it to solve particular problem.
				4. Determine a suitable data structure and algorithm to solve a real world problem
3		CS2074	Discrete Mathematics	1. Describe mathematical logic, truth table and their applications to programming and hardware design



Sr. No.	Semester	Course Code	Course Name	Course Outcome
				<ol style="list-style-type: none"> <li>2. Apply the concepts of set theory</li> <li>3. Characterize the properties of relations, functions and algebraic systems for formal languages</li> <li>4. Develop essential concepts to solve problems on graphs and networks</li> <li>5. Express counting principle to determine various combinatorial configurations</li> </ol>
4		CEMD201	Building Construction and Planning	<ol style="list-style-type: none"> <li>1. Suggest appropriate materials for building construction applications.</li> <li>2. Prepare a functional design of components of the building.</li> <li>3. Design and draw residential building using principles of planning and bye-laws.</li> <li>4. Prepare plumbing and electrification plan for the building.</li> <li>5. Explain properties of building finishing materials and application procedure</li> </ol>
		ATMD201	Automobile Systems	<ol style="list-style-type: none"> <li>1. Explain constructional details and operation of the automotive systems.</li> <li>2. Interpret the influence of various technical parameters on the behavior of the automotive systems.</li> <li>3. Configure the systems and its elements for integrating into drivetrain/chassis systems appropriate for given automotive application.</li> <li>4. Present in detail the technological advancements of the automotive systems.</li> </ol>
5		CEMD201	Building Construction and Planning	<ol style="list-style-type: none"> <li>1. Suggest appropriate materials for building construction applications.</li> <li>2. Prepare a functional design of components of the building.</li> <li>3. Design and draw residential building using principles of planning and bye-laws.</li> <li>4. Prepare plumbing and electrification plan for the building.</li> <li>5. Explain properties of building finishing materials and application procedure.</li> </ol>
6		CSMD201	Introduction to Data Structures	<ol style="list-style-type: none"> <li>1. Compare between linear and nonlinear data structures</li> <li>2. Describe the characteristics of various data structure such as stacks, queues, trees, graphs and Hash tables.</li> <li>3. Analyze various searching and sorting algorithms and apply it to solve particular problem.</li> <li>4. Determine a suitable data structure and algorithm to solve a real world problem</li> </ol>

<b>Sr. No.</b>	<b>Semester</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Course Outcome</b>
7		<b>EEMD201</b>	<b>Electrical Power Generation</b>	1. List the main components of different power plants
				2. Describe the operation of various power plants used for electrical power generation.
				3. Explain working principles of various power plants
				4. Compare different power plants based on advantages, limitations and future prospects
				5. Draw layout of electrical power plants.
				6. Explore alternate electrical energy resources for future needs and challenges.
7		<b>ECMD201</b>	<b>Electronics Devices and Applications</b>	1. Describe the fundamental concepts of electronics and working principles of different devices.
				2. Analyze different analog and digital electronics circuits.
				3. Design digital electronics circuits with truth table and logic diagram.
8		<b>CIMD201</b>	<b>Data Structures</b>	1. Describe the basic terminologies of data structures.
				2. Examine the linear data structure array with its types.
				3. Demonstrate the working of stack, queue performed on data structures.
				4. Illustrate the working of linked list.
				5. Discuss Tree terminologies and their Applications.
				6. Elaborate Graph terminologies with their types.
9		<b>MEMD201</b>	<b>Materials and Applications</b>	1. Describe crystal structures and crystal imperfections.
				2. Illustrate plotting of Equilibrium diagrams from Cooling Curves and its fundamentals.
				3. Explain different Ferrous, Nonferrous alloys, their properties and applications by referring equilibrium diagrams.
				4. Explain properties and applications of Smart Materials, Magnetic Materials and Electronic materials.
				5. Explain properties and applications of Powder Metallurgy
				6. Select suitable material for given engineering application.
10		<b>MCMD201</b>	<b>Fundamentals of Mechatronics</b>	1. Identify various elements of mechatronics systems.
				2. Select appropriate sensor/Actuator/controller/control algorithm for different applications.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				3. Develop PLC/ microcontroller-based applications.
11		AIMD201	<b>Object Oriented Programming</b>	<ol style="list-style-type: none"> <li>1. Understand the basic object oriented programming concepts and apply them in problem solving.</li> <li>2. Illustrate inheritance concepts for reusing the program.</li> <li>3. Implement program using loops, decision statements and functions in Python.</li> <li>4. Plot data using appropriate Python visualization libraries.</li> </ol>
12		SH2174	Environmental Science	<ol style="list-style-type: none"> <li>1. Apply interdisciplinary knowledge in environmental science by integrating concepts and principles from various fields of science and engineering to address environmental issues.</li> <li>2. Evaluate environmental impacts of human activities on ecosystems and on the environment.</li> <li>3. Use scientific approach to identify and solve environment related problems.</li> <li>4. Design sustainable solutions to address environmental challenges by considering renewable energy sources, waste management strategies conservation measures, and environmental policies.</li> <li>5. Participate in group work to become acquainted with the importance of teamwork, collaboration</li> <li>6. Develop presentation and report writing skills</li> </ol>
13		CS221	Object Oriented Programming	<ol style="list-style-type: none"> <li>1. Demonstrate a clear understanding of the fundamental concepts of Object-Oriented Programming</li> <li>2. Design and implement object-oriented programming concepts</li> <li>3. Analyze real-world problems and design effective solutions using object-oriented principles</li> <li>4. Utilize exception handling to manage and recover from runtime errors</li> <li>5. Acquire a solid foundation to pursue more advanced topics in OOP such as templates</li> <li>6. Demonstrate a clear understanding of the fundamental concepts of Object-Oriented Programming</li> </ol>

Sr. No.	Semester	Course Code	Course Name	Course Outcome
14		CS2134	<b>Data structure &amp; Algorithms Lab</b>	1. Implement various data structures and algorithms using programming languages such as C or C++.
				2. Conduct experiments to validate the theoretical analysis of algorithms.
				3. Analyze data, interpret results, and draw conclusions, aiding them in making informed decisions for algorithmic optimizations.
				4. Evaluate the efficiency and scalability of different data structures and algorithms, enabling them to make informed choices when selecting the most appropriate solution for a given problem.
15		CS2154	Computer Organization and Architecture Lab	1. Understand different types of gates.
				2. Implement various logic circuits.
				3. Analyze the functionality and behavior of combinational circuits through truth tables and Karnaugh maps.
				4. Draw flowchart and apply assembly language programming techniques
				5. Develop the assembly language program for microprocessor system.
16		CS223	Digital Marketing	1. Describe the principles of search engine optimization (SEO), social media marketing, email marketing, and analytics.
				2. Apply data analysis techniques to measure and optimize digital marketing campaigns.
				3. Design effective digital marketing plans and strategies.
				4. Develop practical skills in implementing digital marketing strategies.
17		CS2174	Technical Aptitude-I	1. Choose proper techniques to find solution for engineering problems
				2. Solve various types of problems
				3. Develop ability to face competitive examinations
				4. Inspect the problem & conclude with proper solution
18		SH2634	Professional Skills Development and Foreign Languages-I	1. Explain the traits of a leadership through real life examples.
				2. Exhibit the ability to work effectively in team.
				3. Prepare a presentation as per the audience and context requirements.
19		SH2614	<b>Interpersonal Skills</b>	1. Exhibit interpersonal communication skills.
				2. Demonstrate decision-making skills.
				3. Apply conflict resolution styles appropriate in different situations.

<b>Sr. No.</b>	<b>Semester</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Course Outcome</b>
				4. Demonstrate skills to manage balance in work and life.
20		<b>SH2694</b>	<b>Innovation Tools and Methods for Entrepreneurs</b>	<ol style="list-style-type: none"> <li>1. Explain structured approach to define the problem with every possible detail, identify conflicts and solve them</li> <li>2. Apply User Journey Map to the selected problem to show user interaction at various stages</li> <li>3. Analyze the solutions provided by competitors for effectiveness and gaps if any.</li> </ol>
21		<b>SH2594</b>	<b>Personal Effectiveness and Body Language</b>	<ol style="list-style-type: none"> <li>1. Develop skills to build self-esteem and positive attitude.</li> <li>2. Develop interpersonal skills characterized by effective communication and conflict resolution.</li> <li>3. Discover ways to overcome procrastination.</li> <li>4. Demonstrate responsiveness towards stress and health issues.</li> <li>5. Interpret the non-verbal behaviour of a person.</li> </ol>
22		<b>SH 2734</b>	<b>German Language- III</b>	<ol style="list-style-type: none"> <li>1. Interpret the language if the next person is speaking slowly and clearly.</li> <li>2. Make use of the language in routine life with the routing topics like family, shopping, work etc.</li> <li>3. Demonstrate the language by self-introduction in German with simple sentences.</li> </ol>
23		<b>SH2714</b>	<b>Japanese Language - III</b>	<ol style="list-style-type: none"> <li>1. Make use of basic conversations in various situations.</li> <li>2. Identify the sentence patterns.</li> <li>3. Explain insights about the communication required for living in Japan.</li> <li>4. Interpret Japanese work ethics required in their professional career.</li> </ol>
24		<b>CS220</b>	<b>Statistics and Fuzzy Logic</b>	<ol style="list-style-type: none"> <li>1. Apply the probability distributions, random number generation and density estimations to perform analysis of various kinds of data</li> <li>2. To develop the fundamental concepts such as fuzzy sets, operations and fuzzy relations.</li> <li>3. To learn and apply the schemes of fuzzification of scalar variables and the defuzzification of membership functions.</li> <li>4. To develop fuzzy decision making techniques.</li> </ol>
25		<b>CS222</b>	<b>Operating System</b>	<ol style="list-style-type: none"> <li>1. Distinguish between different operating systems</li> <li>2. Express concepts of process management</li> <li>3. Summarize synchronization techniques</li> <li>4. Demonstrate the concept of deadlock</li> <li>5. Discuss memory management and virtual memory management</li> </ol>

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				6. Review on storage management, Protection and security
26		CS224	Finite Automata and Formal Languages	<ol style="list-style-type: none"> <li>1. Solve automata problems using mathematical theorems and techniques.</li> <li>2. Design computational models for different language classes.</li> <li>3. Construct grammar or regular expressions for different language classes.</li> <li>4. Prove and disprove key properties of formal languages and automata.</li> <li>5. Create a compiler using various tools like LEX and YACC.</li> </ol>
27		CS2004	Computer Network	<ol style="list-style-type: none"> <li>1. Remember and explain the modulation techniques, components used in a communication system.</li> <li>2. Analyze different network models and protocols of different layers.</li> <li>3. Understand and discuss the concept of multiplexing &amp; switching.</li> <li>4. Apply and discuss various functions of the different protocols in network layer.</li> <li>5. Create the different services of application layer.</li> </ol>
28		SH202	मराठी भाषिक कौशल्यविकास	<ol style="list-style-type: none"> <li>1. भाषा आणि व्यक्तिमत्व विकास यांमधील सहसंबंध स्पष्ट करू शकेल</li> <li>2. भाषिक कौशल्यविकास करू शकेल</li> <li>3. कथा या मराठी साहित्य प्रकाराचे विश्लेषण करू शकेल</li> <li>4. एकांकिका या मराठी साहित्य प्रकाराच्या विश्लेषणाची क्षमता प्राप्त करेल</li> </ol>
29		SH204	हिंदी कथा साहित्य एवं प्रयोजमूलक हिंदी	<ol style="list-style-type: none"> <li>1. विद्यार्थियों में मानवीय संवेदनाओं के विकास के साथ नवीन सामाजिक सांस्कृतिक बोध और जीवन मूल्यों का विकास होगा।</li> <li>2. विद्यार्थियों में साहित्य के माध्यम से कलात्मक गुणों की अभिवृद्धि होगी कला की साहित्यिक विधाओं के प्रति अभिरुचि जागृत होगी तथा रचनात्मक कौशल्य को बढ़ावा मिलेगा।</li> <li>3. विद्यार्थियों में नए वैश्विक मूल्यों के प्रति सजगता को बढ़ावा मिलेगा एवं मूल्यवादी दृष्टि के प्रति दायित्व बोध उत्पन्न होगा। छात्र व्यवहार में हिंदी भाषा का उचित प्रयोग कर सकेंगे।</li> <li>4. छात्र व्यवहार में हिंदी भाषा का उचित प्रयोग कर सकेंगे।</li> </ol>
30		CS226	Java Programming	<ol style="list-style-type: none"> <li>1. Understand the basic object oriented programming concepts and apply them in problem solving.</li> </ol>

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				2. Apply concept of inheritance for code reusability.
				3. Develop Programs using multithreading.
				4. Develop data-centric applications using JDBC.
				5. Design the basics of java console and GUI based programming
				6. Understand the basic object oriented programming concepts and apply them in problem solving.
31		ATMD202	I. C. Engines	1. Perform a primary thermodynamic analysis of Otto and diesel cycle engines.
				2. Select appropriate engine for specific application.
				3. Select proper fuel system for IC engine.
				4. Conduct performance test of IC engine and portray operating characteristics of engine.
				5. Identify abnormal combustion in engine and remedy over it.
				6. Select proper lubrication, intake, exhaust, cooling system for engine.
32		CEMD202	Building Estimation and Valuation	1. Explain the types and basic requirements of the estimate.
				2. Explain measurement sheet, abstract sheet, and detailed specifications of different construction items.
				3. Prepare detailed estimate of load bearing structure and framed structure.
				4. Prepare rate analysis and bar bending schedule of different construction items.
				5. Explain the tenders and contracts.
				6. Describe basic terms of valuation.
33		CSMD202	Problem Solving using JAVA	1. Understand the basic object oriented programming concepts and apply them in problem solving.
				2. Apply concept of inheritance for code reusability.
				3. Develop Programs using multithreading.
				4. Develop data-centric applications using JDBC.
				5. Design the basics of java console and GUI based programming
34		EEMD202	Power System	1. Write the basic working principles of different generating sources.
				2. Analyze different types of loads
				3. Explain importance of power factor and tariffs in power system.
				4. Identify various components in power transmission and distribution system.
				5. Select substation equipments as per requirement.

<b>Sr. No.</b>	<b>Semester</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Course Outcome</b>
35		<b>ECMD202</b>	<b>Electronics Communication Systems</b>	<ol style="list-style-type: none"> <li>1. Describe different communication systems.</li> <li>2. Explain applications of analog and digital modulation techniques.</li> <li>3. Analyze different modulation and demodulation techniques.</li> <li>4. Explain the use of satellite communication.</li> </ol>
36		<b>CIMD202</b>	<b>Computer Algorithms</b>	<ol style="list-style-type: none"> <li>1. Analysing asymptotically the performance of algorithms.</li> <li>2. Compare and analyse searching and sorting algorithms.</li> <li>3. Apply different algorithm design techniques to solve problems like job sequencing,</li> <li>4. knapsack, TSP, finding shortest path etc.</li> <li>5. Apply backtracking method to solve problems like N-queens, graph coloring, sum of subsets etc.</li> </ol>
37		<b>MC2051</b>	<b>Industrial Fluid Power</b>	<ol style="list-style-type: none"> <li>1. Describe the structure and function of common hydraulic and pneumatic components such as cylinders, valves, pumps, and motors etc.</li> <li>2. Model and analyze common hydraulic and pneumatic components such as cylinders, valves, pumps, and motors.</li> <li>3. Create &amp; simulate basic hydraulic and pneumatic circuit diagrams for different applications.</li> <li>4. Design, develop &amp; analyze simple hydraulic and pneumatic systems for given task.</li> </ol>
38		<b>AIMD202</b>	<b>Data Structures &amp; Algorithms</b>	<ol style="list-style-type: none"> <li>1. Compare between linear and nonlinear data structures</li> <li>2. Describe the characteristics of various data structure such as stacks, queues, trees, graphs and Hash tables.</li> <li>3. Analyze various searching and sorting algorithms and apply it to solve particular problem.</li> <li>4. Determine a suitable data structure and algorithm to solve a real world problem</li> </ol>
39		<b>CS2044</b>	<b>Computer Networks Lab</b>	<ol style="list-style-type: none"> <li>1. Define and apply architectural principles and mechanisms for data exchange among computer</li> <li>2. Design, implement and analyse simple computer networks.</li> <li>3. Identify&amp; analyse the performance of different network layer protocols to formulate and solve network-engineering problems.</li> <li>4. Analyze to compare performance of different routing protocols.</li> <li>5. Ability to use techniques, skills, and modem networking tools necessary for engineering practice.</li> <li>6. Demonstrate an understanding of computer communications standards.</li> </ol>



<b>Sr. No.</b>	<b>Semester</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Course Outcome</b>
40		<b>CS228</b>	<b>Computer Hardware and Networking</b>	1. Explain the working principles of computer peripherals
				2. Identify, Analyze and apply the troubleshooting techniques to solve operating system and hardware problems.
				3. Set up and configure Networking System using various network devices
41		<b>CS2084</b>	<b>Technical Aptitude-II</b>	1. Choose proper techniques to find solution for engineering problems
				2. Solve various types of problems
				3. Develop ability to face competitive examinations
				4. Inspect the problem & conclude with proper solution
42		<b>SH2634</b>	<b>Professional Leadership Skills</b>	1. Explain the traits of a leadership through real life examples.
				2. Exhibit the ability to work effectively in team.
				3. Prepare a presentation as per the audience and context requirements.
43		<b>SH2614</b>	<b>Interpersonal Skills</b>	1. Exhibit interpersonal communication skills.
				2. Demonstrate decision-making skills.
				3. Apply conflict resolution styles appropriate in different situations.
				4. Demonstrate skills to manage balance in work and life.
44		<b>SH2694</b>	<b>Innovation Tools and Methods for Entrepreneurs</b>	1. Explain structured approach to define the problem with every possible detail, identify conflicts and solve them
				2. Apply User Journey Map to the selected problem to show user interaction at various stages
				3. Analyze the solutions provided by competitors for effectiveness and gaps if any.
45		<b>SH2594</b>	<b>Personal Effectiveness and Body Language</b>	1. Develop skills to build self-esteem and positive attitude.
				2. Develop interpersonal skills characterized by effective communication and conflict resolution.
				3. Discover ways to overcome procrastination.
				4. Demonstrate responsiveness towards stress and health issues.
				5. Interpret the non-verbal behaviour of a person.
46		<b>SH 2644</b>	<b>German Language - IV</b>	1. Interpret the language if the next person is speaking slowly and clearly.
				2. Make use of the language in routine life with the routing topics like family, shopping, work etc.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				3. Demonstrate the language by self-introduction in German with simple sentences.
47		SH2624	Japanese Language - IV	1. To be able to make basic conversations in various situations.
				2. To recognize the sentence patterns.
				3. To improve Japanese Language proficiency.
				4. To give students insights about the communication required for living in Japan.
				5. To expose students to the Japanese work ethics required in their professional careers.
Sr. No.	Semester	Course Code	Course Name	Course Outcome
1	V	CS3013	Database Management Systems	1. Describe the purpose and nature of database system for storing and fast access to the data
				2. Sketch E-R models to represent simple database application scenarios
				3. Apply relational database design concepts to remove data redundancy and to retrieve data easily
				4. Write the queries to manipulate and access data using procedural and non-procedural Languages
				5. Explain various protocols, issues and techniques related to transaction management for consistent & stable database
2	VI	CS3033	System Software	1. Explain the role of system programs in development phase and able to apply appropriate knowledge of computing
				2. Illustrate the logical analysis & design aspect of macro with macro preprocessing activities
				3. Determine the aspect of language processing from linker and loaders perspective
				4. Analyze different phases of compilers and practice the compiler construction tools such as LEX and YACC to build systems program modules
				5. Design an effective intermediate and optimized code generator
				6. Describe the various properties of optimization and generation
3	VI	CS3053		1. Study basic algorithmic strategies

Sr. No.	Semester	Course Code	Course Name	Course Outcome
			<b>Design &amp; Analysis of Algorithms</b>	2. Analyze the performance or complexity of algorithms
				3. Identify appropriate algorithm design techniques for solving problems
				4. Design an algorithm to solve problem in systematic way
				5. Explain non-deterministic and randomized algorithms
4		CS3073	<b>Program Elective-I Data Mining</b>	1. Analyze the aspect of mining data over the statistical techniques for selected applications
				2. Justify the usage of various classification/clustering algorithms
				3. Apply knowledge to build association based rules technique for real world case studies
				4. Explore data warehousing and OLAP concepts
				5. Experiment the advancement in mining techniques for wide variety of areas
5	VI	CS3093	<b>Program Elective-I Soft Computing</b>	1. Explain the principles and basic concepts of Soft Computing techniques
				2. Identify the logic of fuzzy rule-set and its reasoning
				3. Solving objective optimization problem GAs
				4. Analyze multi-objective optimization problems using Evolutionary algorithms (MOEAs)
				5. Classify the need for supervised – unsupervised neural models and its application
6	V	CS3113	<b>Program Elective-I Information Security</b>	1. Analyze different methods of Data Encryption and Decryption; their advantages & limitations.
				2. Use different key distribution methods for distribution of Public/Private & Secret keys.
				3. Apply message authentications techniques for implementing security during message communication.
				4. Create and use digital signatures.
				5. Discuss different security attacks & security solutions for e-mail & web applications.
				6. Analyze different methods of Data Encryption and Decryption; their advantages & limitations.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
7	V	CS3133	Swift Development Lab-I	1. Define key programming terms relevant to Swift and iOS programming.
				2. Describe the process of creating iOS apps.
				3. State the purpose of the Apple developer tools, such as Xcode, Instruments, debugger, analyzer, and iOS Simulator.
				4. Recognize patterns and idioms present in the Cocoa Touch API and other Apple frameworks.
				5. Employ the Apple developer tools to create an iOS app.
				6. Demonstrate programming best practices in Swift.
				7. Explain and summarize iOS API features including location, mapping, sensors, gestures, multimedia and user interface components.
8	V	CS3153	Java Programming Lab	1. Demonstrate Object Oriented features and apply them in problem solving
				2. Write programs for solving real world problems using java collection frame work.
				3. Implement the multithreading and client side programming.
				4. Develop graphical User Interface using AWT.
9	V	CS3173	Database Management Systems Lab	1. Sketch E-R diagram for given Case Study/ Problem Statement.
				2. Design relational database using Normalization and Functional Dependency.
				3. Implement SQL query for various operations like retrieval, insertion and manipulation of data etc.
				4. Implement PL/SQL cursor, procedure, function and trigger
				5. Apply hashing mechanism to build hash index file on given records.
				6. Develop a program to connect database to an application program
10	V	CS3193	Technical Aptitude-III	1. Choose proper techniques to find solution for engineering problems
				2. Solve various types of problems
				3. Develop ability to face competitive examinations

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				4. Inspect the problem & conclude with proper solution
11	V	SH3033	Scholastic Training-I	1. Develop a logical approach towards solving Aptitude and Reasoning problems.
				2. Analyze usage of basic aptitude terms of percentages, averages, ratios and applications of business aptitude terms of profits and interests
				3. Develop a bridge in analogies, series and visualizing directions.
				4. Apply various short cuts & techniques to manage speed and accuracy to get equipped for various competitive and campus recruitment exams
12	V	SH3011	Indian Constitution	5. Create awareness about law depiction and importance of Constitution
				6. Define Fundamental Rights and Fundamental Duties of the Indian Citizen to instill morality, social values, honesty, dignity of life and their social Responsibilities.
				7. Create Awareness of their Surroundings, Society, Social problems and their suitable solutions while keeping rights and duties of the citizen keeping in mind.
				8. Recognize distribution of powers and functions of Local Self Government.
12	V	CS3213	Summer Internship/ Professional certification	9. Comprehend the National Emergency, Financial Emergency and their impact on Economy of the country.
				1. Find possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job
				2. Explore the current technological developments relevant to the subject area of training.
				3. Apply the Technical knowledge in real industrial situations
				4. Gain experience in writing Technical reports/projects.
				5. Expose engineer's responsibilities and ethics
6. Understand the social, economic and administrative considerations that				

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				influence the working environment of industrial organizations
				7. Understand the psychology of the Employees and their attitudes and approach to problem solving
13	VI	CS3003	Program Elective-II Advanced Algorithms	1. Analyze the asymptotic performance of algorithms and Explore methods of solving recurrences.
				2. Able to Explain the major graph algorithms and Employ graphs to model engineering problems, when appropriate.
				3. Understand the knowledge about number - theoretic algorithms
				4. Able to analyze String matching algorithms.
				5. Able to represent understand Fast Fourier transformation.
				6. Able be analyze simple approximation algorithms and also able to apply basic design techniques to approximately solve discrete optimization problems.
14	VI	CS3023	Program Elective-II Optimization Techniques	1. Illustrate the concepts of optimization and its terminologies.
				2. Explore optimization problems from various domains and formulate the mathematical models.
				3. Explore different operators of evolutionary algorithms.
				4. Analyze the performance of different swarm algorithms.
				5. Evaluate the efficiency of incremental optimization algorithms for complex problem-solving.
15	VI	CS3043	Program Elective-II Linux Operating System	1. Describe the basic concept of LINUX operating system and LINUX shell commands
				2. Perform various file management operations in Linux environment using appropriate commands and scripts
				3. Design and manage network in Linux environment using appropriate commands and scripts
				4. Perform various system administrative operations in Linux environment using appropriate commands and scripts

Sr. No.	Semester	Course Code	Course Name	Course Outcome
16	VI	CS3063	Swift Development Lab-II	1. Demonstrate an understanding of the fundamentals of Swift, building modern mobile apps, iOS, Xcode, and other tools in the Xcode development environment.
				2. Create a basic iOS app to get familiar using Xcode.
				3. Test and debug apps in a Mac, using the Simulator from Xcode.
				4. Create visual interfaces using the Interface Builder from Xcode.
				5. Demonstrate an understanding on how to build scroll views, table views, and complex input screens for apps.
17	VI	CS3083	Software Engineering	1. Understand and demonstrate basic knowledge in software engineering.
				2. Identify requirements, analyze and prepare models.
				3. Plan, schedule and track the progress of the projects.
				4. Design & develop the software projects.
				5. Identify risks, manage the change to assure quality in software projects.
				6. Apply testing principles on software project and understand the maintenance concepts.
18	VI	SH3021	Biology for Engineers	1. Apply biological engineering principles, procedures needed to solve real-world problems
				2. Describe the functions of biological systems
				3. Analyze biological phenomena and compute work done at microscale.
				4. Explain working of different biomedical instruments
				5. Select the sensors for given biological applications
				6. Explain relevant aspect of movement control process.
19	VI	SH304	Psychology for Engineers	1. Interpret human behavior as a system from a psychological perspective.
				2. Appraise the various factors affecting human behavior at work.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				3. Apply behavioral theories to manage/lead people and emotions at work.
20	VI	CS3103	Capstone Project Phase I	1. Apply knowledge of computer science for real world problem.
				2. Possess Professional, Practical and reflective practitioner skills.
				3. Upgrade and apply the knowledge through continuous learning.
				4. Effectively apply Design Thinking Processes and Template to structure learning lifecycle in the development of a prototype.
				5. To develop project management and time management skills
21	VI	CS3123	.Net Programming Lab	1. Explain the important features of .NET Framework technology.
				2. Develop console and Windows application by using C# language.
				3. Implement object-oriented programming concepts like data encapsulation, data hiding, inheritance and polymorphism using C# language.
				4. Use advanced features of C# language like multithreading, exceptions and delegates.
				5. Design and develop project using C# for any real-world problem.
22	VI	SH3063	Scholastic Aptitude - II	1. Develop a logical approach towards solving Aptitude and Reasoning problems.
				2. Analyze usage of basic aptitude terms of percentages, averages, ratios and applications of business aptitude terms of profits and interests
				3. Develop a bridge in analogies, series and visualizing directions.
				4. Apply various short cuts & techniques to manage speed and accuracy to get equipped for various competitive and campus recruitment exams
23	VI	CS3143	Technical Aptitude-IV	1. Choose proper techniques to find solution for engineering problems
				2. Solve various types of problems
				3. Develop ability to face competitive examinations



Sr. No.	Semester	Course Code	Course Name	Course Outcome
				4. Inspect the problem & conclude with proper solution
24	VI	CS3163	Mobile Application Development Lab	1. Setup the Android development environment
				2. Utilize the appropriate User Interface controls in Android app
				3. Implement SQLite and Shared Preferences concepts to store data in Androidapp
				4. Implement Location and Notification based functionalities in Android app
				5. Design and develop a WebView based Android app
				6. Build and deploy Android app on Google Play Store
25	VI	OE3103	Open Elective-IV Network Administration	1. Identify the correct cable type required to connect two networks.
				2. Express working of Internetworking models and need of OSI model
				3. Differentiate between collision and broadcast domain
				4. Identify Ipv4 address and classify it
				5. Express working of networking services like FTP, Telnet, DHCP and DNS
				6. Design a network for given requirements
26	VI	OE3123	Open Elective IV - Information Technology Foundation Program	1. Apply Object Oriented concepts in real world scenario
				2. Solve computational problems using data structures & algorithms
				3. Design an ER model for a given problem-domain
				4. Test and debug the code

**Final Year B.Tech(CSE)**

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1	VII	CS4013	Machine Learning	1. Differentiate among various machine learning techniques.
				2. Formulate a machine learning problem.
				3. Apply machine learning techniques such as classification and feature selection to practical applications and detect patterns in the data.
				4. Choose appropriate ML and Neural network algorithm for predication of class label or value of target attribute.
				5. Develop new Recommender Systems for a number of domains especially, Education, Health-care etc.
2	VII	CS4033	Program Elective – III Big Data Analytics	1. Identify big data for business intelligence
				2. Explore the fundamental concepts of big data and its analytics
				3. Analyze the big data using Hadoop and intelligent techniques
				4. Apply NoSQL big data management underlying analytics framework
				5. Recognize the suitable secure models for building competitive business decisions
3	VII	CS4053	Program Elective- III: Natural Language Processing	1. Acquire knowledge of the fundamental mathematical models and algorithms in the field of NLP.
				2. Apply these mathematical models and algorithms in applications in software design and implementation for NLP.
				3. Apply deep learning models to solve machine translation and conversation problems.
				4. Analyze deep structured semantic models on information retrieval and natural language applications.

				5. Acquire knowledge of the design and implementation issues in various NLP applications such as information extraction and Machine translation.
4	VII	CS4073	<b>Program Elective-III: Blockchain Technology</b>	1. Differentiate Blockchain models.
				2. Analyze Components & Consensus models of Blockchain.
				3. Illustrate the Forking methods & Cryptographic concepts of Blockchain.
				4. Draw the architecture of Hyperledger fabric.
				5. Describe applications of Blockchain in the sector of Trade, Government & Finance
				6. Explain research aspects of Blockchain
5	VII	CS4093	<b>Program Elective-III:IOS Development Lab-I</b>	1. Define key programming terms relevant to Swift and iOS programming.
				2. Describe the process of creating an iOS application.
				3. Demonstrate programming best practices in Swift.
				4. Select the appropriate UI primitives, persistent storage, user interactions, to develop the working iOS application from the concept.
				5. Develop, report and present implementation of typical Mini Project.
6	VII	CS4113	<b>Program Elective-IV:Parallel Programming</b>	1. Identify compute intensive part from sequential algorithm
				2. Design a parallel algorithm for any compute-intensive application
				3. Develop parallel programs to use multi-core processors using OpenMP
				4. Write parallel programs to demonstrate various features of CUDA C/C++
				5. Explore different features of the CUDA framework
7	VII	CS4133	<b>Program Elective-IV:Artificial Intelligence</b>	1. Apply Artificial Intelligence techniques for problem solving
				2. Comprehend the abstractions and reasoning for Intelligent Agents
				3. Analyze and design a real-world problem for implementation
				4. Develop knowledge of decision making and learning methods

				5. Select appropriately from a range of techniques when implementing intelligent systems
8	VII	CS4153	<b>Program Elective-IV Internet of Things</b>	1. Identify the various components of IoT.
				2. Design a middleware for IoT.
				3. Identify the issues to address the security, intelligence in IoT.
				4. Describe various protocols used in IoT.
				5. Establish the communication between IoT devices and cloud server using wireless technology.
				6. Develop IoT application to solve real world problems.
9	VII	CS4173	<b>Program Elective-V Advanced Database System</b>	1. Introduce different databases systems like distributed and parallel databases
				2. Illustrate data mining & warehousing with OLAP implementations
				3. Explore and design the object-oriented database.
				4. Acquaint with distributed query processing and its phases including query optimization
				5. Demonstrate Bigdata with Hadoop& its components
10	VII	CS4233	<b>IOS Development Lab-II</b>	1. Define key programming terms relevant to Swift and iOS programming.
				2. Describe the process of creating an iOS application.
				3. Design the user interface (UI) and user's interaction for iOS application.
				4. Select the appropriate UI primitives, persistent storage, user interactions, to develop the working iOS application from the concept.
				5. Develop, report and present implementation of typical Mini Project.
11	VII	CS4193	<b>Program Elective V-Computer Vision</b>	1. Implement fundamental image processing techniques required for computer vision
				2. Perform shape analysis
				3. Implement boundary tracking techniques
				4. Apply chain codes and other region descriptors
				5. Apply Hough Transform for line, circle, and ellipse detections.

				6. Apply and analyse 3D vision techniques.
12	VII	CS4213	<b>Program Elective-V:Wireless Networks</b>	1. Comment on difference between wireless and wired networks and possible challenges in the design of wireless networks.
				2. Identify design issues in various wireless technologies and discuss possible solutions for them.
				3. Review architectures of various access technologies such as 3G, 4G, WiFi etc.
				4. List challenges and possible solutions in various layers for Ad hoc networks
				5. Demonstrate working of different types of wireless network applications.
13	VII	CS4253	<b>Cloud Computing</b>	1. Describe fundamental concepts of cloud computing and its Architecture
				2. Explain the core concepts of Virtualization
				3. Differentiate and analyze the components of various cloud platforms
				4. Explain the key components of Amazon web Services
				5. Analyze the applications of Cloud Computing in different domains
14	VII	CS4273	<b>Machine Learning Lab</b>	1. Explore dataset and it associated characteristics using python libraries.
				2. Implement various supervised learning algorithms for given dataset.
				3. Implement various Unsupervised learning algorithms for given dataset.
				4. Implement reinforcement learning algorithm to solve suitable real word problem.
				5. Design solution for real world problem by implementing ML algorithms.
				6. Develop, report and present implementation of typical Mini Project.
15	VII	CS4293	<b>Parallel Programming Lab</b>	1. Design different parallel algorithms to solve compute-intensive problems
				2. Develop programs using different parallel programming languages on multi-core and many-core architecture systems

				<ol style="list-style-type: none"> <li>Evaluate the performance of applications/programs using different performance metrics</li> </ol>
16	VII	CS4313	<b>Program Elective IV Lab: Artificial Intelligence Lab</b>	<ol style="list-style-type: none"> <li>Apply Artificial Intelligence techniques for problem solving</li> </ol>
				<ol style="list-style-type: none"> <li>Comprehend the abstractions and reasoning for Intelligent Agents</li> </ol>
				<ol style="list-style-type: none"> <li>Analyze and design a real-world problem for implementation</li> </ol>
				<ol style="list-style-type: none"> <li>Develop knowledge of decision making and learning methods</li> </ol>
				<ol style="list-style-type: none"> <li>Select appropriately from a range of techniques when implementing intelligent systems</li> </ol>
				<ol style="list-style-type: none"> <li>Design, develop and present a mini project for typical application of Artificial Intelligence.</li> </ol>
17	VII	CS4333	<b>Program Elective IV Lab : Internet of Things Lab</b>	<ol style="list-style-type: none"> <li>Identify the components of IoT</li> </ol>
				<ol style="list-style-type: none"> <li>Design a middleware for IoT</li> </ol>
				<ol style="list-style-type: none"> <li>Develop IoT application to solve social problems</li> </ol>
				<ol style="list-style-type: none"> <li>Analyze various protocols for IoT</li> </ol>
				<ol style="list-style-type: none"> <li>Establish the communication to the cloud through Wi-Fi/ Bluetooth</li> </ol>
				<ol style="list-style-type: none"> <li>Design, develop and present a mini project for typical application of IoT.</li> </ol>
18	VII	CS4353	<b>Capstone Project Phase –II</b>	<ol style="list-style-type: none"> <li>Apply knowledge of computer science for real world problem.</li> </ol>
				<ol style="list-style-type: none"> <li>Possess Professional, Practical and reflective practitioner skills.</li> </ol>
				<ol style="list-style-type: none"> <li>Upgrade and apply the knowledge through continuous learning.</li> </ol>
				<ol style="list-style-type: none"> <li>Effectively apply Design Thinking Processes and Template to structure learning life cycle in the development of a prototype.</li> </ol>
				<ol style="list-style-type: none"> <li>To develop project management and time management skills</li> </ol>
				<ol style="list-style-type: none"> <li>To formulate a process whereby to keep the end-user or customer in mind throughout the project lifecycle.</li> </ol>
19		CS4373	<b>Web Technology Lab</b>	<ol style="list-style-type: none"> <li>Design static and dynamic web pages using scripting languages like HTML and CSS</li> </ol>
				<ol style="list-style-type: none"> <li>Develop a dynamic web application using JavaScript and jQuery to demonstrate data validation</li> </ol>
				<ol style="list-style-type: none"> <li>Demonstrate knowledge of Angular by designing dynamic web applications</li> </ol>

				<p>4. Design and Debug React App</p> <p>5. Develop web Application in React using JavaScript</p>
20	VIII	IP4023	Track I Internship and Project	1. Examine the functioning of the company on the terms of inputs, transformation process and the outputs (products and services)
				2. Develop an attitude to adjust with the company culture, work norms, code of conduct.
				3. Recognize and follow the safety norms, Code of conduct.
				4. Demonstrate the ability to observe, analyse and document the details as per the industry practices.
				5. Interpret the processes, systems and procedures and to relate to the theoretical concepts- studies.
				6. Improve the leadership abilities, communication.
				7. Demonstrate project management and finance sense
21	VIII	IP4381	Track I Finance for Engineers	1. Examine the functioning of the company on the terms of inputs, transformation process and the outputs (products and services)
				2. Develop an attitude to adjust with the company culture, work norms, code of conduct.
				3. Recognize and follow the safety norms, Code of conduct.
				4. Demonstrate the ability to observe, analyse and document the details as per the industry practices.
22	VIII	OE4361	Track I Engineering Management & Economics ( Online Course)	1. Develop administrative, organizational and planning skills to execute engineering project.
				2. Develop bar chart/mile stone chart for the project.
				3. Analyze profit/cost data and carry out economic analysis to take optimal decision.
				4. Calculate depreciation as per various methods.
23	VIII	RE4043	Track- II Undergraduate Research Experience (URE)	1. Investigate the technical literature.
				2. Recognize and evaluate theories, practices, and/or research on a chosen topic by conducting a thorough literature review and submitting a written integrative, critical summary of the current literature.
				3. Design a research problem and develop a methodology.

				<p>4. Develop and implement an advanced original research or creative project.</p> <p>5. Develop the ability to explain the conceptual viability of the project and describe the major components involved.</p> <p>6. Develop the ability to explain how the project will impact the relevant body of work.</p> <p>7. Develop advanced discipline-relevant skills and competencies.</p> <p>8. Construct an accurate record of research performed.</p> <p>9. Write a research report and paper.</p>
<b>24</b>	<b>VIII</b>	ED4083	Track -III Entrepreneurship Development Project	<p>1. Apply knowledge of engineering, economics, marketing and finance for preparation of project report.</p> <p>2. Make commercial, technical and financial appraisal of project.</p>



## PG Program

- **Department Name :- Computer Science & Engineering**
- **PG Program Name :- M.Tech in Computer Science & Engineering**
- **Vision and Mission :-**

<b>Vision</b>	To excel in the computer science engineering discipline through continuous research, innovation and industry-oriented curriculum leading to responsible IT professionals.
<b>Mission</b>	<ol style="list-style-type: none"><li>1. To inculcate teaching and learning process promoting state-of-the-art IT industry practices in computer science engineering and technology to address global challenges.</li><li>2. To integrate academics, research and entrepreneurship skills to address present and future challenges of the society and industry.</li><li>3. To develop professionalism with strong foundations adapting to changing technology.</li></ol>

<b>Sr. No.</b>	<b>Program Outcomes</b>
13.	An ability to independently carry out research /investigation and development work to solve practical problems.
14.	An ability to write and present a substantial technical report/document.
15.	Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.
16.	Apply knowledge of database management systems, data mining and analytics techniques to solve real world problems.
17.	Apply knowledge of machine learning and intelligence to identify, formulate and solve complex engineering problems.
18.	Design, develop and deploy software using emerging IT technologies like open source tools, mobile application development platforms, web technologies and cloud computing.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1	I	CSE1130	Mathematical Foundations for Computer Science	1. Solve problems using combinatorics in context to data science
				2. Use relevant probability distribution and linear algebra to solve the engineering problems.
				3. Explore the fundamental concepts of big data and its analytics
				4. Analyse the big data science using statistical and inferential techniques
				5. Investigate data science solutions using advanced tools system
2	I	CSE1015	Machine Learning	1. Set necessary mathematical background to understand Machine Learning concepts.
				2. Recognize and appreciate need of Machine Learning in various applications.
				3. Apply Classification and Regression techniques for decision making.
				4. Use probabilistic graphical models to represent given problems.
				5. Apply sequential data processing algorithms to solve problems.
3	I	CSE1025	Advanced Algorithms	1. Select appropriate algorithm design techniques such as greedy method, dynamic programming, backtracking and heuristic algorithms.
				2. Explore different NP problems and approximation algorithmic solutions.
				3. Apply backtracking algorithm to solve real world problems.
				4. Apply and design parallel algorithms to solve fundamental problems.
				5. Apply and compare performance of local search techniques algorithms for solving fundamental combinatorial problems.
				6. Compare and design global search techniques for solving engineering/real-world combinatorial problems.
4	I	CSE1035	Program Elective-I	1. Understand OSI security architecture and classic encryption techniques

			Cryptology and Network Forensics)	<ol style="list-style-type: none"> <li>2. Acquire fundamental knowledge on the concepts of finite fields and number theory</li> <li>3. Understand various block cipher and stream cipher models</li> <li>4. Describe the principles of public key cryptosystems, hash functions and digital signature</li> <li>5. Understand and the principles of network forensics and investigate network frauds</li> </ol>
5	I	CSE1045	Program Elective-I (Cloud Computing)	<ol style="list-style-type: none"> <li>1. Compare cloud computing with other computing technologies.</li> <li>2. Illustrate the virtualization technologies and its role in enabling the cloud computing system model.</li> <li>3. Identify and compare different cloud service and deployment models for scientific,</li> <li>4. business and consumer applications.</li> <li>5. Describe Aneka platform as a service to design different applications.</li> <li>6. Compare different cloud services with pros and cons from multiple cloud providers.</li> </ol>
6	I	CSE1055	Program Elective-I (Open Source Technologies)	<ol style="list-style-type: none"> <li>1. Demonstrate the configuration of software services on servers.</li> <li>2. Exercise the FOSS tools for the software development.</li> <li>3. Contribute to existing FOSS in FOSS environment.</li> <li>4. Ability to use a version control system and to interface with version control systems used by development communities.</li> </ol>
7	I	CSE1065	Program Elective-II (Natural Language Processing)	<ol style="list-style-type: none"> <li>1. Acquire knowledge of the fundamental mathematical models and algorithms in the field of NLP.</li> <li>2. Apply these mathematical models and algorithms in applications in software design and implementation for NLP.</li> <li>3. Apply deep learning models to solve machine translation and conversation problems.</li> <li>4. Apply deep structured semantic models on information retrieval and natural language applications.</li> </ol>

				5. Acquire knowledge of the design and implementation issues in various NLP applications such as information extraction and Machine translation.
8	I	CSE1071	Program Elective –II (Computer Vision)	1. Understand Image formation process.
				2. Apply fundamental image processing techniques required for computer vision.
				3. Analyze 3-D vision.
				4. Use 3-D vision analysis for specific applications.
				5. Generate appropriate 3D model from images.
9	I	CSE1085	Program Elective-II (Adhoc Sensor Network)	1. Discuss the design and research issues in wireless networks
				2. Demonstrate the working of 802.11 a/g/n wireless standards
				3. Apply the different types of routing protocols in ad-hoc networks.
				4. Analyze different protocols in MAC, Routing and Transport Control for Sensor Networks
10	I	CSE1095	Research Methodology and IPR	1. Formulate a research problem.
				2. Analyze research related information.
				3. Prepare and present research proposal / paper by following research ethics.
				4. Make effective use of computers and computing tools to search information, analyze information and prepare report.
				5. Describe nature and processes involved in development of intellectual property rights.
11	I	CSE1105	Machine Learning Laboratory	1. Set necessary mathematical background to understand Machine Learning concepts.
				2. Recognize and appreciate need of Machine Learning in various applications.
				3. Apply Classification and Regression techniques for decision making.
				4. Use probabilistic graphical models to represent given problems.
				5. Apply sequential data processing algorithms to solve problems.
12	I	CSE1115	Advanced Algorithms Laboratory	1. Select appropriate algorithm design techniques such as greedy method, dynamic programming, backtracking and heuristic algorithms.
				2. Apply backtracking algorithm to solve real world problems.

				<ol style="list-style-type: none"> <li>3. Explore different NP problems and approximation algorithmic solutions.</li> <li>4. Apply and design parallel algorithms to solve fundamental problems.</li> <li>5. Apply and compare performance of local search techniques algorithms for solving fundamental combinatorial problems.</li> <li>6. Compare and design global search techniques for solving engineering/real-world combinatorial problems.</li> </ol>
13	I	CSE1125	Seminar	<ol style="list-style-type: none"> <li>1. Explore research areas and problems.</li> <li>2. Present the finding of literature survey / review.</li> <li>3. Find reputed journals and conference in relevant filed.</li> </ol>
14	II	CSE1151	Deep Learning	<ol style="list-style-type: none"> <li>1. Compare Machine Learning and Deep Learning approaches to solve problems; understand usefulness of each one.</li> <li>2. Understand how Deep Learning solves problems which Machine Learning cannot.</li> <li>3. Analyze Convolutional networks.</li> <li>4. Evaluate Convolutional networks.</li> <li>5. Develop deep learning concept for different real-time applications.</li> </ol>
15	II	CSE1165	Big Data Analytics	<ol style="list-style-type: none"> <li>1. Analyze big data for business intelligence</li> <li>2. Explore business case studies for big data analytics</li> <li>3. Implement map-reduce analytics using hadoop related advance frameworks</li> <li>4. Apply NoSQL big data management</li> <li>5. Manage big data with aspects of Security, Privacy and ethics</li> </ol>
16	II	CSE1175	Program Elective-III (Web Application Development)	<ol style="list-style-type: none"> <li>1. Gain technical competencies in web application development and maintenance.</li> <li>2. Implement interactive web pages and apply validation checks using client side programming languages like HTML, CSS, Java Script and AngularJS.</li> <li>3. Process the business data and generate responses dynamically using PHP.</li> <li>4. Design and develop web services.</li> </ol>

				5. Use Django Python framework to design interactive web applications.
17	II	CSE1185	Program Elective III:( <b>Parallel Computing</b> )	1. Explain how massive parallelisms are implemented in accelerator architectures.
				2. Design and implement parallel algorithms for GPGPU.
				3. Demonstrate parallel patterns for performance improvement.
				4. Analyze the parallel programming and computational thinking strategies.
				5. Compare different Parallel algorithms from various application domains for performance analysis.
18	II	CSE1195	Program Elective-III ( <b>Internet of Things</b> )	1. Identify and understand the unique characteristics and components of IoT
				2. Compare various development boards Arduino, Raspberry pi, Beagle bone
				3. Design a middleware for IoT
				4. Analyze various protocols for IoT
				5. Compare various IoT communication technologies and Design various IoT applications
19	II	CSE1205	Program Elective-IV( <b>Soft Computing</b> )	1. Identify and describe soft computing techniques and their roles in building intelligent machines.
				2. Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems.
				3. Design artificial neural network for solving real world problems.
				4. Apply genetic algorithms to combinatorial optimization problems.
				5. Evaluate solutions by various evolutionary approaches for a given problem.
				6. Design hybrid algorithms for solving complex problems
20	II	CSE1215	Program Elective-IV( <b>Block Chain Technology</b> )	1. Identify basic cryptographic primitives utilised in Blockchain-Secure, collision-resistant hash functions, digital signatures, public key cryptosystems, and zero-knowledge proof systems
				2. Explain basic Distributed System concepts – distributed consensus and atomic broadcast, Byzantine fault-tolerant consensus methods
				3. Compare Basic Blockchain (Blockchain 1.0), Blockchain 2.0 and Blockchain 3.0

				4. Design various Blockchain applications
21	II	CSE1225	Program Elective-IV( <b>Software Architecture</b> )	1. Recognize major software architectural styles, design patterns, and frameworks
				2. Describe a software architecture using various documentation approaches and architectural description languages
				3. Design and develop software architecture for large scale software systems
				4. Formulate architectural alternatives for a problem and select among them
				5. Apply well-understood paradigms for designing new systems
22	II	CSE1231	<b>Deep Learning Laboratory</b>	1. Get knowledge about implementing Deep Learning algorithms
				2. Acquire knowledge about advanced Machine Learning concept.
				3. Analyze and evaluate convolutional networks, RNNs, LSTM, Adam, Dropout.
				4. Work in team to develop and implement deep learning algorithms.
23	II	CSE1245	<b>Big Data Analytics Laboratory</b>	1. Identify and investigate the distributed underlying experimental bed of Hadoop
				2. Compare the usage of Map-reduce paradigm for parallel execution
				3. Recognize the NoSQL prototype to build the big data management
				4. Apply the skills to construct NoSQL designs and its manipulation
				5. Visualizing business benefits from unstructured data analysis
24	II	CSE1255	<b>Program Elective-III Laboratory (Web Application Development Laboratory)</b>	1. Gain technical competencies in web application development and maintenance.
				2. Implement interactive web pages and apply validation checks using client-side programming languages like HTML, CSS, Java Script and AngularJS.
				3. Process the business data and generate responses dynamically using PHP.
				4. Design and develop web services.
				5. Use Django Python framework to design interactive web applications.

25	II	CSE1265	<b>Program Elective-III Laboratory (Parallel Computing Lab)</b>	1. Design different parallel algorithms suitable for multi-core and many-core systems.
				2. Implement different parallel algorithms on multi-core and many-core systems.
				3. Solve compute intensive problems/develop applications using accelerators.
				4. Perform the analysis with different performance metrics.
26	II	CSE1275	<b>Program Elective-III Laboratory(Internet of Things Laboratory)</b>	1. Identify the components of IoT
				2. Design a middleware for IoT
				3. Develop IoT application to solve social problems
				4. Analyze various protocols for IoT
				5. Establish the communication to the cloud through Wi-Fi / Bluetooth
27	II	CSE1285	<b>Mini Project</b>	1. Identify and formulate research problem.
				2. Identify and implement suitable techniques for research problems.
				3. Analyze the results with appropriate tools and techniques available.
				4. Present the finding of experimental details and result.
28	II	SHP5511	<b>Technical Communication</b>	1. Use grammatically correct sentences in different types of technical writings.
				2. Apply technical writing skills to improve readability of documents.
				3. Demonstrate professional skills required in job interviews and at workplace.
29	III	CSE2015	<b>Industry Internship</b>	1. Acquire sufficient knowledge in respective Industry / advanced IT Technology.
				2. Identify problems in the process in industry and provide solution to the same /
				3. Implement small demonstrative module using learning got through the professional certification.
30	III	MOE2011	<b>Artificial Intelligence - Machine Learning</b>	1. Describe central machine learning methods and techniques and how they relate to artificial intelligence.
				2. Differentiate between supervised and unsupervised learning techniques
				3. Apply the ML algorithms to a real-world problem,
				4. Optimize the models learned and report on the expected accuracy that can be achieved by applying the models.



				5. Evaluate a given problem and apply appropriate machine learning technique
31	III	MOE2021	<b>Creative Thinking: Techniques &amp; Tools</b>	1. Comprehend importance in tackling global challenges as well as in everyday problem-solving scenarios
				2. Apply different brainstorming techniques in group activities
				3. Be proficient in the application of the 6 thinking hats tool in different life scenarios
				4. Develop a systematic approach to idea generation through the use of morphological analysis
				5. Innovate on an existing product, service or situation applying the SCAMPER method
				6. Get confident with the theory of inventive problem solving, called TRIZ
32	III	MOE2031	<b>MOOC Course</b>	1. Identify the real applications and practices of courses studied, at industry level
				2. Recognize various modelling, analysis and validation techniques adopted at industries.
				3. Demonstrate the issues at design, manufacturing and assembly levels.
				4. Summarize and present technical data in report format.
33	III	MOE2041	<b>Condition Monitoring and Signal Processing</b>	1. Identify the maintenance scheme, their scope and limitations – apply the maintenance strategies to various problems in the industrial sectors.
				2. Analyze for machinery condition monitoring and explain how this compliments monitoring the condition.
				3. Develop an appreciation for the need of modern technological approach for plant maintenance to reduce the maintenance expenditure.
				4. Emphasizes on case studies that require gathering information using the modern testing equipment and processing it to identify the malfunction in that system.
				5. Identify vibration measurement, lubrication oil analysis.
34	III	MOE2051	<b>Aircraft Conceptual Design</b>	1. Analyze the design process of aircraft and decide the aircraft configuration.
				2. Choose type of power plant as per flight regime.

				<ol style="list-style-type: none"> <li>3. Design the fuselage layout as per type of aircraft.</li> <li>4. Design the wing for type of aircraft and its wing loading</li> <li>5. Evaluate lift, drag and mass for design synthesis process.</li> <li>6. Examine the influence of various design requirements on the configuration of an aircraft to derive an optimized design.</li> </ol>
35	III	MOE2060	<b>Augmented Reality and Virtual Reality</b>	<ol style="list-style-type: none"> <li>1. Define the basic concepts of Virtual and Augmented Reality</li> <li>2. Identify the differences in AR/V concepts and technologies</li> <li>3. Describe the fundamental concepts relating to Virtual Reality such as presence, immersion, and engagement.</li> <li>4. Evaluate usability of AR/VR applications and critique their use of AR/VR capabilities</li> <li>5. Design and prototype effective AR/VR applications using UNITY platform for various application.</li> </ol>
36	III	MOE2070	<b>Industrial Instrumentation</b>	<ol style="list-style-type: none"> <li>1. Elaborate working principal of different transducers.</li> <li>2. Select suitable transducer/sensor for specific application.</li> <li>3. Justify the use of specific measurement technique for specific task.</li> <li>4. Evaluate the Calibration and Interfacing of the transducers.</li> </ol>
37	III	MOE2080	<b>Advanced Mechatronics Systems</b>	<ol style="list-style-type: none"> <li>1. Explain Mechatronics System</li> <li>2. Analyze the Mechatronics Based System</li> <li>3. Model, simulate, and verify the mechatronics systems.</li> <li>4. Identify Electrical, Hydraulic and Pneumatic Components.</li> </ol>
38	III	CSE2035	<b>Dissertation Phase-I</b>	<ol style="list-style-type: none"> <li>1. Identify domain, sub-domain and problem statement for the Study.</li> <li>2. Perform a literature survey and identify possible gaps in the existing work in context with identified problem statement.</li> <li>3. Formulate the problem statement and its objectives of project.</li> <li>4. Selection of suitable methodology, techniques and dataset for the research work.</li> <li>5. Write synopsis using standard format with technical aspects and language.</li> </ol>

39	III	CSE2045	<b>Dissertation Phase-II</b>	1. Design and develop bench-marking system which complies expectations and technical specifications mentioned in the Synopsis.
				2. Perform experimental observation and analysis of the bench-marking system.
				3. Identify gap and propose possible improvements in the implemented bench-marking system.
				4. Submit an research article to reputed international conference which should be based on work done till Dissertation Phase 2.
				5. Prepare a comprehensive, technically and grammatically correct Dissertation Phase 2 report describing the work done.
40	III	CSE2055	<b>Dissertation Phase-III</b>	1. Identify research gap or opportunities for novel work in selected problem statement or domain.
				2. Define the problem based on identified research gap.
				3. Develop algorithm/ methodology to address the identified research gap/ provide solution to the selected problem.
				4. Write pseudo code/develop flow-chart/ develop working flow of proposed system.
				5. Implement the proposed approach using required tools.
41	IV	CSE2065	<b>Dissertation Phase - IV Viva-Voce</b>	1. Develop / simulate / implement the proposed system by complying with desired technical specifications.
				2. Compare working and experimental results of the proposed system with the existing system.
				3. Analyze and synthesize obtained results in theoretical and practical context.
				4. Present findings in logical order and write Dissertation Report on basis of work done, results and observations, findings, and contributions.
				5. Submit an research article to reputed international conference which should be based on work done.

**Computer Science and  
Engineering  
(Artificial Intelligence &  
Machine Learning)**

## UG Program

- **Department Name:- Computer Science and Engineering (Artificial Intelligence & Machine Learning)**
- **UG Program Name: - Computer Science and Engineering (Artificial Intelligence & Machine Learning)**
- **Vision and Mission: -**

<b>Vision</b>	To be renowned department for education in Artificial Intelligence & Machine Learning for molding students into professional with research aptitude and innovation
<b>Mission</b>	<ul style="list-style-type: none"> <li>➤ To offer high quality education through state of art curriculum and innovate teaching &amp; learning practices</li> <li>➤ To establish state of art laboratories and center of excellence in the emerging fields of AI and ML</li> <li>➤ To mold students to be technically competent through innovation and leadership.</li> <li>➤ To inculcate problem solving aptitude in graduates with lifelong learning skills to become valuable resource for industry and society.</li> <li>➤ To adopt professional practice, standards and ethical values</li> </ul>

Sr. No.	Program Outcomes
37.	<b>Engineering knowledge:</b> Comprehend the fundamental knowledge related to domains of statistical mathematics, science and engineering specialization to articulate complex engineering issues
38.	<b>Problem analysis:</b> Recognize the research gaps and formulate the substantial view underlying decisive analysis to project critical conclusions over engineering problems
39.	<b>Design/development of solutions:</b> Develop an aptitude to streamline processes for designing system components addressing specific needs of complex engineering problems
40.	<b>Conduct investigations of complex problems:</b> Inculcate research oriented propensity and apply methodology to analyze data and design experimentations while articulating scope to provide valid conclusions
41.	<b>Modern tool usage:</b> Opt, train and apply suitable advance IT tools and techniques in cutting edges of AI & ML field to leverage the business cohort's
42.	<b>The engineer and society:</b> Identify the role of engineers in societal development and contextually extend the services of AI & ML inline to realm of healthcare, security and cultural issues
43.	<b>Environment and sustainability:</b> Follow the standards practices for conservation of environment and develop the proficient sustainable engineering solutions
44.	<b>Ethics:</b> Practice the core values underlining the ethical principles and commitment towards professional responsibilities
45.	<b>Individual and team work:</b> Work efficiently as an individual/member in a team with effectively addressing the leadership qualities in multidisciplinary teams
46.	<b>Communication:</b> Communicate in point of fact on complex engineering activities with society at large encompassing the vital ability to comprehend, design and write effective reports along with effective presentations

47.	<b>Project management and finance:</b> Demonstrate the knowledge of engineering and management principles for standard project development in team/individual essentially mitigating multidisciplinary environment
48.	<b>Life-long learning:</b> Identify the need and elevate the ability to engage in independent as well as life-long learning to acquaint technological changes for betterment of mankind

<b>Sr. No.</b>	<b>Program Specific Outcomes</b>
<b>PSO1</b>	Design and develop applications of AI & ML for Data analytics, Augmented / Virtual Reality (AR/VR), health care systems and allied domains
<b>PSO2</b>	Utilize dynamic up-scaling of AI and ML techniques for industrial applications in the areas including Robotics, Autonomous Systems, Natural Language Processing, IOT, Cloud Computing, Security, Networks, Computing, Open source technologies and emerging areas
<b>PSO3</b>	Demonstrate use of AI and ML techniques for solutions of real life problems

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1	III	AI201	Discrete Mathematics	Define mathematical logic, truth table and their applications to programming and design
				Apply the concepts of set theory
				Characterize the properties of relations, functions and algebraic systems for formal languages
				Develop essential concepts to solve problems on graphs and networks
				Express counting principle to determine various combinatorial configurations
2	III	AI203	Data structure & Algorithms	Compare between linear and nonlinear data structures
				Describe the characteristics of various data structure such as stacks, queues, trees, graphs and Hash tables.
				Analyze various searching and sorting algorithms and apply it to solve particular problem.
				Determine a suitable data structure and algorithm to solve a real world problem
3	III	AI205	Computer Organization and Architecture	Perform various arithmetic operations on different number systems.
				Apply Boolean algebra to solve logic functions.
				Design, implement, and analyze various logic circuits.
				Apply the programming techniques in developing the assembly language program for the microprocessor system.
				Analyze flow chart and apply assembly language programming techniques
4	III	AI207	Principles of Artificial Intelligence	Recognize the basic concepts and techniques of Artificial Intelligence.
				Apply AI algorithms for solving typical practical problems.
				Describe appropriate knowledge representation schemes in AI.
				Analyze reasoning schemes in AI.
5	III	AIMD201	Object Oriented Programming	Identify and integrate basic object-oriented programming concepts and apply them in problem-solving
				Construct and test inheritance concepts for reusing the program.
				Develop and test a program using loops, decision statements, and functions in Python.
				Evaluate the given Plot data using appropriate Python visualization libraries.

6	III	SH2174	Environmental Science	Apply interdisciplinary knowledge in environmental science by integrating concepts and principles from various fields of science and engineering to address environmental issues.
				Evaluate environmental impacts of human activities on ecosystems and on the environment.
				Use scientific approach to identify and solve environment related problems.
				Design sustainable solutions to address environmental challenges by considering renewable energy sources, waste management strategies conservation measures, and environmental policies. .
				Participate in group work to become acquainted with the importance of teamwork, collaboration
				Develop presentation and report writing skills
7	III	AI209	Object Oriented Programming using JAVA	Recognize the basic object oriented programming concepts and apply them in problem solving.
				Illustrate inheritance concepts for reusing the program.
				Demonstrate on the multi-tasking by using multiple threads.
				Develop data-centric applications using JDBC.
				Exhibit the basics of java console and GUI based programming
8	III	AI211	Data structure & Algorithms Lab	Implement various data structures and algorithms using programming languages such as C or C++.
				Conduct experiments to validate the theoretical analysis of algorithms.
				Analyze data, interpret results, and draw conclusions, aiding them in making informed decisions for algorithmic optimizations.
				Evaluate the efficiency and scalability of different data structures and algorithms, enabling them to make informed choices when selecting the most appropriate solution for a given problem
9	III	AI213	Desktop Publishing for Web Development	Create well-structured web pages using HTML and apply the principles of semantic markup.
				Style web pages effectively using CSS, including layout design and responsive techniques.



				<p>Implement client-side interactivity and dynamic content using JavaScript and jQuery.</p> <p>Utilize Bootstrap to develop responsive and mobile-first web applications.</p> <p>Set up and customize WordPress websites, managing content and plugins effectively.</p> <p>Build and deploy functional websites that integrate HTML, CSS, JS, Bootstrap, and WordPress.</p>
10	III	AI215	Technical Aptitude-I	<p>Choose proper techniques to find solution for engineering problems</p> <p>Solve various types of problems</p> <p>Develop ability to face competitive examinations</p> <p>Inspect the problem &amp; conclude with proper solution</p>
11	III	SH2634	Professional Leadership Skills	<p>Explain the traits of a leadership through real life examples.</p> <p>Exhibit the ability to work effectively in team.</p> <p>Prepare a presentation as per the audience and context requirements.</p>
12	III	SH2614	Interpersonal Skills	<p>Exhibit interpersonal communication skills.</p> <p>Demonstrate decision-making skills.</p> <p>Apply conflict resolution styles appropriate in different situations.</p> <p>Demonstrate skills to manage balance in work and life.</p>
13	III	SH2694	Innovation Tools and Methods for Entrepreneurs	<p>Explain structured approach to define the problem with every possible detail, identify conflicts and solve them</p> <p>Apply User Journey Map to the selected problem to show user interaction at various stages</p> <p>Analyze the solutions provided by competitors for effectiveness and gaps if any.</p>
14	III	SH2594	Personal Effectiveness and Body Language	<p>Develop skills to build self-esteem and positive attitude.</p> <p>Develop interpersonal skills characterized by effective communication and conflict resolution.</p> <p>Discover ways to overcome procrastination.</p> <p>Demonstrate responsiveness towards stress and health issues.</p> <p>Interpret the non-verbal behaviour of a person.</p>

15	III	SH 2734	German Language-III	Interpret the language if the next person is speaking slowly and clearly.
				Make use of the language in routine life with the routing topics like family, shopping, work etc.
				Demonstrate the language by self-introduction in German with simple sentences
16	III	SH2714	Japanese Language – III	Make use of basic conversations in various situations.
				Identify the sentence patterns.
				Explain insights about the communication required for living in Japan.
17	IV	AI202	Statistics and Fuzzy systems	Interpret Japanese work ethics required in their professional career.
				Apply the probability distributions, random number generation and density estimations to perform analysis of various kinds of data
				Develop the fundamental concepts such as fuzzy sets, operations and fuzzy relations.
				Acquire and apply the schemes of fuzzification of scalar variables and the defuzzification of membership functions.
18	IV	AI204	Machine Learning	Develop fuzzy decision making techniques.
				Realize machine learning and learn the basic theory underlying machine learning.
				Differentiate supervised, unsupervised and reinforcement learning
				Recognize the basic concepts of learning and decision trees.
				Realize Bayesian techniques for problems appear in machine learning
19	IV	AI206	Computer Networks	Perform statistical analysis of machine learning techniques
				Analyze the various Components of Data Communication & Various Networking Concepts.
				Apply the concepts, Services and Protocols.
				Assess the algorithms used in Computer Networks
20		AI208	Database Management Systems	Evaluate the problems related to framing, routing error correction & detection and others.
				Enlighten terms related to database design and management
				Apply the Relational Algebra with Structured Query Language (SQL) for database definition and manipulation

				Use the concept of functional dependency and decompose schemas by applying certain normal forms
				Analyze the principles of concurrency control, recovery and deadlock handling for database consistency
				Design and create database to solve real world problems
21	IV	AIMD202	Data Structures & Algorithms	Compare between linear and nonlinear data structures
				Describe the characteristics of various data structure such as stacks, queues, trees, graphs and Hash tables.
				Analyze various searching and sorting algorithms and apply it to solve particular problem.
				Determine a suitable data structure and algorithm to solve a real world problem
				Compare between linear and nonlinear data structures
22	IV	SH202	मराठी भाषिक कौशल्यविकास	भाषा आणि व्यक्तिमत्व विकास यांमधील सहसंबंध स्पष्ट करू शकेल
				भाषिक कौशल्यविकास करू शकेल
				कथा या मराठी साहित्य प्रकाराचे विश्लेषण करू शकेल
				एकांकिका या मराठी साहित्य प्रकाराच्या विश्लेषणाची क्षमता प्राप्त करेल
23	IV	SH204	हिंदी कथा साहित्य एवं प्रयोजमूलक हिंदी	विद्यार्थियों में मानवीय संवेदनाओं के विकास के साथ नवीन सामाजिक सांस्कृतिक बोध और जीवन मूल्यों का विकास होगा।
				विद्यार्थियों में साहित्य के माध्यम से कलात्मक गुणों की अभिवृद्धि होगी कला की साहित्यिक विधाओं के प्रति अभिरुचि जागृत होगी तथा रचनात्मक कौशल्य को बढ़ावा मिलेगा।
				विद्यार्थियों में नए वैश्विक मूल्यों के प्रति सजगता को बढ़ावा मिलेगा एवं मूल्यवादी दृष्टि के प्रति दायित्व बोध उत्पन्न होगा। छात्र व्यवहार में हिंदी भाषा का उचित प्रयोग कर सकेंगे।
				छात्र व्यवहार में हिंदी भाषा का उचित प्रयोग कर सकेंगे।
24	IV	AI210	Machine Learning Lab	Explore dataset and its associated characteristics using python libraries.
				Implement various supervised learning algorithms for given dataset.
				Implement various Unsupervised learning algorithms for given dataset.

				Design solution for real world problem by implementing ML algorithms.
				Develop, report and present implementation of typical Mini Project in ML.
25	IV	AI212	Database Management Systems Lab	Sketch E-R diagram for given Case Study/ Problem Statement.
				Implement SQL query for various operations like retrieval, insertion,
				manipulation of data, PL/SQL cursor, procedure and triggers
				Design relational database using Normalization and Functional Dependency
				Apply hashing mechanism to build hash index file on given records
26	IV	AI214	Hardware Networking with python programming	Explain the concepts in Python.
				Implement programs using loops, decision statements, python collections, functions, and modules in Python.
				Use object-oriented programming with classes using Python.
				Apply data pre-processing for the given dataset using Python.
				Plot data using appropriate Python visualization libraries.
				Perform the exploratory data analysis using Python for the given dataset.
27	IV	AI216	Technical Aptitude-II	Choose proper techniques to find solution for engineering problems
				Solve various types of problems
				Develop ability to face competitive examinations
				Inspect the problem & conclude with proper solution
28	IV	SH2634	Professional Leadership Skills	Explain the traits of a leadership through real life examples.
				Exhibit the ability to work effectively in team.
				Prepare a presentation as per the audience and context requirements.
29	IV	SH2614	Interpersonal Skills	Exhibit interpersonal communication skills.
				Demonstrate decision-making skills.
				Apply conflict resolution styles appropriate in different situations.
				Demonstrate skills to manage balance in work and life.
30	IV	SH2694	Innovation Tools and Methods for Entrepreneurs	Explain structured approach to define the problem with every possible detail, identify conflicts and solve them

				Apply User Journey Map to the selected problem to show user interaction at various stages
				Analyze the solutions provided by competitors for effectiveness and gaps if any.
31	IV	SH2594	Personal Effectiveness and Body Language	Develop skills to build self-esteem and positive attitude.
				Develop interpersonal skills characterized by effective communication and conflict resolution.
				Discover ways to overcome procrastination.
				Demonstrate responsiveness towards stress and health issues.
				Interpret the non-verbal behavior of a person.
32	IV	SH 2644	German Language - IV	Interpret the language if the next person is speaking slowly and clearly.
				Make use of the language in routine life with the routing topics like family, shopping, work etc.
				Demonstrate the language by self-introduction in German with simple sentences.
33	IV	SH2624	Japanese Language - IV	To be able to make basic conversations in various situations.
				To recognize the sentence patterns.
				To improve Japanese Language proficiency.
				To give students insights about the communication required for living in Japan.
				To expose students to the Japanese work ethics required in their professional careers.

# **Electrical Engineering**

- **Department Name :- Electrical Engineering**
- **UG Program Name :-Electrical Engineering**
- **Vision and Mission :-**

Vision of the Department: Develop globally competent electrical engineers to serve future needs and challenges of the society

- **Mission of the Department:** To inculcate teaching and learning processes to promote state-of-the-art service in electrical industries to address local and global challenges.
- To integrate academics, research, and entrepreneurship skills in the domain of electrical engineering to address the present and future challenges of society.
- To develop professionalism with strong foundations in adopting change in environmental technology.

Sr. No.	Program Outcomes
49.	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
50.	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
51.	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
52.	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
53.	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
54.	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
55.	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
56.	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
57.	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
58.	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
59.	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these

	to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
60.	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Sr. No.	Program Specific Outcomes
1.	Apply knowledge of Power systems, Power electronics, Electrical machines and Control systems for the Industrial Applications
2.	Operate and control Renewable energy sources and Electric vehicle systems

S. Y. B. Tech.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1	III	EE211	Mathematics for Electrical Engineers	CO1: Solve Linear Differential equations related to engineering application in electrical Engineering.
				CO2: Find and represent periodic functions using Fourier series.
				CO3: Apply rules of vector differential calculus to evaluate gradient, divergence and conservative vector field.
				CO4: Identify an appropriate probability distribution and use its properties to calculate probabilities
				CO5: Apply Laplace transform and Z-transform by using properties to various functions to solve electrical engineering problems.
2	III	EE2014	DC Machines and Transformer	CO1: Explain working principle and operation of single phase three phase transformer.
				CO2: Analyze working performance with different application of three phase transformer.
				CO3: Evaluate performance of dc machine.
				CO4: Interpret characteristics of DC machines.
				CO5: Identify suitable DC machines and transformer for industrial application
3	III	EE2034	Electrical Circuit Analysis	CO1: Apply fundamental laws to analyze DC and AC circuits.
				CO2: Make use of different Theorems to evaluate steady state parameters of AC and DC circuits.
				CO3: Analyze the electrical two port network.
				CO4: Evaluate the circuit under transient condition.
				CO5: Design basic passive filters.



4	III	EE213	Power Transmission and Distribution System	CO1: Compare different tariffs for economic generation
				CO2: Calculate different transmission line parameters.
				CO3: Select different components of overhead transmission lines and cables
				CO4: Explain various phenomena occurring in power system
				CO5: Identify importance of power factor and choose distribution system with minimum power loss.
5	III	EEMD201	Electrical Power Generation	CO1: Explain the fundamental concepts of energy sources like conventional and non-conventional energy..
				CO2: Describe various advantages and disadvantages of energy sources..
				CO3: Illustrate different technology associate with thermal, hydro and nuclear power energy sources..
				CO4: Illustrate different technology associate with solar, wind, biomass and other renewable energy sources.
				CO5: Describe the working of micro/mini hydropower system.
6	III	EE2514	DC Machines and Transformer Lab	CO1: Perform experiments on DC machines and transformers
				CO2: Plot the characteristics of various machines and solving engineering problems.
				CO3: Analyze the outcome and make interpretations of the machines.
				CO4: Analyze the parameters and predict the durability of the machines.
				CO5: Compare the performances of the machines by referring relevant standards.
7	IV	EE214	Electrical Measurement and Instrumentation	CO1: Analyze different electrical measuring instrument..
				CO2: Identify the various parameters in electrical measuring instruments.
				CO3: Design measuring schemes for various electronic instrument applications..
				CO4: Select appropriate transducer for various measuring applications..
				CO5: Describe different non-electrical measuring instruments.
8	IV	EE2544	Analog and Digital Electronics lab	CO1: Illustrate input & output response of analog electronic circuits and compare with theoretical values.

				CO2: Build diode circuits like rectifier, clipper & clamper.
				CO3: Design various applications of Op-Amp.
				CO4: Design sequential and combinational circuits.
				CO5: Simulate and validate Analog and Digital circuits using simulation tools.
9	III	EE2574	Computer Programming Lab	CO1: Analyze the problem to find the objects and build Object Oriented Program.
				CO2: Elaborate the concepts of “Inline function”, “Friend Function”, “Function Overloading” and “Operator Overloading”.
				CO3: Modify/Extend the program by using Inheritance.
				CO4: Use of memory management technique “Constructors” & “Destructors” to increase speed of program execution.
				CO5: Perform different operation of file like “Create”, “Open”, “Close” files and perform “Read”, “Write” and “Append”.
10	III	EE2594	Technical Aptitude -I	CO1: Apply the knowledge acquired during the course work.
				CO2: Develop the ability of problem solving.
11	III/IV	SH2634	Professional Leadership Skills	CO1: Explain the traits of a leadership through real life examples.
				CO2: Exhibit the ability to work effectively in team.
				CO3: Prepare a presentation as per the audience and context requirements.
12	III/IV	SH2614	Interpersonal Skills	CO1: Exhibit interpersonal communication skills.
				CO2: Demonstrate decision-making skills.
				CO3: Apply conflict resolution styles appropriate in different situations.
				CO4: Demonstrate skills to manage balance in work and life.
				CO5: Apply Jeevanvidya wisdom in day to day life.
13	III/IV	SH2694	Innovation Tools and Methods for Entrepreneurs	CO1: Explain structured approach to define the problem with every possible detail, identify conflicts and solve them
				CO2: Apply User Journey Map to the selected problem to show user interaction at various stages
				CO3: Analyze the solutions provided by competitors for effectiveness and gaps if any.

14	III/IV	SH2594	Personal Effectiveness and Body Language	CO1: Develop skills to build self-esteem and positive attitude.
				CO2: Develop interpersonal skills characterized by effective communication and conflict resolution.
				CO3: Demonstrate responsiveness towards stress and health issues.
				CO4: Interpret the non-verbal behaviour of a person.
15	III	SH2734	German Language- Basic Level III	CO1: Interpret the language if the next person is speaking slowly and clearly.
				CO2: Make use of the language in routine life with the routing topics like family, shopping, work etc.
				CO3: Demonstrate the language by self-introduction in German with simple sentences.
16	III	SH2714	Japanese Language - Level III	CO1: Make use of basic conversations in various situations.
				CO2: Identify the sentence patterns.
				CO3: Explain insights about the communication required for living in Japan.
				CO4: Interpret Japanese work ethics required in their professional career.
17	IV	EE2024	AC Machines	CO1: Describe behavior of three phase and single phase induction motors..
				CO2: Interpret various characteristics of three phase induction motor.
				CO3: Identify various industrial applications for single phase and three phase Induction Motor.
				CO4: Evaluate winding parameters of Synchronous Generator..
				CO5: Analyze performance characteristics and testing of Synchronous Machine..
18	III	EE261	Electrical Maintenance and Troubleshooting	CO1: Perform unloading of the electrical equipment's/machines.
				CO2: Use tools/instruments for installation and to generate technical report.
				CO3: Conduct commissioning test on electrical equipment/machines.

				CO4: Prepare maintenance schedule of different equipment/machines
				CO5: Develop trouble shooting chart for various electrical equipment, machines & domestic appliances.
19	IV	EE2064	Analog and Digital Electronics	CO1: Interpret characteristics of diodes, transistors, and MOSFET..
				CO2: Analyze various analog circuits..
				CO3: Design operational amplifier-based circuits.
				CO4: Describe the fundamental concepts and techniques used in digital electronics.
				CO5: Design combinational and sequential logic circuits.
20	III	SH2174	Environmental Science	CO1: Apply interdisciplinary knowledge in environmental science by integrating concepts and principles from various fields of science and engineering to address environmental issues.
				CO2: Evaluate environmental impacts of human activities on ecosystems and on the environment.
				CO3: Use scientific approach to identify and solve environment related problems.
				CO4: Design sustainable solutions to address environmental challenges by considering renewable energy sources, waste management strategies conservation measures, and environmental policies.
				CO4: Participate in group work to become acquainted with the importance of teamwork, collaboration
				CO5: Develop presentation and report writing skills.
21	IV	EE2524	AC Machine Lab	CO1: Perform experiments on AC machines (Asynchronous and Synchronous)
				CO2: Plot the characteristics of various machines and solving engineering problems.
				CO3: Analyze the outcome and make interpretations from test parameters.
				CO4: Analyze the parameters and predict the durability of the machines.
				CO5: Compare the performances of the machines by referring relevant standards.
	IV	EE2084	Signals and Systems	CO1: Represent the various signals mathematically

				CO2: Classify the systems and infer their properties
				CO3: Compute the Fourier series and Fourier Transforms for given signals
				CO4: Apply Laplace and Z-transforms to solve the systems.
				CO5: Appreciate the significance of Sampling
	IV	EEMD202	Power System	CO1: Write the basic working principles of different generating sources.
				CO2: Analyze different types of loads
				CO3: Explain importance of power factor and tariffs in power system.
				CO4: Identify various components in power transmission and distribution system.
				CO5: Select substation equipments as per requirement.
	IV	EE262	Electrical Measurement and Instrumentation Lab	CO1: Determine the measurement of electrical parameters using various measurement techniques.
				CO2: Examine AC bridges for the measurement of inductance, capacitance and frequency.
				CO3: Identify different measuring instruments for the measurement of various electrical and non-electrical parameters.
				CO4: Demonstrate various digital measuring instruments.
				CO5: Draw the characteristics of solar panel, earth resistance and temperature transducers.
	IV	EE264	Electrical Installation	CO1: Elaborate electrical Safety, Installation Codes, and Standards
				CO2: Determine a suitable size of wires and switchgears
				CO3: Design various electrical installation diagrams
				CO4: Estimate component requirements of electrical installation
				CO5: Prepare quotation, tender and other related documents
26	IV	EE2564	Technical Aptitude -II	CO1: Apply the knowledge acquired during the course work.
				CO2: Develop the ability of problem solving.
27	IV	SH2634	Professional Leadership Skills	CO1: Adequate knowledge of basic grammar of English language.
				CO2: Intermediate level vocabulary of English language.
				CO3: Ability to communicate moderately in English.

28	IV	SH2614	Interpersonal Skills	CO1: Exhibit interpersonal communication skills.
				CO2: Demonstrate decision-making skills.
				CO3: Apply conflict resolution styles appropriate in different situations.
				CO4: Demonstrate skills to manage balance in work and life.
				CO5: Apply Jeevanvidya wisdom in day to day life.
29	IV	SH2694	Innovation Tools and Methods for Entrepreneurs	CO1: Explain structured approach to define the problem with every possible detail, identify conflicts and solve them
				CO2: Apply User Journey Map to the selected problem to show user interaction at various stages
				CO3: Analyze the solutions provided by competitors for effectiveness and gaps if any.
30	IV	SH2594	Personal Effectiveness and Body Language	CO1: After successful completion of the course, students will be able to,
				CO2: Develop skills to build self-esteem and positive attitude.
				CO3: Develop interpersonal skills characterized by effective communication and conflict resolution.
				CO4: Discover ways to overcome procrastination.
				CO5: Demonstrate responsiveness towards stress and health issues.
				CO6: Interpret the non-verbal behaviour of a person.
31	IV	SH2644	German Language-Advanced Level	CO1: Interpret the language if the next person is speaking slowly and clearly.
				CO2: Make use of the language in routine life with the routing topics like family, shopping, work etc.
				CO3: Demonstrate the language by self-introduction in German with simple sentences.
32	IV	SH2624	Japanese Language - Level IV	CO1: To be able to make basic conversations in various situations.
				CO2: To recognize the sentence patterns.
				CO3: To improve Japanese Language proficiency.
				CO4: To give students insights about the communication required for living in Japan.

CO5: To expose students to the Japanese work ethics required in their professional careers.

T. Y. B. Tech.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1	V	EE3013	Electromagnetic Fields	CO 1. Apply coordinate systems to electric field in the context of divergence, curl and gradient.
				CO 2. Apply Coulomb's law, Gauss's law and divergence theorem.
				CO 3. Apply Biot- Savart law and Amperes circuital law to magneto static fields.
				CO 4. Evaluate Maxwell's equations for time varying fields derived from Faradays and Amperes law.
				CO 5. Develop electromagnetic wave equations for free-space, dielectric and conductors
2	V	EE3033	Power System Analysis	CO 1. Analyze power system components using per unit system.
				CO 2. Examine symmetrical components used in power system
				CO 3. Estimate symmetrical and unsymmetrical faults in power system
				CO 4. Inspect power system transient stability.
				CO 5. Organize FACTS devices in power system for better operation.
3	V	EE3053	Control Systems	CO 1. Model different physical and other systems using different modelling techniques like transfer function, block diagrams, signal flow graphs etc.
				CO 2. Analyse the different systems using Time domain and Frequency domain tools and techniques.
				CO 3. Examine the stability of given LTI system.

				CO 4. Compare different controllers and compensators used in control systems.
				CO 5. Apply the knowledge of State Space techniques for analysing and understanding the MIMO systems.
4	V	EE3073	Microprocessor & Microcontroller	CO 1. Illustrate internal & external structure of microprocessor 8085 and Microcontroller 8051
				CO 2. Develop program for 8051 in assembly and C language
				CO 3. Make a use of timer, interrupt, and serial ports to develop 8051 program
				CO 4. Design memory and I/O devices interfacing circuit to microprocessor and Microcontroller
				CO 5. Develop microcontroller-based real life applications
5	V	EE3093	Energy Storage Technologies	CO 1. Explain the energy storage as a structural unit of a power system.
				CO 2. Compare various energy storage technologies for power systems.
				CO 3. Apply energy storage based on hydrogen for power system.
				CO 4. Apply energy storage for short-term, mid-term and long-term applications
				CO 5. Analyze economics and reliability of energy storage Systems
6	V	EE3113	Restructured Power System	CO 1. Define reformation in Indian power sector
				CO 2. Identify new dimensions associated with the power system and its economics.
				CO 3. Compare the various operating mechanisms of conventional and restructured power system.
				CO 4. Interpret various aspects of power markets and market architecture.
				CO 5. Explain Transmission Congestion Management and Pricing in power sector
				CO 6. Propose ancillary services and bidding strategies in power sectors



7	V	EE3133	Digital Signal Processing	CO 1. Formulate signals mathematically in continuous, discrete-time and frequency domain.
				CO 2. Analyze discrete-time systems using z-transform.
				CO 3. Construct signals using Discrete-Fourier Transform (DFT) and FFT algorithms.
				CO 4. Design digital filters for various applications using various technique.
				CO 5. Apply digital signal processing for the analysis of real-life signals.
8	V	EE3153	Electrical Utilization and Traction	CO 1. Analyze electric heating for industrial application.
				CO 2. Demonstrate electric welding for industrial application.
				CO 3. Inspect electric circuits for refrigeration and air conditioning.
				CO 4. Evaluate the use of various process control techniques.
				CO 5. Summarize electrical traction systems and drives.
9	V	EE3513	Control Systems Lab	CO 1. Test for responses of the mathematical model of different electromechanical systems for various standard inputs.
				CO 2. Evaluate time domain and frequency domain specifications of LTI systems
				CO 3. Examine the stability of LTI system using time domain and frequency domain techniques.
				CO 4. Design simple controller for LTI systems
				CO 5. Analyze state space models of LTI systems
10		EE3533	Microprocessors and Microcontroller Lab	CO 1. Writing assembly language programs for basic operations
				CO 2. Develop assembly language programs using subroutines & SFRs
				CO 3. Design interfacing circuits of various input output devices
				CO 4. Develop microcontrollers based real life prototype model
11	V	EE3553	Technical Aptitude -III	CO 1. Apply the knowledge acquired during the course work.
				CO 2. Develop the ability of problem solving.

12	V	SH3033	Scholastic Aptitude-I	CO 1. Develop a logical approach towards solving Aptitude and Reasoning problems.
				CO 2. Analyze usage of basic aptitude terms of percentages, averages, ratios and applications of business aptitude terms of profits and interests
				CO 3. Develop a bridge in analogies, series and visualizing directions.
				CO 4. Apply various short cuts & techniques to manage speed and accuracy to get equipped for various competitive and campus recruitment exams
13		EE3573	Summer Internship (4 Weeks)	CO 1. Apply the Technical knowledge in real industrial situations.
				CO 2. Get exposure of industrial environment which create competent professionals for the industry.
				CO 3. Familiarization with specific Department/shop/function assigned to student.
				CO 4. Identify the industry problem on which they can do their final year project.
14	V	SH3011	Indian Constitution	CO 1. Create awareness about law depiction and importance of Constitution
				CO 2. Define Fundamental Rights and Fundamental Duties of the Indian Citizen to instill morality, social values, honesty, dignity of life and their social Responsibilities.
				CO 3. Create Awareness of their Surroundings, Society, Social problems and their suitable solutions while keeping rights and duties of the citizen keeping in mind.
				CO 4. Recognize distribution of powers and functions of Local Self Government.
				CO 5. Comprehend the National Emergency, Financial Emergency and their impact on Economy of the country.
15	VI	EE3023	Power System Operation and Control	CO 1. After successful completion of the course, students will be able to,
				CO 2. Make use of different economic tools for the power system operation.

				CO 3. Analyze economic load dispatch for the power system
				CO 4. Compare different power flow methods
				CO 5. Model load frequency control for power system.
				CO 6. Analyze voltage control and voltage stability for power system
16	VI	EE3043	Power Electronics	CO 1. Compare performance of various power electronic switches.
				CO 2. Analyze the performance of uncontrolled rectifiers and phase-controlled converters
				CO 3. Design DC-DC converters for different type of loads.
				CO 4. Analyze the performance of different types of inverters and AC-AC converters.
				CO 5. Suggest suitable power electronic converters for specific application
17	VI	EE3063	Electrical Energy Conservation and Auditing	CO 1. Measure the energy conservation/saving opportunities in different electric system.
				CO 2. Select 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. Judge cost-effective measures towards improving energy efficient and energy conservation
18	VI	EE3083	Electric and Hybrid Electric Vehicles	CO 1. Discuss Conventional Vehicles and Powertrains
				CO 2. Analyse the electric drive mechanism.
				CO 3. Investigate Battery Management Systems
				CO 4. Classify hybrid electric vehicles
				CO 5. Describe plug-in hybrid electric vehicles and electrical infrastructure.
19	VI	EE3103	Advanced Control Systems	CO 1. Design compensators for LTI systems.
				CO 2. Design state feedback controller and observer for the system models.
				CO 3. Examine stability of the state space models.
				CO 4. Analyze discrete time systems

				CO 5. Examine stability of discrete time systems
20	VI	EE3123	Applications of Microcontrollers in Electrical Engineering	CO 1. Explain architecture, memory organization and essential features of PIC18F458 microcontroller
				CO 2. Write program for PIC microcontrollers in assembly language for specific applications.
				CO 3. Implement CCP module of PIC in various modes for generation of waveforms, period measurement of unknown signal and speed control of DC motor
				CO 4. Develop a logic to interface PIC microcontroller to various peripheral devices
				CO 5. Design microcontroller based system using advanced microcontroller for electrical engineering related applications.
21	VI	OE3163	Engineering Materials	CO 1. Define and chose various engineering materials.
				CO 2. Classify, compare, illustrate and demonstrate the properties and behavior of materials.
				CO 3. Identify, construct, experiment and make use of various materials.
				CO 4. Examine, distinguish and analyze behavior based on the functioning of materials.
				CO 5. Estimate, interpret, judge various material and possibly make use for creative products.
22	VI	OE3181	Industrial Drives	CO 1. Analyze stability, moment of inertia, speed and torque in industrial drive system
				CO 2. Explain energy conservation in industrial drive system
				CO 3. Discuss various sensors required for industrial drives.
				CO 4. Compare various control strategies for AC and DC drives
				CO 5. Select special motors for industrial applications
23	VI	SH3021	Biology for Engineers	CO 1. Apply biological engineering principles, procedures needed to solve real-world problems
				CO 2. Describe the functions of biological systems

				CO 3. Analyze biological phenomena and compute work done at microscale.
				CO 4. Explain working of different biomedical instruments
				CO 5. Select the sensors for given biological applications
				CO 6. Explain relevant aspect of movement control process.
24	VI	EE3523	Modelling and Simulation Lab	CO 1. Analyze rectifier circuits using PSIM and MATLAB software.
				CO 2. Make use of MATLAB programming and the Simulink platform to solve different problems.
				CO 3. Analyze the power system analysis problem using MATLAB toolbox
				CO 4. Develop a power system network in ETAP software to solve power flow analysis problems.
				CO 5. Develop a power system network in CYME Power software to solve power flow analysis problems.
				CO 6. Develop a power system network in GAMS software to solve power system problems.
25	VI	EE3543	Power Electronics Lab	CO 1. Demonstrate turn on & turn off schemes for semiconductor devices operated as power switches.
				CO 2. Demonstrate converter circuits connected to different loads.
				CO 3. Analyze converter circuits connected to different loads.
				CO 4. Design various converters for specific applications
				CO 5. Simulate power electronic converters using MATLAB software.
26	VI	EE3563	Technical Aptitude -IV	CO 1. Apply the knowledge acquired during the course work.
				CO 2. Develop the ability of problem solving.
27	VI	EE3583	Capstone Project Phase -I	CO 1. Carry out literature survey and identify as well as select a problem.
				CO 2. Comprehend and analyze an engineering problem and report findings to provide an appropriate solution.

				CO 3. Design an experimental setup or develop an analytical model to analyze the system under consideration.
				CO 4. Communicate problem, methodology and outcomes systematically and effectively in the form of a technical report.
				CO 5. Work as a member and a team leader in engineering teams / multidisciplinary teams.
				CO 6. Demonstrate an ability to use different tools and techniques to solve the given problem.
28	VI	SH304	Psychology for Engineers	CO 1. Interpret human behavior as a system from a psychological perspective.
				CO 2. Appraise the various factors affecting human behavior at work.
				CO 3. Apply behavioral theories to manage/lead people and emotions at work.
29	VI	SH3063	Scholastic Aptitude-II	CO 1. Develop a logical approach towards solving Aptitude and Reasoning problems.
				CO 2. Analyze usage of basic aptitude terms of percentages, averages, ratios and applications of business aptitude terms of profits and interests
				CO 3. Develop a bridge in analogies, series and visualizing directions.
				CO4. Apply various short cuts & techniques to manage speed and accuracy to get equipped for various competitive and campus recruitment exams

Final Year B. Tech.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1.	VII	EE4013	Power System Protection	CO 1.Explain different types of power system faults.
				CO 2. Compare the different protective devices
				CO 3.Describe Relays for power system protection.
				CO 4.Classify different circuit breakers as per their application

				CO 5. Ensure the proper earthing system and selection of Lightning arrester
2.	<b>VII</b>	<b>EE4033</b>	<b>Electrical Drives</b>	CO 1. List the parts of electrical drives, advantages and factors affecting the choice of electrical drives.
				CO 2. Interpret the equivalent parameters, stability and components of load torque for a given motor-load system.
				CO 3. Apply power electronics converter and their control techniques to control dc drives.
				CO 4. Estimate the performance parameters of dc drives controlled by rectifiers and choppers.
				CO 5. Describe stator side and rotor side control of induction motor drive.
				CO 6. Explain the special motor drives for industrial applications.
3.	<b>VII</b>	<b>EE4053</b>	<b>Power System Dynamics and Control</b>	CO 1. Compare various methods to enhance power system stability.
				CO 2. Develop dynamic modeling of a synchronous machine, excitation system, speed governing system, and transmission line.
				CO 3. Examine the impact of stability on power system planning, and operation.
				CO 4. Outline stability issues in interconnected power system.
				CO 5. Analyze Power system stabilizer.
4.	<b>VII</b>	<b>EE4073</b>	<b>HVDC Transmission Systems</b>	Elaborate HVDC system and describe various types of DC links
				Analyze Line Commutated Converters and Voltage Source Converters in HVDC Transmission System with their control methods
				Explain various faults and protection methods for HVDC transmission systems

				Discuss about Reactive power, Harmonics and filters in HVDC system
				Illustrate HVDC components modeling and AC/DC power flow
5.	<b>VII</b>	<b>EE4093</b>	<b>Nonlinear Control Systems</b>	List different types of nonlinearities present in the system
				Analyze non-linear systems using analytical and graphical methods
				Comment on the stability of nonlinear systems using various approaches.
				Apply Lyapunov stability criteria for nonlinear system
				Develop mathematical model of real-time nonlinear systems
6.	<b>VII</b>	<b>EE4113</b>	<b>FACTS Controllers</b>	Examine the importance of controllable parameters and benefits of FACTS Controllers.
				Compare the operation of SVC and STATCOM
				Analyze the functional operation and control of series compensation
				Describe the principles, operation and control of voltage & Phase angle regulator
				Explain combined & special purpose FACTS controllers
7.	<b>VII</b>	<b>EE4133</b>	<b>High Voltage Engineering</b>	Identify and analyze the breakdown theories of solid, liquid and gaseous materials
				Describe as well as use different methods of generation of high AC, DC, impulse voltage and current.
				Demonstrate and use different methods of measurement of high AC, DC, impulse voltage and current
				Identify the occurrence of overvoltage and to provide remedial solutions
				Demonstrate an ability to carry out different tests on high voltage equipment and devices as well as ability to design the high voltage laboratory with all safety measures



8.	<b>VII</b>	<b>EE4153</b>	<b>Power Quality and Harmonics</b>	Discuss various power quality problems and their analysis.
				Describe Power Quality Standards and Monitoring
				Asses sources of harmonic in power system
				Analyze effects of Harmonics on Power system
				Explain harmonic filters
9.	<b>VII</b>	<b>EE4173</b>	<b>Smart Grids</b>	Summarize the concept and future of smart grid
				Develop smart grid architecture
				Compile various smart grid technologies
				Identify communication and information technologies for smart grid
				Elaborate distribution generation technologies
				Recommend smart metering and distribution automation equipment's
10.	<b>VII</b>	<b>EE4193</b>	<b>FPGA DSP Processors</b>	Explain the basic functions of FPGA DSP processors.
				Interpret the modules of DSP processors
				Compare FPGA based DSP technologies
				Elaborate FPGA implantation tools and its synthesis
				Develop architecture of FPGA based DP systems
11.	<b>VII</b>	<b>EE4213</b>	<b>Computer Modeling of Electrical Power System</b>	Develop mathematical models of various equipment used in power system to analyse both AC and AC-DC power system network.
				Model single and three phase power system network by using linear transformation and compound admittance technique.
				Formulate AC and AC-DC power system analysis problem.
				Apply various methods of load flow studies to analyse AC power system network.
				Analyse AC-DC power system network by using power flow analysis method..

12.	<b>VII</b>	<b>EE4233</b>	<b>Power System Optimization</b>	Describe the need of power system optimization.
				Formulate power system optimization problem.
				Apply numerical and heuristic technique to solve power system optimization problem.
				Solve power system optimization problem.
				Assess the impact of parameters on defined optimization problem
13.	<b>VII</b>	<b>EE4253</b>	<b>Battery Management System</b>	Discuss BMS for various applications.
				Compare various batteries for specific applications
				Illustrate battery parameters and battery testing
				Explain battery management methods for a given system
				Illustrate thermal management and aging of batteries for electric vehicles
14.	<b>VII</b>	<b>EE4273</b>	<b>Advanced Power Electronics</b>	Design mathematical model of various converters.
				Analyze AC voltage controllers and resonant converters.
				Describe Switched mode power converters.
				Apply knowledge of inverters for various electrical applications
				Select power electronic conditioners and filters for Power Quality Improvement.
15.	<b>VII</b>	<b>EE4513</b>	<b>Power System Protection Laboratory</b>	Explain different types of power system schemes.
				Compare the Electromagnetic, static and microprocessor based relays
				Describe Current-time and voltage-time characteristics of relays.
				Demonstrate faults on power system fault simulation panels
				Ensure the proper earthing system and safety precautions in Electrical systems
16.	<b>VII</b>	<b>EE4533</b>	<b>Electrical Drives Lab</b>	Demonstrate AC and DC drives, fed from various power electronics converters

				Examine closed loop control of electrical drive system
				Analyze performance of electrical drives by plotting speed-torque characteristics
				Compare performance of electrical drives using speed-torque characteristics
				Simulate AC and DC drives, fed from various power electronics converters
17.	<b>VII</b>	<b>EE4553</b>	<b>Wind Solar Lab</b>	Prepare report on wind resource assessment
				Operate and maintain squirrel cage and DFIG based systems.
				Compute reactive power requirement for standalone wind turbine system
				Demonstrate the effects of shadowing on PV modules
				Identify the installation materials for off grid PV systems
18.	<b>VII</b>	<b>EE4573</b>	<b>Control and Automation Lab</b>	Design relay logic-based control system for the given applications.
				Implement IEC based programming languages for various PLCs
				Develop Relay Logic Ladder for the real-time PLC based control applications.
				Study SCADA based GUI system for the real time applications.
				Use HMI to develop GUI based monitoring system of the real time applications.
19.	<b>VII</b>	<b>EE4593</b>	<b>Capstone Project Phase-II</b>	Devise sound technical knowledge, for identified problem of project.
				Propose engineering solution to complex problems.
				Demonstrate the skills and attitude in professional way in a team.
				Illustrate the component and cost optimization solutions wherever applicable.
				Develop skills towards the use of modern tools and presentations.

				Justify outcomes through simulation/ experimentation in environmental and sustainable way.
				Summarize project report in an ethical way
20.	<b>VIII</b>	<b>OE4381</b>	<b>Finance for Engineers (Online Course)</b>	Discuss the fundamental aspects of accounting and finance.
				Apply theoretical knowledge and information for preparing various financial statements.
				Analyze the financial information for solving managerial problems.
				Evaluate financial performance of the organization for effective decision making.
21.	<b>VIII</b>	<b>OE4361</b>	<b>Engineering Management &amp; Economics (Online Course)</b>	Develop administrative, organizational and planning skills to execute engineering project.
				Develop bar chart/mile stone chart for the project.
				Analyze profit/cost data and carry out economic analysis to take optimal decision.
				Calculate depreciation as per various methods.
22.	<b>VIII</b> <b>VIII</b>	<b>IP4023</b>	<b>Internship &amp; Project</b>	<b>Internship</b>
				Examine the functioning of the company on the terms of inputs, transformation process and the outputs (products and services)
				Develop an attitude to adjust with the company culture, work norms, code of conduct.
				Recognize and follow the safety norms, Code of conduct.
				Demonstrate the ability to observe, analyse and document the details as per the industry practices.
				Interpret the processes, systems and procedures and to relate to the theoretical concepts- studies.
				Develop the leadership abilities, communication.
				Demonstrate project management and finance sense
				<b>Project</b>

				<p>1. Identify the project/problem in the domain of a program relevant for the company.</p> <p>2. Compile the information to the pertaining to the problem identified.</p> <p>3. Analyse the information using the statistical tools/ techniques.</p> <p>4. develop the feasible solution for given problem.</p> <p>5. Analyse the impact of the project on the performance of company/department.</p>
23.	<b>VIII</b>	<b>RE4043</b>	<b>Research Project</b>	<p>Investigate the technical literature.</p> <p>Recognize and evaluate theories, practices, and/or research on a chosen topic by conducting a thorough literature review and submitting a written integrative, critical summary of the current literature.</p> <p>Design a research problem and develop a methodology.</p> <p>Develop and implement an advanced original research or creative project.</p> <p>Develop the ability to explain the conceptual viability of the project and describe the major components involved.</p> <p>Develop the ability to explain how the project will impact the relevant body of work.</p> <p>Develop advanced discipline-relevant skills and competencies.</p> <p>Construct an accurate record of research performed.</p> <p>Write a research report and paper.</p>
24.	<b>VIII</b>	<b>ED4103</b>	<b>Project Management</b>	<p>Prepare business Plan for selected business.</p> <p>Make risk analysis&amp; market analysis of selected project.</p> <p>Make risk analysis&amp; market analysis of selected project</p> <p>Make financial appraisal of selected project.</p>
25.	<b>VIII</b>	<b>ED4043</b>		Interpret basic Financial Terminologies.

			<b>Commercial Aspects of the Project</b>	Prepare & analyze financial statements.
				Prepare financial Plan for venture.
				Apply basic principles of marketing for various products.
				Prepare market survey.
				Apply knowledge of marketing management for selected business.
26.	<b>VIII</b>	<b>ED4062</b>	<b>Entrepreneurship Development Program (EDP)</b>	Apply knowledge of engineering, economics, marketing and finance for formulation of business plan, starting & managing new business.
27.	<b>VIII</b>	<b>ED4083</b>	<b>Entrepreneurship Development Project</b>	Apply knowledge of engineering, economics, marketing and finance for preparation of project report.
				Make commercial, technical and financial appraisal of project.

- **Department Name:Electrical Engineering**
- **PG Program Name:Power System and Power Electronics**
- **Vision and Mission :-**

Vision of the Department: Develop globally competent electrical engineers to serve future needs and challenges of the society

- **Mission of the Department:** To inculcate teaching and learning processes to promote state-of-the-art service in electrical industries to address local and global challenges.
- To integrate academics, research, and entrepreneurship skills in the domain of electrical engineering to address the present and future challenges of society.
- To develop professionalism with strong foundations in adopting change in environmental technology.

<b>Sr. No.</b>	<b>Program Outcomes</b>
1.	To independently carry out research /investigation and development work to solve practical problems.
2.	To write and present a substantial technical report/document.
3.	To demonstrate a degree of mastery over the area of power systems and power electronics.
4.	To collaborate, work harmoniously in teams and address multidisciplinary issues with consideration of professional, legal, and ethical concerns.
5.	To use advanced techniques, skills, and modern engineering tools with financial aspects.
6.	To learn continuously, independently and update knowledge & skills

<b>Course Code</b>	<b>Course</b>	<b>COs</b>	<b>Course Outcome</b>
SH 515	Numerical Computational Techniques	CO1	Estimate the error.
		CO2	Apply the relevant numerical method for interpolating the polynomial
		CO3	Develop the equation to be fitted and fit the curve for given data
		CO4	Estimate numerically the solution of given algebraic equation.
		CO5	Use the relevant method for solving the simultaneous linear equations and compute the Eigen values.
		CO6	Construct the fuzzy set for given linguistic variable and apply fuzzy logic.

Course Code	Course	COs	Course Outcome
EPP1010	Computer Aided Power System Analysis	CO1	Develop mathematical models of various components of power system
		CO2	Identify different variables and constants associated with load flow studies
		CO3	Apply various methods of load flow studies to compute unknown variables
		CO4	Compare different methods of load flow studies
		CO5	Solve load flow problem by writing computer program .
EPP1020	Electric and Hybrid Electric Vehicles	CO1	Discuss the trends and philosophy of electric vehicles
		CO2	Analyze Conventional Vehicles and Powertrains
		CO3	Discuss the electric drive mechanism.
		CO4	Classify hybrid electric vehicles
		CO5	Differentiate Electric and range-extended electric vehicles
		CO6	Describe plug-in hybrid electric vehicles and electrical infrastructure
EPP1030	Wind and Solar Energy Technology	CO1	Describe the principle of energy generation from wind and solar PV systems
		CO2	Formulate wind and solar energy systems by mathematical equations
		CO3	Assess energy produced from wind and solar energy systems.
		CO4	Compare the different methods of energy generation from wind and energy systems
		CO5	Develop economic analysis of a wind turbine and solar PV systems
EPP1040	Advanced Power Electronics Systems	CO1	Classify different type's converters with respect to power output, configuration and application.
		CO2	Compare different types of power converters
		CO3	Describe the working principle of different types of power converters
		CO4	Model different types of power converters mathematically.
		CO5	Design pore converter for specific application.
EPP1050	Distribution Automation	CO1	Prepare layout of the substations and feeders considering load and desired voltage
		CO2	Design distribution system and associated equipment and devices.
		CO3	Identify an appropriate method of communication for any particular distribution system with a view of automation.
		CO4	Evaluate the economic aspects of any distribution system with automation
		CO5	Explain the importance of automation and SCADA



Course Code	Course	COs	Course Outcome
EPP1060	HVDC Transmission	CO1	Justify the need of HVDC Transmission system for power transmission
		CO2	Analyze different working modes of converters used for HVDC transmission
		CO3	Compare different control schemes employed for controlling HVDC system
		CO4	Compute the filter parameters for elimination of voltage and current harmonics in HVDC system
		CO5	Draw and compare different configuration multi-terminal HVDC system
EPP1070	Power Electronics Application to Power System	CO1	Classify different power electronics systems deployed for performance improvement of power system
		CO2	Analyze power quality issues in power system
		CO3	Identify suitable power electronic solutions for specific power system problems.
		CO4	Compare performance of different power electronics devices used for power system compensation problems
		CO5	Design suitable power electronic system for specific power system problem related to reactive power compensation
EPP1080	Smart Grid Technologies	CO1	Discuss the smart grid in Indian perspective
		CO2	Explain various smart grid technologies.
		CO3	Describe smart meters and advance metering infrastructure.
		CO4	Compare Smart grid and microgrid
		CO5	Apply power quality management in smart grid
		CO6	Identify communication technologies for smart grid
EPP1090	Power System Steady State Analysis Lab	CO1	Develop script to analyze symmetrical components using power system software.
		CO2	Analyze load flow and fault studies of given power system network using power system software.
		CO3	Develop MATLAB programme for power system optimization problem
		CO4	Develop estimation algorithm using least square methods.
		CO5	Use various power system software packages to analyze power system networks
EPP1100	Renewable Energy Lab	CO1	Prepare report on wind resource assessment
		CO2	Operate and maintain squirrel cage and DFIG based systems.
		CO3	Compute reactive power requirement for standalone wind turbine system
		CO4	Demonstrate the effects of shadowing on PV modules

Course Code	Course	COs	Course Outcome
		CO5	List the installation materials for off grid PV systems
EPP2010	Power System Dynamics and Stability	CO1	Describe power system operating states and control
		CO2	Analyze synchronous machine models
		CO3	Model excitation and prime mover system
		CO4	Classify power system stability
		CO5	Describe transient and voltage stability
EPP2020	Advanced Control of Electric Drives	CO1	Justify the need of closed loop drive system for industrial applications.
		CO2	Explain the working principle of different types of drive system.
		CO3	Compare different types of electric drives.
		CO4	Develop mathematical models of electric drive system for specific application.
		CO5	Design controllers for closed-loop operation of different types of electrical motors.
EPP2030	Grid Integration of Renewable Energy Sources	CO1	Summarize the grid codes for integration of renewable energy sources
		CO2	Explain the working principle of different power electronic topologies and controllers.
		CO3	Model mathematically renewable energy sources and associated control system
		CO4	Design systems to reduce impact of renewable energy fluctuations on grid
		CO5	Decide control strategy for PV renewable systems distribution system for voltage profile improvement
EPP2040	Digital Protection of Power Systems	CO1	Discuss the importance of power electronics devices in power system protection.
		CO2	Distinguish between conventional relays and modern relays
		CO3	Apply mathematical approach towards protection
		CO4	Develop algorithms for numerical protection
		CO5	Explore recent advances in digital protection of power systems
EPP2050	Power System Optimization	CO1	Explain the need of power system optimization
		CO2	Formulate power system optimization problem
		CO3	Apply numerical and heuristic technique to solve power system optimization problem.
		CO4	Solve power system optimization problem
		CO5	Assess the impact of parameters on defined optimization problem.
EPP2060	Restructured Power System	CO1	Describe the new dimensions associated with the power systems.
		CO2	Determine transmission congestion management
		CO3	Discuss pricing of transmission network

Course Code	Course	COs	Course Outcome
		CO4	Explain ancillary service management in electrical market
		CO5	Justify the role and functions of PX, IEX and various organization in Indian restructured power market
EPP2070	Power Quality and Harmonics	CO1	Discuss various power quality problems and their analysis.
		CO2	Classify various voltage quality issues and solutions.
		CO3	Describe Power Quality Standards and Monitoring.
		CO4	Asses sources of harmonic in power system
		CO5	Analyze effects of Harmonics on Power system
		CO6	Design of harmonic filters.
EPP2080	Energy Storage Systems	CO1	Discuss the energy storage as a structural unit of a power system.
		CO2	Compare various energy storage technologies for power systems.
		CO3	Apply battery energy storage and management for power system.
		CO4	Describe hydrogen energy storage for power system.
		CO5	Discuss short-term, mid-term and long-term applications of power system.
		CO6	Analyze economics and reliability of energy storage Systems
EPP2090	Research Methodology and IPR	CO1	Formulate a research problem.
		CO2	Analyze research related information
		CO3	Prepare and present research proposal/paper by following research ethics
		CO4	Make effective use of computers and computing tools to search information, analyze information and prepare report.
		CO5	Describe nature and processes involved in development of intellectual property rights
EPP2100	Power System Protection Lab	CO1	Analyze characteristics of digital relays
		CO2	Demonstrate fault simulation on different protection panels
		CO3	Develop an algorithm for different protection schemes
		CO4	Simulate protection models in MATLAB, E-tap
		CO5	Interpret the simulation results
EPP2110	Advanced Electric Drives Lab	CO1	Demonstrate control of Induction motor drive.
		CO2	Experiment with chopper fed DC drive system.
		CO3	Experiment with three phase half and full converter fed DC motor drive.
		CO4	Demonstrate control of BLDC, servo and stepper motor drive system.

Course Code	Course	COs	Course Outcome
		CO5	Demonstrate control of AC and DC drives using MATLAB/SIMULINK.
SHP 551	Technical Communication	CO1	Acquire skills required for good oral and written communication
		CO2	Demonstrate improved writing and reading skills
		CO3	Ensure the good quality of oral and written communication
EPP2120	Mini Project	CO1	Formulate a real world problem.
		CO2	Design solution for a set of requirements.
		CO3	Use software packages available to analyze the proposed theory.
		CO4	Explain technical ideas, strategies and methodologies in written form and oral presentations
EPP3010	Industry Internship	CO1	Apply engineering knowledge learned during the program.
		CO2	Apply his/her technical skills to solve industrial problem.
		CO3	Work in multi-disciplinary environment.
EPP3020	MOOC Course	CO1	Identify the real applications and practices of courses studies, at industry level
		CO2	Recognize various modeling, analysis and validation techniques adopted at industries
		CO3	Demonstrate the issues at design, manufacturing and assembly levels
		CO4	Summarize and present technical data in report format
EPP3030	Dissertation Phase-I	CO1	Identify research opportunities in his/her domain or multidisciplinary domains.
		CO2	Formulate the problem statement and its objectives correctly
		CO3	Apply the principles of project management during development of the project
		CO4	Present report in logical order
		CO5	Write report of the system implementation
EPP3040	Dissertation Phase-II	CO1	Identify research opportunities in his/her domain or multidisciplinary domains.
		CO2	Formulate the problem statement and its objectives correctly
		CO3	Develop, simulate and implement the system by complying with desired technical specifications
		CO4	Analyze and synthesize obtained results in theoretical and practical context
		CO5	Present report in logical order
		CO6	Write report of the system implementation
EPP4010	Dissertation Phase –III	CO1	Formulate the problem statement and its objectives correctly

<b>Course Code</b>	<b>Course</b>	<b>COs</b>	<b>Course Outcome</b>
		CO2	Develop, simulate and implement the system by complying with desired technical specifications
		CO3	Analyze and synthesize obtained results in theoretical and practical context
		CO4	Present report in logical order
		CO5	Write report of the system implementation
		CO6	Apply the principles of project management during development of the project
EPP4020	Dissertation Viva-Voce	CO1	Formulate the problem statement and its objectives correctly
		CO2	Develop, simulate and implement the system by complying with desired technical specifications
		CO3	Analyze and synthesize obtained results in theoretical and practical context
		CO4	Present report in logical order
		CO5	Write report of the system implementation
		CO6	Apply the principles of project management during development of the project

# **Electronics and Telecommunication Engineering**

- **Department Name :-Electronics and Telecommunication Engineering**
- **UG Program Name :-B. Tech. Electronics and Telecommunication Engineering**
- **Vision and Mission :-**

<b>Vision</b>	Promote excellence in the field of Electronics & Telecommunication Engineering and allied areas through quality education and research to provide valuable assets for industry and society with global perspective
<b>Mission</b>	<ul style="list-style-type: none"> <li>• To provide quality education through industry ready curriculum, effective teaching learning process and stateof-art infrastructure to develop global competency.</li> <li>• To inculcate research aptitude leading to patents and publications in refereed journals.</li> <li>• To imbibe professional ethics, leadership skills, social, cultural &amp; environmental awareness with a passion for lifelong learning.</li> <li>• To strengthen relationships with industry, society, government bodies and alumni</li> </ul>

<b>Sr. No.</b>	<b>Program Outcomes</b>
61.	1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
62.	2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
63.	3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
64.	4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
65.	5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
66.	6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
67.	7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
68.	8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
69.	9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
70.	10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design

	documentation, make effective presentations, and give and receive clear instructions.
71.	11. Project management and finance: Demonstrate knowledge and understanding of the Engineering and management principles and apply these to ones own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
72.	12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Sr. No.	Program Specific Outcomes
3.	Knowledge of Communication Engineering: Demonstrate the knowledge of communication engineering and its tools for the purpose of research, development and testing of main or subsystems in electronics domain.
4.	Knowledge of Embedded Systems: Integrate the hardware and programming for the development of embedded systems.
5.	Knowledge of Signal Processing: Analyze set of data in the form of various kinds of signals for the purpose of research, design and development of electronic systems.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1	I	EC2053	Analog Communication	CO:1 Describe different communication systems
				CO:2 Solve problems based on various communication systems
				CO:3 Analyze different modulation-demodulation techniques
				CO:4 Evaluate performance parameters of communication systems
				CO:5
2	I	EC2133	Analog Communication lab	CO:1 Demonstrate different modulation and demodulation waveforms in time and frequency domain.
				CO:2 Analyse different modulation-demodulation techniques
				CO:3 Interpret result and prepare report
				CO:4
				CO:5
	III	EC2012	Electronics Devices	Describe fundamentals of semiconductor devices
				Explain working principle of various solid state devices
				Illustrate various applications of electronics devices
				Analyze different biasing circuits and frequency models



	EC2032	Digital System Design	State fundamental knowledge of digital design
			Apply knowledge for real-time application
			Illustrate combinational and sequential circuits
			Design combinational and sequential circuits
	EC2052	Analog Communication	1. Describe the basic concepts of communication systems.
			2. Solve problems based on different communication signals.
			3. Develop simple systems for generating and demodulating am and fm signals.
			4. Explain different types of pulse modulation systems.
			5. Compare the performance of various modulation systems
	EC2072	Network Theory	Analyze ac & dc circuits
			Illustrate resonance in series & parallel circuit
			Calculate different parameters of electrical circuits
			Design analog passive filters & attenuators
	SH2112	Engineering Mathematics III	Build and test circuit as per the requirement
			Observe and plot the frequency response of amplifier
			Interpret results of experiment and compared with measured values
			Communicate results and observations and write report
EC2092	Comprehensive Exam I	Demonstrate overall understanding of core subjects together.	
		Manage time to solve critical problems in core subjects.	
		Apply appropriate mathematical tools and techniques for quick analysis of the problem.	
		Understand self intellectual level to prepare for future competitive exam.	
EC2112	Electronics Devices Lab	Build and test circuit as per the requirement	
		Observe and plot the frequency response of amplifier	

				Interpret results of experiment and compared with measured values		
				Communicate results and observations and write report		
				EC2132	Digital System Design Lab	Apply boolean laws/k-map-method to reduce a given boolean function
						Demonstrate the operation of combinational and sequential circuits for various practical applications
						Interpret results and compare with experimental values
						Communicate effectively through lab journals
				EC2152	Analog Communication Lab	Analyze & design simple analog communication systems
						Illustrate amplitude and frequency modulation and demodulation methods
						Draw different modulation and demodulation waveforms and frequency spectrums.
						Demonstrate different types of pulse modulation systems
Conduct the experiments in group and write reports.						

1	II	EC2083	Signals & Systems	CO:1 Describe mathematical description and representation of continuous time and discrete time signals & systems.
				CO:2 Determine the response of LTI systems using Convolution.
				CO:3 Apply knowledge of transform theory techniques for signal and system analysis.
				CO:4 Analyze signals and systems in frequency domain using Fourier transform.
				CO:5 Demonstrate use of MATLAB to manipulate signals and systems.
2	II	EC212	Linear Integrated Circuit & Applications	CO:1 Describe fundamentals of Linear Integrated Circuits.
				CO:2 Analyse different AC and DC parameters of Operational Amplifier.
				CO:3 Design various applications of Operational Amplifier.
				CO:4 Elaborate fundamentals and applications of special Integrated Circuits.

3	II	EC220	Linear Integrated Circuits & Applications Lab	CO:1 Analyze different parameters of various configurations of Op-Amp.
				CO:2 Design various applications of Op-Amp.
				CO:3 Interpret theoretical and practical results.
				CO:4 Communicate effectively through lab journals.
4	II	EC2042	Microcontroller	CO:1 Describe basic fundamentals of pic microcontroller
				CO:2 Write programs for pic microcontroller
				CO:3 Interface peripherals with pic microcontroller
				CO:4 Develop an embedded application using pic microcontroller
				CO:5
5	II	EC2142	Microcontroller Lab	CO:1 Install configure and utilize the mlab tool for pic microcontroller programming.
				CO:2 Write programs for pic microcontroller
				CO:3 Compile debug and test programs for pic microcontroller
				CO:4 Develop application using pic microcontroller
				CO:5

1	I	EC315	VLSI Testing & Verification	CO:1 Apply techniques to improve testability of VLSI circuits.
				CO:2 Use logic simulation methods, ATPG, BIST and boundary scan techniques in testing of VLSI circuits.
				CO:3 Analyze design of VLSI circuits by application of functional, timing and formal verification methods.
2	I	EC311	Information Theory and Coding	CO:1 Explain different concepts in information theory and coding.
				CO:2 Solve numerical on information theory, source coding and channel coding and error control coding.
				CO:3 Apply various theorems of encoding, error control etc. on signals.
				CO:4 Analyse various channel coding and error control techniques.
				CO:5

IV	CE2262	Engineering Mechanics	Identify various forces and their effects, to analyze real life problems
			Analyze engineering problems applying conditions of equilibrium
			Determine centroid & moment of inertia of the geometrical plane lamina
			Apply fundamental concepts of kinematics and kinetics to analyze practical problems
	EC2022	Analog Circuits	Interpret different parameters of various configurations of Operational Amplifier
			Analyze various applications of Operational Amplifier
			Explain various oscillators and active filters
			Illustrate waveform generators using special IC s
	EC2042	Microcontrollers	1. Describe basic fundamentals of pic microcontroller
			2. Write programs for pic microcontroller
			3. Interface peripherals with pic microcontroller
			4. Develop an embedded application using pic microcontroller
	EC2062	Digital Communication	Explain different concepts of digital communication systems
			Solve numerical on statistical theory, source coding & channel coding
			Apply various theorems of encoding, error control etc on signals
			Analyze various digital modulation and channel coding techniques
	EC2082	Signals and Systems	Classify continuous and discrete-time signals and systems
Illustrate use of convolution and impulse response in lti systems			
Apply mathematical techniques to represent signals and systems			
Make use of transform theory techniques for system analysis			
Distinguish fourier techniques for frequency-domain analysis			
EC2102	Comprehensive Exam II	Demonstrate overall understanding of core subjects together.	
		Manage time to solve critical problems in core subjects.	

		Apply appropriate mathematical tools and techniques for quick analysis of the problem.
		Understand self intellectual level to prepare for future competitive exam.
CE2282	Engineering Mechanics Lab	Identify various forces and their effects, to analyze real life problems
		Analyze engineering problems applying conditions of equilibrium
		Determine centroid & moment of inertia of the geometrical plane lamina
		Apply fundamental concepts of kinematics and kinetics to analyze practical problems
EC2122	Analog Circuits Lab	Analyze different parameters of various configurations of Operational Amplifier
		Design various applications of Operational Amplifier
		Interprete theoretical & practical results
		Communicate effectively through lab journals
EC2142	Microcontrollers Lab	1. install configure and utilize the mplab tool for pic microcontroller programming.
		2. write programs for pic microcontroller
		3. compile debug and test programs for pic microcontroller
		4. develop application using pic microcontroller
EC2162	Digital Communication Lab	Calculate PDF, CDF, mean and variance of continuous and discrete random variables using simulation tool
		Demonstrate different modulation and shift keying techniques
		Write necessary reports and conduct the experiments in group
SH2172	Environmental Science	Interpret impacts of human activities on natural resources and its control measure
		Apply ecological knowledge to solve environmental problems
		Select the appropriate technology to control environmental pollution
		Plan waste management and disaster management practices.

		Justify methods to assess impacts of developmental activities on environment.
		Analyze environmental change and its social impacts

V	EC3012	Digital Signal Processing	Relate effect of computation accuracy on performance of digital signal processing system
			Represent signals mathematically in continuous and discrete-time, and in the frequency domain.
			Analyze discrete-time systems using z-transform
			Describe the Discrete-Fourier Transform (DFT) and the FFT algorithms.
			Design digital filters for various applications.
	EC3032	Power Electronics	Discuss characteristics, ratings and drive circuits of the power devices
			Analyze the operation of power electronics converters, inverters and drives
			Determine performance parameters of the converters and inverters
			Design switching control circuit to meet desired specifications.
	EC3052	Product Design	Describe the stages of product design and development
			Apply various concepts for product design.
			Devise product testing methods.
			Explain the processes and importance of documentation.
	EC3072	Electromagnetic Waves & Antenna Theory	Apply the knowledge of vector algebra and co-ordinate system to formulate and solve electromagnetic field problems.
			Use and apply basics of electric and magnetic fields to solve the electrostatics and magnetostatics problems.
			Solve transmission line and Wave propagation problems.
			Explain basics of antennas.
EC3092	Program Elective - I ECS_ ITC	Able to use Mathematics,investigate existing techniques-To have electronics systems	
		Analyze coding techniques with mathematics using different software-To Demonstrate in systems	

			Apply research based knowledge of coding.- To Analyze the system	
			Analyze coding and error correction techniques considering ethical aspects and communicate effectively by demonstrating engineering principles with life long learning.-Demonstrate effectively	
	EC3172	Program Elective - I CS		Identify different mathematical models of the control systems
				Design and analyze the system parameters to meet performance specifications in time and frequency domain.
				Comment on stability of control system using different methods
				Compare different control system and compensators
	EC3192	Comprehensive Exam III		Demonstrate overall understanding of core subjects together.
				Manage time to solve critical problems in core subjects.
				Apply appropriate mathematical tools and techniques for quick analysis of the problem.
				Understand self intellectual level to prepare for future competitive exam.
	EC3212	Digital Signal Processing Lab		Design and simulate the working of given digital signal processing techniques
				Describe techniques available for implementation of digital signal processing system
				Write relevant conclusion on the performance of designed digital signal processing system
				Present and write laboratory reports in desired format in grammatically correct language
	EC3232	Power Electronics Lab		Interpret v-i characteristics of power electronics devices
				Experiment power electronics converter for various conditions
				Design and test power electronic converter.
Write report on the conduction of experimentation.				

	EC3235	Object Oriented Programming using C++ Lab	Write, debug, and test basic cpp codes using the object oriented approaches introduced in the course.
			Discuss and analyze c++ problems in an object-oriented programming tool.
			Evaluate the performance of developed c++ program.
			Present and write laboratory reports in desired format in grammatically correct language.
	EC3272	Antenna Lab	Measure and analyze the parameters of the different antennas
			Design and Simulate different types of Antennas using Electromagnetic Field solver
			Analyze the performance of the different types of antennas
			Demonstrate ability to work effectively in a team
	SH3032	Aptitude Training I	Develop thorough conceptual understanding and logical approach towards solving Aptitude and Reasoning problem.
			Write use of basic aptitude terms of percentage, average, ratios and application of business aptitude terms of profits and interests.
			Develop a bridge in analogies, series and visualizing directions.
	EC3292	Summer Internship	Demonstrate skills to use modern engineering tools, software, and equipment to solve real world problems.
			Apply knowledge of professional and ethical responsibilities.
			Communicate in verbal and written form.
			Write a detailed report on Summer Internship

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1	I	EC4013	Computer Network	CO:1 Describe the networking concepts
				CO:2 Formulate Algorithms of error correction and congestion
				CO:3 Analyze the performance of the network by implementing various algorithms
				CO:4 Illustrate network security aspects.



				CO:5 Design network for specific application
2	I	EC4192	Computer Architecture	CO:1 Describe computer architecture concepts and mechanisms related to the design of modern processors, memories, and networks and explain how these concepts and mechanisms interact.
				CO:2 Evaluate various design alternatives and make a compelling quantitative and/or qualitative argument for why one design is superior to the other approaches.
				CO:3 Demonstrate the ability to implement and verify designs of varying complexity at the register-transfer-level.
				CO:4 Communicate with i/o devices and standard i/o interfaces.
				CO:5 Create new designs at the register-transfer-level and the associated effective testing strategies.
3	I	EC4132	Biomedical Electronics	CO:1 Analyze the biological processes like other electronic processes
				CO:2 Recognize the application of the electronic systems in biological and medical applications.
				CO:3 Signify the importance of safety aspects in the medical field

- **Department Name :-Electronics and Telecommunication Engineering**
- **UG Program Name :-M. Tech. Electronics**
- **Vision and Mission :-**

<b>Vision</b>	Promote excellence in the field of Electronics & Telecommunication Engineering and allied areas through quality education and research to provide valuable assets for industry and society with global perspective
<b>Mission</b>	<ul style="list-style-type: none"> <li>• To provide quality education through industry ready curriculum, effective teaching learning process and state-of-art infrastructure to develop global competency.</li> <li>• To inculcate research aptitude leading to patents and publications in refereed journals.</li> <li>• To imbibe professional ethics, leadership skills, social, cultural &amp; environmental awareness with a passion for lifelong learning.</li> <li>• To strengthen relationships with industry, society, government bodies and alumni</li> </ul>

<b>Sr. No.</b>	<b>Program Outcomes</b>
19.	<p>PO1:An ability to independently carry out research /investigation and development work to solve practical problems.</p> <p>PO2:An ability to write and present a substantial technical report/document.</p> <p>PO3:Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.</p> <p>PO4:Adapt professional, ethical and moral responsibilities.</p> <p>PO5:Use knowledge of Project Management and Finance to tackle administrative responsibilities.</p> <p>PO6:Explore ideas and engage in lifelong learning.</p>

<b>Sr. No.</b>	<b>Semester</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Course Outcome</b>
1	I	EEE1175	Research methodology	CO:1 Formulate a research problem
				CO:2 Analyze research related information
				CO:3 Prepare and present research proposal/paper by following research ethics
				CO:4 Describe nature and processes involved in development of intellectual property rights

				CO:5
2	I	EEE1015	Industrial Automation	CO1. Explain the functions of components of industrial automation system
				CO2. Write PLC ladder programs for the given applications
				CO3. Interface the given I/O devices with the PLC module
				CO4. Design an automation system for industrial applications
				CO:5

# **Information Technology**

- **Department Name :- Information Technology**
- **UG Program Name :- B. Tech. in Computer Science and Information Technology**
- **Vision and Mission :-**
  - **Vision:** To become a prominent department of Information Technology producing competent IT professionals with research and innovation skills, inculcating moral values and societal concerns.
  - **Mission:**
    - To offer high quality education through state of art curriculum and innovative teaching & learning practices.
    - To establish state of art laboratories and center of excellence in the field of technology.
    - To adopt professional practice, standards and values.
    - To inculcate problem solving aptitude in graduates with lifelong learning skills to become valuable resource for IT industry and society.
    - To create, share, and apply knowledge in Computer Science and Information Technology, including in interdisciplinary areas that extend the scope of Computer Science and Information Technology to benefit society.

Sr. No.	Program Outcomes
73.	<b>PO1: Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and IT engineering specialization to the solution of complex engineering problems.
74.	<b>PO2: Problem analysis:</b> Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.
75.	<b>PO3: Design/Development of solutions:</b> Design and develop IT solutions using domain knowledge for engineering problems that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
76.	<b>PO4: Conduct investigations of problems:</b> Use fundamental knowledge and engineering skills including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
77.	<b>PO5: Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
78.	<b>PO6: The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

79.	<b>PO7: Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.
80.	<b>PO8: Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
81.	<b>PO9: Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
82.	<b>PO10: Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions..
83.	<b>PO11: Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
84.	<b>PO12: Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Sr. No.	Program Specific Outcomes
6.	<b>PSO1:</b> Apply advanced computational algorithms and methodologies across diverse domains to formulate and solve complex engineering problems effectively, demonstrating proficiency in interdisciplinary thinking and problem-solving skills.
7.	<b>PSO2:</b> Employ state-of-the-art software engineering principles and practices to conceptualize, design, and implement robust and scalable IT solutions for a variety of application domains, ensuring high quality and adherence to industry standards and best practices.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1.	III	CI2012	Discrete Mathematics	<ol style="list-style-type: none"> <li>1. Evaluate logic statements using the properties of logic.</li> <li>2. Apply the concepts in discrete data structures such as sets, relations and functions to solve the problems.</li> <li>3. Use elementary combinatorics to solve counting problems.</li> <li>4. Solve examples of lattices, algebraic structures.</li> <li>5. Prove the theorems and properties of lattices, algebraic structures, graphs.</li> </ol>

				6. Apply graph theory concepts to solve problems of connectivity.
2.		CI2032	Data Structures	<ol style="list-style-type: none"> <li>1. Describe the basic terminologies of data structures and algorithms</li> <li>2. Write algorithms for operations to be performed on data structures</li> <li>3. Demonstrate the working of stack, queue, linked list, tree and graph</li> <li>4. Compare static and dynamic representations of linear and non-linear data structures</li> <li>5. Choose appropriate data structures while developing solution to the problem</li> </ol>
3.		CI219	Digital Logic and Computer Organization	<ol style="list-style-type: none"> <li>1. Comprehend computer structure, types, operational concepts, performance, parallelism, history, and digital logic gates.</li> <li>2. Apply Boolean algebra concepts, perform binary arithmetic operations, understand number base conversions, analyse and manipulate different number representations, utilize various codes, and simplify logic functions using K-Maps up to 4 variables.</li> <li>3. Design combinational circuits and sequential circuits.</li> <li>4. Demonstrate proficiency in instruction set architecture, RISC and CISC instruction sets, instruction execution and branching.</li> <li>5. Explain the I/O organization principle and the memory system concepts.</li> <li>6. Describe the pipelining concepts.</li> </ol>
4.		CIMD201	Data Structures (MDM-I)	<ol style="list-style-type: none"> <li>1. Describe the basic terminologies of data structures.</li> <li>2. Examine the linear data structure array with its types.</li> <li>3. Demonstrate the working of stack, queue performed on data structures.</li> <li>4. Illustrate the working of linked list.</li> <li>5. Discuss Tree terminologies and their Applications.</li> <li>6. Elaborate Graph terminologies with their types.</li> </ol>
5.		SH2174	Environmental Science	<ol style="list-style-type: none"> <li>1. Apply interdisciplinary knowledge in environmental science by integrating concepts and principles from various fields of science and engineering to address environmental issues.</li> <li>2. Evaluate environmental impacts of human activities on ecosystems and on the environment.</li> <li>3. Use scientific approach to identify and solve environment related problems.</li> </ol>

				<ol style="list-style-type: none"> <li>4. Design sustainable solutions to address environmental challenges by considering renewable energy sources, waste management strategies conservation measures, and environmental policies.</li> <li>5. Participate in group work to become acquainted with the importance of teamwork, collaboration Develop presentation and report writing skills.</li> </ol>
6.		CI2052	Object Oriented Programming with Java Lab	<ol style="list-style-type: none"> <li>1. Explain the concepts and terminologies in object-oriented concepts and java programming language.</li> <li>2. Apply object-oriented programming features and concepts for solving given problem.</li> <li>3. Develop the java application using the collection framework to solve real word problem.</li> <li>4. Apply the concepts of package, multithreading and exception handling to develop efficient and error free codes.</li> <li>5. Use the lambda expression to iterate, filter and extract data from collection and streams to manipulate and transform the data.</li> </ol>
7.		CI2072	Data Structures Lab	<ol style="list-style-type: none"> <li>1. Describe the basic terminologies of data structures and algorithms</li> <li>2. Write algorithms for operations to be performed on data structures</li> <li>3. Implement stack, queue, linked list, tree and graph data structures in C language</li> <li>4. Compare static and dynamic representations of linear and non-linear data structures</li> <li>5. Choose appropriate data structures while developing solution to the problem</li> </ol>
8.		CI221	UI/UX Design Lab	<ol style="list-style-type: none"> <li>1. Apply the foundational concepts and principles of UI/UX design.</li> <li>2. Apply the design thinking process to identify user needs and problems.</li> <li>3. Create wireframes and prototypes using industry-standard design tools.</li> <li>4. Evaluate and improve the usability of digital interfaces.</li> </ol>



				<p>5. Demonstrate knowledge of responsive design techniques for different devices.</p> <p>6. Collaborate effectively within a design team and communicate design solutions clearly.</p>
9.		CI2092	Technical Aptitude-I	<p>1. Comprehend the knowledge gained in the course work.</p> <p>2. Demonstrate the ability in Problem Solving</p>
10.		SH2634	Professional Skills Development and Foreign Languages –I Professional Leadership Skills	<p>1. Explain the traits of a leadership through real life examples.</p> <p>2. Exhibit the ability to work effectively in team.</p> <p>3. Prepare a presentation as per the audience and context requirements</p>
11.		SH2614	Professional Skills Development and Foreign Languages -I- Interpersonal Skills	<p>1. Exhibit interpersonal communication skills.</p> <p>2. Demonstrate decision-making skills.</p> <p>3. Apply conflict resolution styles appropriate in different situations.</p> <p>4. Demonstrate skills to manage balance in work and life.</p> <p>5. Apply Jeevanvidya wisdom in day to day life.</p>
12.		SH2694	Professional Skills Development and Foreign Languages – I- Innovation Tools and Methods for Entrepreneur s	<p>1. Explain structured approach to define the problem with every possible detail, identify conflicts and solve them</p> <p>2. Apply User Journey Map to the selected problem to show user interaction at various stages</p> <p>3. Analyze the solutions provided by competitors for effectiveness and gaps if any.</p>
13.		SH2594	Professional Skills Development and Foreign Languages – I-- Personal Effectiveness	<p>1. Develop skills to build self-esteem and positive attitude.</p> <p>2. Develop interpersonal skills characterized by effective communication and conflict resolution.</p> <p>3. Discover ways to overcome procrastination.</p> <p>4. Demonstrate responsiveness towards stress and health issues.</p>

			and Body Language	5. Interpret the non-verbal behaviour of a person.
14.		SH2734	Open Elective-II Professional Skills Development and Foreign Languages — German Language-Level III	<ol style="list-style-type: none"> <li>1. Interpret the language if the next person is speaking slowly and clearly.</li> <li>2. Make use of the language in routine life with the routing topics like family, shopping, work etc.</li> <li>3. Demonstrate the language by self-introduction in German with simple sentences.</li> </ol>
15.		SH2714	Professional Skills Development and Foreign Languages — Japanese Language-Level-III	<ol style="list-style-type: none"> <li>1. Make use of basic conversations in various situations.</li> <li>2. Identify the sentence patterns.</li> <li>3. Explain insights about the communication required for living in Japan.</li> <li>4. Interpret Japanese work ethics required in their professional career.</li> </ol>
1.	IV	SH216	Mathematics for IT	<ol style="list-style-type: none"> <li>1. Compute Karl Pearson's Product moment correlation Coefficient and fit the lines of regression.</li> <li>2. Compute Discrete probability distribution, Continuous probability distributions and Joint probability distributions.</li> <li>3. Apply specific probability distributions to real-life examples.</li> <li>4. Compute the Mathematical formulas for the given fuzzy set.</li> <li>5. Prove additional properties of alpha-cuts and use extension principle to fuzzy sets.</li> <li>6. Apply extension principle to fuzzy arithmetic and solve fuzzy equations.</li> </ol>
2.		CI2022	Design and Analysis of Algorithms	<ol style="list-style-type: none"> <li>1. Analyzing asymptotically the performance of algorithms.</li> <li>2. Compare and analyze various searching and sorting algorithms.</li> <li>3. Apply different algorithm design techniques to solve problems like job sequencing, knapsack, TSP, finding shortest path etc.</li> <li>4. Apply backtracking method to solve problems like N-queens, graph coloring, sum of subsets etc.</li> <li>5. Describe computational complexity theory to classify computational problems according to their inherent difficulty.</li> </ol>

3.		CI2042	Software Engineering and Project Management	<ol style="list-style-type: none"> <li>1. Describe fundamental concepts in software engineering and project management</li> <li>2. Practice software process models for the undertaken software problems</li> <li>3. Design function-oriented and object oriented models using modern tools.</li> <li>4. Compare different software testing techniques and strategies.</li> <li>5. Apply the project management concepts for the undertaken software problems</li> <li>6. Illustrate concepts of project monitoring and control in software development</li> </ol>
4.		CI2062	Database Management Systems	<ol style="list-style-type: none"> <li>1. Describe the fundamental elements of relational database management systems.</li> <li>2. Design ER-models to represent simple database application scenarios.</li> <li>3. Write SQL/PL-SQL query to perform various operations on the database.</li> <li>4. Apply concepts of integrity constraints, Hashing and Indexing on databases.</li> <li>5. Illustrate the transaction management, concurrency control and crash recovery.</li> <li>6. Explain fundamentals of NoSQL (MongoDB) Database System.</li> </ol>
5.		CIMD20 2	Computer Algorithms (MDM-II)	<ol style="list-style-type: none"> <li>1. Analysing asymptotically the performance of algorithms.</li> <li>2. Compare and analyse searching and sorting algorithms.</li> <li>3. Apply different algorithm design techniques to solve problems like job sequencing, knapsack, TSP, finding shortest path etc.</li> <li>4. Apply backtracking method to solve problems like N-queens, graph coloring, sum of subsets etc.</li> <li>5. Describe computational complexity theory to classify computational problems</li> <li>6. according to their inherent difficulty.</li> </ol>
6.		SH202	Modern Indian Language मराठी भाषिक कौशल्यविकास	<ol style="list-style-type: none"> <li>१. भाषा आणि व्यक्तिमत्व विकास यांमधील सहसंबंध स्पष्ट करू शकेल</li> <li>२. भाषिक कौशल्यविकास करू शकेल</li> <li>३. कथा या मराठी साहित्य प्रकाराचे विश्लेषण करू शकेल</li> <li>४. एकांकिका या मराठी साहित्य प्रकाराच्या विश्लेषणाची क्षमता प्राप्त करेल</li> </ol>

7.		SH204	Modern Indian Language Hindi	<ol style="list-style-type: none"> <li>1. विद्यार्थियों में मानवीय संवेदनाओं के विकास के साथ नवीन सामाजिक सांस्कृतिक बोध और जीवन मूल्यों का विकास होगा।</li> <li>2. विद्यार्थियों में साहित्य के माध्यम से कलात्मक गुणों की अभिवृद्धि होगी कला की साहित्यिक विधाओं के प्रति अभिरुचि जागृत होगी तथा रचनात्मक कौशल्य को बढ़ावा मिलेगा।</li> <li>3. विद्यार्थियों में नए वैश्विक मूल्यों के प्रति सजगता को बढ़ावा मिलेगा एवं मूल्यवादी दृष्टि के प्रति दायित्व बोध उत्पन्न होगा। छात्र व्यवहार में हिंदी भाषा का उचित प्रयोग कर सकेंगे। छात्र व्यवहार में हिंदी भाषा का उचित प्रयोग कर सकेंगे।</li> </ol>
8.		CI218	Design and Analysis of Algorithms Lab	<ol style="list-style-type: none"> <li>1. Compare different algorithm design techniques.</li> <li>2. Apply various sorting techniques to sort the given numbers and analyze its time complexity.</li> <li>3. Implement divide and conquer technique to solve the problem and analyze its time complexity.</li> <li>4. Demonstrate algorithm design techniques like greedy, dynamic programming and backtracking to solve real world problems.</li> </ol>
9.		CI2082	Database Management Systems Lab	<ol style="list-style-type: none"> <li>1. Sketch E-R diagram for given Case Study/ Problem Statement.</li> <li>2. Write SQL query for various operations like retrieval, insertion and manipulation of data etc.</li> <li>3. Apply PL/SQL for implementing Cursor, Procedure/Function and Trigger.</li> <li>4. Design databases for given applications.</li> <li>5. Demonstrate basic commands of MongoDB with installation.</li> </ol>
10.		CI2102	Python lab	<ol style="list-style-type: none"> <li>1. Explain the concepts in python.</li> <li>2. Implement programs using loops, decision statements, python collections, functions and modules in python.</li> <li>3. Use object-oriented programming with classes using python.</li> <li>4. Apply data pre-processing for the given dataset using python.</li> <li>5. Plot data using appropriate Python visualization libraries.</li> <li>6. Perform the exploratory data analysis using python for the given dataset.</li> </ol>

11.		CI220	Web Development Lab	<ol style="list-style-type: none"> <li>1. Create well-structured web pages using HTML and apply the principles of semantic markup.</li> <li>2. Style web pages effectively using CSS, including layout design and responsive techniques.</li> <li>3. Implement client-side interactivity and dynamic content using JavaScript and jQuery.</li> <li>4. Utilize Bootstrap to develop responsive and mobile-first web applications.</li> <li>5. Set up and customize WordPress websites, managing content and plugins effectively.</li> <li>6. Build and deploy functional websites that integrate HTML, CSS, JS, Bootstrap, and WordPress.</li> </ol>
12.		CI2122	Technical Aptitude-II	<ol style="list-style-type: none"> <li>1. Comprehend the knowledge gained in the course work.</li> <li>2. Demonstrate the ability in Problem Solving</li> </ol>
13.		SH2634	Professional Skills Development and Foreign Languages  Professional Leadership Skills	<ol style="list-style-type: none"> <li>1. Explain the traits of a leadership through real life examples.</li> <li>2. Exhibit the ability to work effectively in team.</li> <li>3. Prepare a presentation as per the audience and context requirements</li> </ol>
14.		SH2614	Professional Skills Development and Foreign Languages  Interpersonal Skills	<ol style="list-style-type: none"> <li>1. Exhibit interpersonal communication skills.</li> <li>2. Demonstrate decision-making skills.</li> <li>3. Apply conflict resolution styles appropriate in different situations.</li> <li>4. Demonstrate skills to manage balance in work and life.</li> <li>5. Apply Jeevanvidya wisdom in day to day life.</li> </ol>
15.		SH2694	Professional Skills Development and Foreign Languages  Innovation Tools and	<ol style="list-style-type: none"> <li>1. Explain structured approach to define the problem with every possible detail, identify conflicts and solve them</li> <li>2. Apply User Journey Map to the selected problem to show user interaction at various stages</li> </ol>

			Methods for Entrepreneur s	3. Analyze the solutions provided by competitors for effectiveness and gaps if any.
16.		SH2594	Professional Skills Development and Foreign Languages  Personal Effectiveness and Body Language	1. Develop skills to build self-esteem and positive attitude. 2. Develop interpersonal skills characterized by effective communication and conflict resolution. 3. Discover ways to overcome procrastination. 4. Demonstrate responsiveness towards stress and health issues. 5. Interpret the non-verbal behaviour of a person.
17.		SH2644	Professional Skills Development and Foreign Languages  German Language- Level - IV	1. Interpret the language if the next person is speaking slowly and clearly. 2. Make use of the language in routine life with the routing topics like family, shopping, work etc. 3. Demonstrate the language by self-introduction in German with simple sentences.
18.		SH2624	Professional Skills Development and Foreign Languages  Japanese Language - Level-IV	1. To be able to make basic conversations in various situations. 2. To recognize the sentence patterns. 3. To improve Japanese Language proficiency. 4. To give students insights about the communication required for living in Japan. 5. To expose students to the Japanese work ethics required in their professional careers.
1.	V	CI3011	Operating Systems	1. Explain fundamental concepts in operating systems 2. Apply the concepts of operating systems for the given requirement 3. Select the appropriate algorithm such as scheduling, deadlock, page replacement or disk scheduling for devising solution to the given problem 4. Compare various operating system techniques 5. Justify findings of the given problem using operating system concepts

2.		CI3031	Database Management Systems	<ol style="list-style-type: none"> <li>1. Describe the fundamental elements of relational database management systems.</li> <li>2. Design a database using ER-models &amp; schema diagrams to represent simple application scenarios</li> <li>3. Write SQL/PL-SQL query to perform various operations on the database.</li> <li>4. Apply integrity constraints on databases.</li> <li>5. Apply concepts of indexing and hashing on databases to index and retrieve items in a database.</li> <li>6. Illustrate the transaction management, concurrency control and crash recovery.</li> </ol>
3.		CI3051	Design and Analysis of Algorithms	<ol style="list-style-type: none"> <li>1. Analyzing asymptotically the performance of algorithms.</li> <li>2. Compare various searching and sorting algorithms.</li> <li>3. Apply different algorithm design techniques to solve real life problems like change making problem, job sequencing, finding shortest path, etc.</li> <li>4. Identify appropriate algorithm design strategy that is applicable to a given contextual problem.</li> <li>5. Describe Computational complexity theory to classify computational problems according to their inherent difficulty.</li> </ol>
4.		CI3071	Program Elective-I - Organizational Management Behavior	<ol style="list-style-type: none"> <li>1. Describe the primary functions of management.</li> <li>2. Identify the financing process of the entrepreneurial business.</li> <li>3. Develop strategy with marketing and materials department.</li> <li>4. Present/Solve for the case study based on management and organizational behavior concepts.</li> <li>5. Describe the distinction between groups, social networks, and formal organizations.</li> <li>6. Identify the best culture for different types of organizations.</li> </ol>
5.		CI3091	Program Elective-I - IPR and Cyber Laws	<ol style="list-style-type: none"> <li>1. Describe fundamentals of Intellectual Property Rights.</li> <li>2. Justify Information Technology related Intellectual Property Rights.</li> </ol>

				<ol style="list-style-type: none"> <li>3. Interpret Ownership and Enforcement of Intellectual Property.</li> <li>4. Compare various cyber-attacks &amp; offenses.</li> <li>5. Analyze Indian IT Act 2000 &amp; amendments in IT Act</li> <li>6. Construct a strategy for creating awareness about cyber security for e-banking and legal issues among the social community.</li> </ol>
6.		CI3111	Program Elective-I - Software Modeling & Design	<ol style="list-style-type: none"> <li>1. Identify object classes and build the domain model using advanced concepts in object, dynamic and functional modeling.</li> <li>2. Apply different object-oriented design techniques.</li> <li>3. Design models using UML diagrams for software systems: use case, class, sequence, collaboration, activity, state chart diagrams, component and deployment.</li> <li>4. Design software systems using open source and advanced modeling tools.</li> <li>5. Evaluate designs of software systems in mini-projects, projects using Software Modeling &amp; Design concepts.</li> </ol>
7.		CI323	Program Elective-I - Internetworking Protocols	<ol style="list-style-type: none"> <li>1. Implement the client server programs for network services.</li> <li>2. Solve the problems related to IPv6 addressing.</li> <li>3. Illustrate the working of DHCP, DNS, TELNET, SSH, FTP and TFTP, WWW, Email.</li> <li>4. Compare different application layer protocols.</li> <li>5. Analyze the packet formats of different protocols.</li> </ol>
8.		CI3131	JAVA Programming Lab	<ol style="list-style-type: none"> <li>1. Explain the concepts and terminologies in java programming language</li> <li>2. Develop Java applications to address particular software needs by making use of collections frameworks.</li> <li>3. Create class hierarchy using Java inheritance and interface for given requirement.</li> <li>4. Implement programs on exception handling, packages, multithreading, file handling, database handling using IDE's</li> </ol>



				5. Design GUI based applications with event handling using AWT and Swing packages.
9.		CI3151	Database Management Systems Lab	6. Draw Schema Diagram on given problem statement. 7. Write SQL query for various operations like retrieval, insertion and manipulation of data etc. 8. Implement PL/SQL cursor, procedure/function and trigger. 9. Implement a program to connect databases to application programs. 10. Implement basic commands of MongoDB with installation.
10.		CI3171	Operating Systems Lab	1. Identify and use the basic and advanced commands in Unix 2. Practice simple and advanced filters of Unix system using regular expression 3. Implement shell scripts and shell programs for given problems 4. Practice user management administration in Unix
11.		SH3033	Scholastic Aptitude -I	1. Develop a logical approach towards solving Aptitude and Reasoning problems. 2. Analyze usage of basic aptitude terms of percentages, averages, ratios and applications of business aptitude terms of profits and interests 3. Develop a bridge in analogies, series and visualizing directions. 4. Apply various short cuts & techniques to manage speed and accuracy to get equipped for various competitive and campus recruitment exams.
12.		CI3191	Summer Internship	1. Apply the theoretical and practical knowledge of CS/IT Engineering for product/service development. 2. Undergo real time IT Industry practices regarding product/service development. 3. Identify and analyze engineering problems to provide IT based solutions. 4. Adopt recent industry practices for project development 5. Improve the ability to work in teams

				6. Enhance technical skills for solving complex engineering problems.
13.		CI3211	Technical Aptitude-III	1. Comprehend the knowledge gained in the course work. 2. Demonstrate the ability in Problem Solving
14.		SH3011	Indian Constitution	1. Create awareness about law depiction and importance of Constitution 2. Define Fundamental Rights and Fundamental Duties of the Indian Citizen to instill morality, social values, honesty, dignity of life and their social Responsibilities. 3. Create Awareness of their Surroundings, Society, Social problems and their suitable solutions while keeping rights and duties of the citizen keeping in mind. 4. Recognize distribution of powers and functions of Local Self Government. 5. Comprehend the National Emergency, Financial Emergency and their impact on Economy of the country.
1.	VI	CI3021	Information Security	1. Describe the key components of information security. 2. Analyze different threats and attacks modes. 3. Apply cipher techniques and cryptographic algorithms & tools. 4. Present the ways to provide access control like authorization and authentication. 5. Compare the security provisions in network, operating system and web applications. 6. Discuss the purpose and need for intrusion detection system (IDS) and intrusion prevention system (IPS).1
2.		CI3041	Program Elective-II – Data Mining	1. Explain different fundamental concepts of data mining. 2. Apply and differentiate different classification and clustering algorithms to any given data set. 3. Apply and differentiate different data mining algorithms to generate association rules. 4. Predict the outcome of certain problem using appropriate data mining techniques. 5. Apply text mining to mine data.

				6. Use advance techniques and software's for web mining.
3.		CI3061	Program Elective-II - Sensor Networks	<ol style="list-style-type: none"> <li>1. Explain the basic terminology of sensor networks.</li> <li>2. Explain the architecture and concepts of sensor networks.</li> <li>3. Identify the different platforms, communication technologies and protocols in sensor networks.</li> <li>4. Apply time-synchronization strategy for any wireless sensor application.</li> <li>5. Identify the security issues and challenges in wireless sensor network.</li> <li>6. Compare different Sensor Network Platforms and Tools.</li> </ol>
4.		CI3081	Program Elective-II - Machine Learning Algorithms	<ol style="list-style-type: none"> <li>1. Explain different concepts of Machine Learning algorithm.</li> <li>2. Apply regression, classification and clustering algorithms to solve the problems.</li> <li>3. Analyze regression, classification and clustering technique.</li> <li>4. Elaborate the working of the Recommendation System and its importance in different application domains.</li> <li>5. Evaluate performance of Artificial Neural Networks on different parameters such as architecture, learning rate etc.</li> </ol>
5.		CI3101	Program Elective-II – Computer Graphics	<ol style="list-style-type: none"> <li>1. Generate the 2D and 3D transformations of different objects.</li> <li>2. Create the interactive computer graphics using the OpenGL API.</li> <li>3. Apply clipping techniques on different graphics.</li> <li>4. Represent the different curves and surfaces.</li> <li>5. Design animation sequences for different objects.</li> <li>6. Apply the Illumination and color model on different objects.</li> </ol>
6.		OE336	Open Elective-IV - Neural	<ol style="list-style-type: none"> <li>1. Understand the mathematical foundations of neural network models.</li> </ol>

		Network and Deep Learning	<ol style="list-style-type: none"> <li>2. Understand and apply the backpropagation learning algorithm.</li> <li>3. Illustrate the architecture, building blocks and challenges of deep networks.</li> <li>4. Elaborate and compare different deep network architectures.</li> <li>5. Identify and effectively apply neural networks and deep networks for the problem.</li> <li>6. Design neural network and deep network systems to solve real world problems.</li> </ol>
7.		OE3221 Open Elective-IV Cyber Forensics	<ol style="list-style-type: none"> <li>1. Explain the fundamentals of computer forensics</li> <li>2. Assess different cyber attacks and crimes.</li> <li>3. Analyze Windows and Linux operating systems for data recovery and preserving.</li> <li>4. Design acquisition procedures for cell phones and mobile devices.</li> <li>5. Compare various browsers with respect to their functionality &amp; investigation.</li> <li>6. Demonstrate penetration testing using various tools &amp; modern techniques.</li> </ol>
8.		SH3021 Biology for Engineers	<ol style="list-style-type: none"> <li>1. Apply biological engineering principles, procedures needed to solve real-world problems</li> <li>2. Describe the functions of biological systems</li> <li>3. Analyze biological phenomena and compute work done at microscale.</li> <li>4. Explain working of different biomedical instruments</li> <li>5. Select the sensors for given biological applications</li> <li>7. Explain relevant aspect of movement control process.</li> </ol>
9.		CI3181 Front End Web Technology Lab	<ol style="list-style-type: none"> <li>1. Design visualizations in accordance with UI/UX theories.</li> <li>2. Developing web pages using HTML and CSS.</li> <li>3. Implementing responsive web pages by applying bootstrap technology.</li> <li>4. Designing interactive web pages using JavaScript and JQuery.</li> </ol>

				<ol style="list-style-type: none"> <li>To build components, use directive, work with data binding and using different angular JS services.</li> <li>Apply best practices when building Angular JS apps.</li> </ol>
10.		CI3201	Mobile Application Development Lab	<ol style="list-style-type: none"> <li>Explain the basic concepts and terminologies of Android technology</li> <li>Design User Interfaces using views, layout managers, menus and dialogs</li> <li>Make use of shared preferences, files and SQLite database for persistent data storage and multimedia in android application</li> <li>Develop mobile application using activity, services, content providers and broadcast receivers of Android Technology</li> <li>Apply testing frameworks, packaging and deploy android application to emulators and physical devices</li> </ol>
11		SH3063	Scholastic Aptitude -II	<ol style="list-style-type: none"> <li>Develop a logical approach towards solving Aptitude and Reasoning Problems</li> <li>Analyze usage of aptitude terms of speed, time and distance and permutations, probabilities and applications.</li> <li>Understand blood relations and ways of seating arrangements along with various geometrical figures</li> <li>Apply various short cuts &amp; techniques to manage speed and accuracy to get equipped for various competitive and campus recruitment exams.</li> </ol>
12.		CI3241	Technical Aptitude -IV	<ol style="list-style-type: none"> <li>Comprehend the knowledge gained in the course work.</li> <li>Demonstrate the ability in Problem Solving</li> </ol>
13.		CI3221	Capstone Project Phase-I	<ol style="list-style-type: none"> <li>Apply the theoretical and practical knowledge of CS/IT Engineering for product/service development</li> <li>Identify and analyze engineering problems to provide IT based solutions</li> <li>Design efficient algorithms for better products/services</li> <li>Adopt recent industry practices for project development</li> <li>Improve the ability to work in teams</li> </ol>

				<p>6. Develop effective presentation and communication skills through projects</p> <p>7. Manage the project in terms of scope, cost, time and quality of project as defined by stakeholders</p>
14.		SH304	Psychology for Engineers	<p>1. Interpret human behavior as a system from a psychological perspective.</p> <p>2. Appraise the various factors affecting human behavior at work.</p> <p>3. Apply behavioral theories to manage/lead people and emotions at work.</p>
1.	VII	CI4011	Cloud Computing	<p>1. Understand the technological changes in computing technologies.</p> <p>2. Compare the architectures and service &amp; deployment models of cloud computing.</p> <p>3. Explore the need and importance of virtualization technologies.</p> <p>4. Practice various cloud applications to obtain the cloud platform services.</p> <p>5. Examine cloud computing service and application adoption issues in different sectors.</p> <p>6. Elaborate advanced applications in different sectors of cloud computing market.</p>
2.		CI4031	Soft Computing (PE-III)	<p>1. Gain understanding of various soft computing techniques.</p> <p>2. Identify and design fuzzy based systems.</p> <p>3. Analyze performance of different evolutionary algorithms for mathematical and real-world optimization problems.</p> <p>4. Explore different selection, crossover and mutation operators in different types genetic algorithms.</p> <p>5. Identify and formulate complex problems from different engineering domains.</p>

3.		CI4051	Human Computer Interaction (PE-III)	<ol style="list-style-type: none"> <li>1. Explain the concepts of human computer interaction.</li> <li>2. Analyze the steps involved in the design process of human computer interaction.</li> <li>3. Design graphical user interface for given specification.</li> <li>4. Describe special considerations in designing user interfaces for wellness.</li> <li>5. 5. Discuss and analyze research in the field of HCI.</li> </ol>
4.		CI4071	Software Testing (PE-III)	<ol style="list-style-type: none"> <li>1. Describe software testing fundamentals.</li> <li>2. Explain different software testing types.</li> <li>3. Design/build test cases based on different test case design techniques.</li> <li>4. Illustrate the different stages of Defect Management process.</li> <li>5. Make use of modern automation tools for testing a given software system.</li> <li>6. Produce test case reports using manual and automation testing for given case studies.</li> </ol>
5.		CI431	Software Project Management (PE-III)	<ol style="list-style-type: none"> <li>1. Identify the key phases of Software project management.</li> <li>2. Create the systematic project plans for any software projects.</li> <li>3. Estimate the effort and cost needed to implement the software projects.</li> <li>4. Prepare an activity plan for a project and estimate the overall duration.</li> <li>5. Develop strategies to calculate risk factors involved in Software projects.</li> <li>6. Assess the Quality management through different types of metrics used in software development.</li> </ol>

6.		CI4091	Internet of Things (PE-IV)	<ol style="list-style-type: none"> <li>1. Describe the applications, basic terminologies and fundamentals of IoT.</li> <li>2. Illustrate the different IoT platforms, communication standards and protocols.</li> <li>3. Identify the security issues and challenges in IoT.</li> <li>4. Design and develop the IoT solutions for real word problems.</li> <li>5. Prepare an IoT case study for smart applications.</li> </ol>
7.		CI407	Big Data (PE-IV)	<ol style="list-style-type: none"> <li>1. Understand the need of Big data Technologies.</li> <li>2. Write program using Map Reduce framework.</li> <li>3. Describe Hadoop and its component</li> <li>4. Write the queries using HIVEQL</li> <li>5. Use Hadoop ecosystem like Pig and Hive to build application</li> </ol>
8.		CI4111	Computer Vision (PE-IV)	<ol style="list-style-type: none"> <li>1. 1. Identify basic concepts, terminology, theories, models and methods in the field of computer vision.</li> <li>2. 2. Choose the appropriate image processing methods for image segmentation.</li> <li>3. 3. Apply computer vision techniques for solving practical problems on Area Extractions.</li> <li>4. 4. Analyze the accuracy of the methods used in Region Analysis.</li> <li>5. 5. Illustrate basic methods of computer vision related to Facet Model Recognition</li> <li>6. 6. Explain the different forms of Knowledge Representation methods used in computer vision.</li> </ol>
9.		CI4131	Data Analytics (PE-IV)	<ol style="list-style-type: none"> <li>1. Differentiate the characteristics of datasets and compare the trivial data and big data for various applications.</li> <li>2. Select and implement techniques and computing environment that are suitable for the data analytical applications.</li> </ol>



				<ol style="list-style-type: none"> <li>3. Solve problems associated with the data characteristics such as high dimensionality, dynamically growing data and in particular scalability issues.</li> <li>4. Understand and apply scaling up machine learning techniques and associated computing techniques and technologies for data analytical.</li> <li>5. Provide problem solutions for multi-core or distributed, concurrent/Parallel environments.</li> </ol>
10.		CI433	Bioinformatics (PE-IV)	<ol style="list-style-type: none"> <li>1. Extract information from different types of bioinformatics data (gene, protein, disease, etc.), including their biological characteristics and relationships</li> <li>2. Employ different data representation models and formats used for bioinformatics data representation, including markup languages such as SBML and CellML, and ontologies such as GO ontology</li> <li>3. Apply the different approaches used for data integration and data management, including data warehouse and wrapper approaches</li> <li>4. Analyze processed data with the support of analytical and visualization tool</li> <li>5. Interact with non-bioinformatics professionals, such as biologists and biomedical researchers, to better understand their bioinformatics needs for improved support and service delivery</li> <li>6. Design and develop bioinformatics solutions by adapting existing tools, designing new ones, or a combination of both.</li> </ol>
11.		CI4151	Blockchain Technology (PE-V)	<ol style="list-style-type: none"> <li>1. Differentiate Blockchain models.</li> <li>2. Analyze Components &amp; Consensus models of Blockchain.</li> <li>3. Discuss Forking &amp; Cryptographic concepts of Blockchain.</li> <li>4. Describe applications of Blockchain in the sector of Trade, Government &amp; Finance</li> <li>5. Explain research aspects of Blockchain</li> </ol>

12.		CI4171	Virtual Reality and Augmented Reality (PE-V)	<ol style="list-style-type: none"> <li>1. Describe the basic concept and framework of virtual reality and development tools.</li> <li>2. Illustrate the principles and multidisciplinary features of virtual reality</li> <li>3. Describe the technology for multimodal user interaction and perception in VR (visual, audial and haptic interface and behavior).</li> <li>4. Discuss the technologies for managing large-scale VR environment in real time.</li> <li>5. Analyze the virtual reality issues.</li> </ol>
13.		CI4211	Parallel Computing (PE-V)	<ol style="list-style-type: none"> <li>1 Summarize parallel programming technique and compare it with Sequential Programming</li> <li>2 Develop programs to use multi-core processors using OpenMP</li> <li>3 Write a parallel program using MPI</li> <li>4 Explore different features of the CUDA framework.</li> <li>5 Identify the different CUDA capable GPU platforms.</li> <li>6 Design a parallel algorithm for any compute-intensive application.</li> </ol>
14.		CI4231	Big Data (PE-V)	<ol style="list-style-type: none"> <li>1. Understand the need of Big data Technologies.</li> <li>2. Write program using Map Reduce framework.</li> <li>3. Describe Hadoop and its components</li> <li>4. Write the queries using HIVEQL</li> <li>5. Use Hadoop ecosystem like Pig and Hive to build application</li> </ol>
15.		CI4191	Web Technology Lab	<ol style="list-style-type: none"> <li>1. Install and Configure Web servers and application servers.</li> <li>2. Implement JSTL Tags.</li> <li>3. Design Spring Boot Applications.</li> <li>4. Demonstrate framework to map object-oriented domain models to relational databases for web applications</li> <li>5. Manage relational data in Java applications using JPA</li> <li>6. To develop web services using Spring boot Framework</li> </ol>

16.		CI4251	R Programming (PE Lab)	<ol style="list-style-type: none"> <li>1. Implementation of core concepts of R programming using R studio and console</li> <li>2. Implement basic statistical operations using R Programming.</li> <li>3. Apply suitable type of data distributions to different engineering problems</li> <li>4. Create charts, plots and vectors for graphical analysis.</li> <li>5. Solve Machine Learning Algorithms Using R Programming</li> </ol>
17.		CI4291	Asp.Net MVC Lab (PE Lab)	<ol style="list-style-type: none"> <li>1. Develop dynamic web application using ASP.NET.</li> <li>2. Apply front end technologies to make web application responsive and fast.</li> <li>3. Develop web application using MVC and Entity framework.</li> <li>4. Build web services in ASP.NET.</li> </ol>
18.		CI435	PHP (PE Lab)	<ol style="list-style-type: none"> <li>1. Enable Students to develop a complete web application that includes Front-end, Back-end and Data-exchange technologies.</li> <li>2. Understand the syntax, semantics, and basics of PHP programming language.</li> <li>3. Proficient with databases and server-side languages with PHP and MySQL.</li> <li>4. Build web applications using advanced PHP framework.</li> <li>5. Become an industry-ready engineer who can be readily deployed in a project</li> </ol>
19.		CI4271	Capstone Project Phase- II	<ol style="list-style-type: none"> <li>1. Apply the theoretical and practical knowledge of CS/IT Engineering for product/service development</li> <li>2. Identify and analyze engineering problems to provide IT based solutions</li> <li>3. Design efficient algorithms for better products/services</li> </ol>

				<ol style="list-style-type: none"><li>4. Develop the project using modern IT tools, techniques and technologies</li><li>5. Adopt recent industry practices for project development</li><li>6. Improve the ability to work in teams</li></ol>
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# **Mechanical Engineering**

- **Department Name:** - Mechanical Engineering
- **UG Program Name:** - Mechanical Engineering
- **Vision and Mission:** -

<b>Vision</b>	To transform the department into center of excellence by synergizing teaching, learning and research to produce globally competent, innovative and entrepreneurial Mechanical Engineers.
<b>Mission</b>	<ul style="list-style-type: none"> <li>• To develop state of the art facilities to stimulate faculty, staff and students to create, analyze, apply and disseminate knowledge.</li> <li>• To build the competency to transform students into globally competent mechanical engineers by imparting quality education.</li> <li>• To collaborate with research organizations, reputed educational institutions, industries and alumni for excellence in teaching, research and consultancy practices</li> </ul>

<b>Sr. No.</b>	<b>Program Outcomes</b>
85.	Apply the knowledge of mathematics, science, engineering fundamentals, and mechanical engineering to the solution of complex engineering problems.
86.	Identify, formulate, review research literature, and analyze complex mechanical engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
87.	Design solutions for complex mechanical engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
88.	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
89.	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex mechanical engineering activities with an understanding of the limitations.
90.	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practices.
91.	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
92.	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices.
93.	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
94.	Communicate effectively on complex mechanical engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

95.	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
96.	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological changes.

Sr. No.	Program Specific Outcomes
PSO_1	Use Company standards, national and international standards like IS, BS, SAE, ISO, ASTM, etc. for designing and manufacturing mechanical components and systems.
PSO_2	Engage professionally in industries or as an entrepreneur by applying manufacturing, design, thermal and management practices.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1.	III	ME2094	Mathematics for Mechanical Engineers	1. Solve the differential equation using the appropriate concept.
				2. Determine the Laplace & inverse Laplace transform of various functions.
				3. Solve Problems on different probability distributions.
				4. Develop Fourier series of periodic functions.
2.	III	ME2114	Manufacturing Processes and Machine Tools	1. Select suitable Engineering forming process for production of component of required specification
				2. Select casting as manufacturing process suitable for the component design and production volume
				3. Select suitable furnaces in casting process as per requirement.
				4. Select appropriate joining process for given application.
				5. Illustrate and identify main parts of machine tools for metal cutting operations.
				6. Describe the Construction of different components of precision machines.
3.	III	ME2134	Engineering Thermodynamics	1. Apply thermodynamics principles to mechanical engineering applications
				2. Describe entropy, change in entropy and increase of entropy principle.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				<p>3. Differentiate between available and unavailable energy with examples.</p> <p>4. Recognize the properties of pure substances and use thermodynamic property tables charts.</p> <p>5. Apply mathematical fundamental to study the properties of steam gas and gas mixtures</p> <p>6. Explain the air and vapour power cycles and calculate cycle performance.</p>
4.	III	ME2154	Engineering Mechanics	<p>1. Calculate resultant force of coplanar force system.</p> <p>2. Analyze engineering problems applying conditions of equilibrium</p> <p>3. Determine centroid &amp; moment of inertia of the geometrical plane lamina.</p>
5.	III	ATMD201	Automobile Systems	<p>1. Explain constructional details and operation of the automotive systems.</p> <p>2. Interpret the influence of various technical parameters on the behavior of the automotive systems.</p> <p>3. Configure the systems and its elements for integrating into drivetrain/chassis systems appropriate for given automotive application.</p> <p>4. Present in detail the technological advancements of the automotive systems.</p>
6.	III	CEMD201	Building Construction and Planning	<p>1. Suggest appropriate materials for building construction applications.</p> <p>2. Prepare a functional design of components of the building.</p> <p>3. Design and draw residential building using principles of planning and bye-laws.</p> <p>4. Prepare plumbing and electrification plan for the building.</p>



Sr. No.	Semester	Course Code	Course Name	Course Outcome
				5. Explain properties of building finishing materials and application procedure.
7.	III	CSMD201	Introduction to Data Structures	<ol style="list-style-type: none"> <li>1. Compare between linear and nonlinear data structures</li> <li>2. Describe the characteristics of various data structure such as stacks, queues, trees, graphs and Hash tables.</li> <li>3. Analyze various searching and sorting algorithms and apply it to solve particular problem.</li> <li>4. Determine a suitable data structure and algorithm to solve a real world problem</li> </ol>
8.	III	EEMD201	Electrical Power Generation	<ol style="list-style-type: none"> <li>1. List the main components of different power plants</li> <li>2. Describe the operation of various power plants used for electrical power generation.</li> <li>3. Explain working principles of various power plants</li> <li>4. Compare different power plants based on advantages, limitations and future prospects</li> <li>5. Draw layout of electrical power plants.</li> <li>6. Explore alternate electrical energy resources for future needs and challenges.</li> </ol>
9.	III	ECMD201	Electronics Devices and Applications	<ol style="list-style-type: none"> <li>1. Describe the fundamental concepts of electronics and working principles of different devices.</li> <li>2. Analyze different analog and digital electronics circuits.</li> <li>3. Design digital electronics circuits with truth table and logic diagram.</li> </ol>
10.	III	CIMD201	Data Structures	<ol style="list-style-type: none"> <li>1. Describe the basic terminologies of data structures.</li> <li>2. Examine the linear data structure array with its types.</li> <li>3. Demonstrate the working of stack, queue performed on data structures.</li> <li>4. Illustrate the working of linked list.</li> </ol>

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				5. Discuss Tree terminologies and their Applications.
				6. Elaborate Graph terminologies with their types.
11.	III	CIMD201	: Data Structures	1. Describe the basic terminologies of data structures.
				2. Examine the linear data structure array with its types.
				3. Demonstrate the working of stack, queue performed on data structures.
				4. Illustrate the working of linked list.
				5. Discuss Tree terminologies and their Applications.
				6. Elaborate Graph terminologies with their types.
12.	III	MEMD201	Materials and Applications	1. Describe crystal structures and crystal imperfections.
				2. Illustrate plotting of Equilibrium diagrams from Cooling Curves and its fundamentals.
				3. Explain different Ferrous, Nonferrous alloys, their properties and applications by referring equilibrium diagrams.
				4. Explain properties and applications of Smart Materials, Magnetic Materials and Electronic materials.
				5. Explain properties and applications of Powder Metallurgy
				6. Select suitable material for given engineering application.
13.	III	MCMD201	Fundamentals of Mechatronics	1. Identify various elements of mechatronics systems.
				2. Select appropriate sensor/Actuator/controller/control algorithm for different applications.
				3. Develop PLC/ microcontroller-based applications.
14.	III	AIMD201	Object Oriented Programming	1. Understand the basic object oriented programming concepts and apply them in problem solving.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				<ul style="list-style-type: none"> <li>2. Illustrate inheritance concepts for reusing the program.</li> <li>3. Implement program using loops, decision statements and functions in Python.</li> <li>4. Plot data using appropriate Python visualization libraries.</li> </ul>
15.	III	ME2174	Computer Programming C++ Lab	<ul style="list-style-type: none"> <li>1. Build Object Oriented Programs.</li> <li>2. Elaborate the concepts of “inline function”, “friend function”, “function overloading” and “operator overloading”.</li> <li>3. Extend the program by using inheritance.</li> <li>4. Use memory management technique “constructors” &amp; “destructors”.</li> </ul>
16.	III	ME2314	Engineering Mechanics Lab	<ul style="list-style-type: none"> <li>1. Verify law of polygon of forces, law of triangle of forces and principle of moment.</li> <li>2. Verify Lami’s theorem.</li> <li>3. Compare coefficient of friction of various surfaces in contact.</li> <li>4. Correlate theoretical and practical results of support reactions and Centroid of plane lamina.</li> <li>5. Analyze a simple truss.</li> </ul>
17.	III	ME2334	Machine Drawing Lab	<ul style="list-style-type: none"> <li>1. Prepare free hand sketches of engineering and working drawings with dimensions following proper BIS conventions.</li> <li>2. Develop details and assembly drawings using part drawings of machine components with dimensions using CAD.</li> <li>3. Apply limits and tolerances to part and assemblies and choose appropriate fits.</li> <li>4. Interpret the symbols of welded, machining and surface roughness on the component drawings.</li> <li>5. Apply the geometrical dimensioning and tolerances to the mechanical components.</li> <li>6. Prepare details and assembly production drawings using actual measurements of part drawings of</li> </ul>

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				machine components with dimensions using CAD
18.	III	ME2354	Workshop Practice -I	<ol style="list-style-type: none"> <li>1. Describe the principles and techniques of tool grinding and sharpening and apply them to improve tool performance.</li> <li>2. Perform different operations to produce “A” part of job on lathe machine such as turning, facing, step turning, knurling, threading operations on MS workpiece, ensuring flatness, smooth surface finish with accuracy and precision.</li> <li>3. Operate TIG, MIG and submerged arc welding setup with proficiency.</li> <li>4. Analyze the factors affecting machining responses such as surface roughness and tool wear.</li> </ol>
19.	III	ME2374	Technical Aptitude -I	<ol style="list-style-type: none"> <li>1. Apply the fundamental knowledge to solve the mechanical engineering problems.</li> <li>2. Develop the ability of problem solving.</li> </ol>
20.	III/IV	SH2634	Professional Leadership Skills	<ol style="list-style-type: none"> <li>1. Explain the traits of a leadership through real life examples.</li> <li>2. Exhibit the ability to work effectively in team.</li> <li>3. Prepare a presentation as per the audience and context requirements.</li> </ol>
21.	III/IV	SH2614	Interpersonal Skills	<ol style="list-style-type: none"> <li>1. Exhibit interpersonal communication skills.</li> <li>2. Demonstrate decision-making skills.</li> <li>3. Apply conflict resolution styles appropriate in different situations.</li> <li>4. Demonstrate skills to manage balance in work and life.</li> </ol>
22.	III/IV	SH2694	Innovation Tools and Methods for Entrepreneurs	<ol style="list-style-type: none"> <li>1. Explain structured approach to define the problem with every possible detail, identify conflicts and solve them</li> <li>2. Apply User Journey Map to the selected problem to show user interaction at various stages</li> </ol>

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				3. Analyze the solutions provided by competitors for effectiveness and gaps if any.
23.	III/IV	SH2594	Personal Effectiveness and Body Language	1. Develop skills to build self-esteem and positive attitude.
				2. Develop interpersonal skills characterized by effective communication and conflict resolution.
				3. Demonstrate responsiveness towards time, stress, and health issues.
				4. Interpret the non-verbal behavior of a person.
24.	III	SH2734	German Language - Level III	1. Interpret the language if the next person is speaking slowly and clearly.
				2. Make use of the language in routine life with the routing topics like family, shopping, work etc.
				3. Demonstrate the language by self-introduction in German with simple sentences.
25.	IV	SH2644	German Language - Level IV	1. Interpret the language if the next person is speaking slowly and clearly.
				2. Make use of the language in routine life with the routing topics like family, shopping, work etc.
				3. Demonstrate the language by self-introduction in German with simple sentences.
26.	III	SH2714	Japanese Language - Level III	1. Make use of basic conversations in various situations.
				2. Identify the sentence patterns.
				3. Explain insights about the communication required for living in Japan.
				4. Interpret Japanese work ethics required in their professional career.
27.	IV	SH2624	Japanese Language - Level IV	1. To be able to make basic conversations in various situations.
				2. To recognize the sentence patterns.
				3. To improve Japanese Language proficiency.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				4. To give students insights about the communication required for living in Japan.
				5. To expose students to the Japanese work ethics required in their professional careers.
28.	IV	ME216	Fluid Mechanics and Turbomachinery	1. Define, calculate, and measure properties of fluid
				2. Apply Continuity equation, Bernoulli's equation, Equation of motion and Momentum equation for different flow system
				3. Estimate forces acting on fluid & different energy losses in fluid flow.
				4. Estimate forces acting on bodies submerged in fluid.
				5. Explain construction, working of turbo machines and select appropriate hydraulic machine for specific applications
				6. Perform basic hydraulic/thermal design and interpret performance characteristic curves.
29.	IV	ME2124	Mechanics of Solids	1. Determine types of stresses and strains induced in any machine component.
				2. Draw Shear force and bending moment diagram for different types of beam.
				3. Develop bending stress distribution and shear stress distribution for various cross sections of beam.
				4. Estimate the slope and deflection of beams by analytical and graphical method
				5. Find the principal stress and strain for plain stress system
				6. Analyze axially loaded column for different end conditions.
30.	IV	ME2144	Material Science & Metallurgy	1. Explain different alloys, their properties and applications by referring equilibrium diagrams.
				2. Determine mechanical properties by destructive testing methods.
				3. Detect flaws in components by non-destructive testing methods.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				<p>4. Select suitable heat treatment to achieve desired changes in mechanical properties of steels.</p> <p>5. Select suitable material for given engineering applications.</p> <p>6. Explain manufacturing of a component by using powder metallurgy.</p>
31.	IV	ATMD202	I. C. Engines	<p>1. Perform a primary thermodynamic analysis of Otto and diesel cycle engines.</p> <p>2. Select appropriate engine for specific application.</p> <p>3. Select proper fuel system for IC engine.</p> <p>4. Conduct performance test of IC engine and portray operating characteristics of engine.</p> <p>5. Identify abnormal combustion in engine and remedy over it.</p> <p>6. Select proper lubrication, intake, exhaust, cooling system for engine.</p>
32.	IV	CEMD202	Building Estimation and Valuation	<p>1. Explain the types and basic requirements of the estimate.</p> <p>2. Explain measurement sheet, abstract sheet, and detailed specifications of different construction items.</p> <p>3. Prepare detailed estimate of load bearing structure and framed structure.</p> <p>4. Prepare rate analysis and bar bending schedule of different construction items.</p> <p>5. Explain the tenders and contracts.</p> <p>6. Describe basic terms of valuation.</p>
33.	IV	CSMD202	Problem Solving using JAVA	<p>1. Understand the basic object oriented programming concepts and apply them in problem solving.</p> <p>2. Apply concept of inheritance for code reusability.</p> <p>3. Develop Programs using multithreading.</p> <p>4. Develop data-centric applications using JDBC.</p>

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				5. Design the basics of java console and GUI based programming
34.	IV	EEMD202	Power System	1. Write the basic working principles of different generating sources.
				2. Analyze different types of loads
				3. Explain importance of power factor and tariffs in power system.
				4. Identify various components in power transmission and distribution system.
				5. Select substation equipments as per requirement.
35.	IV	ECMD202	Electronics Communication Systems	1. Describe different communication systems.
				2. Explain applications of analog and digital modulation techniques.
				3. Analyze different modulation and demodulation techniques.
				4. Explain the use of satellite communication.
36.	IV	CIMD202	Computer Algorithms	1. Analyzing asymptotically the performance of algorithms.
				2. Compare and analyze searching and sorting algorithms.
				3. Apply different algorithm design techniques to solve problems like job sequencing,
				4. knapsack, TSP, finding shortest path etc.
				5. Apply backtracking method to solve problems like N-queens, graph coloring, sum of subsets etc.
37.	IV	MEMD202	Design and Drawing of Machine Components	1. Produce the production drawing of simple mechanical assemblies.
				2. Design the machine components subjected to static loading.
				3. Design of spur gear and selection of roller bearing.
				4. Design a components against fluctuating load.
38.	IV	MCMD202	Industrial Fluid Power	1. Describe the structure and function of common hydraulic and pneumatic components such as cylinders, valves, pumps, and motors etc.
				2. Model and analyze common hydraulic and pneumatic



Sr. No.	Semester	Course Code	Course Name	Course Outcome
				<p>components such as cylinders, valves, pumps, and motors.</p> <p>3. Create &amp; simulate basic hydraulic and pneumatic circuit diagrams for different applications.</p> <p>4. Design, develop &amp; analyze simple hydraulic and pneumatic systems for given task</p>
39.	IV	AIMD202	Data structure & Algorithms	<p>1. Compare between linear and nonlinear data structures</p> <p>2. Describe the characteristics of various data structure such as stacks, queues, trees, graphs and Hash tables.</p> <p>3. Analyze various searching and sorting algorithms and apply it to solve particular problem.</p> <p>4. Determine a suitable data structure and algorithm to solve a real world problem</p>
40.	IV	SH202	मराठी भाषिक कौशल्यविकास	<p>1. भाषा आणि व्यक्तिमत्व विकास यांमधील सहसंबंध स्पष्ट करू शकेल</p> <p>2. भाषिक कौशल्यविकास करू शकेल</p> <p>3. कथा या मराठी साहित्य प्रकाराचे विश्लेषण करू शकेल</p> <p>4. एकांकिका या मराठी साहित्य प्रकाराच्या विश्लेषणाची क्षमता प्राप्त करेल</p>
41.	IV	SH204	हिंदी कथा साहित्य एवं प्रयोजमूलक हिंदी	<p>1. विद्यार्थियों में मानवीय संवेदनाओं के विकास के साथ नवीन सामाजिक सांस्कृतिक बोध और जीवन मूल्यों का विकास होगा।</p> <p>2. विद्यार्थियों में साहित्य के माध्यम से कलात्मक गुणों की अभिवृद्धि होगी कला की साहित्यिक विधाओं के प्रति अभिरुचि जागृत होगी तथा रचनात्मक कौशल्य को बढ़ावा मिलेगा।</p> <p>3. विद्यार्थियों में नए वैश्विक मूल्यों के प्रति सजगता को बढ़ावा मिलेगा एवं मूल्यवादी दृष्टि के प्रति दायित्व बोध उत्पन्न होगा। छात्र व्यवहार में हिंदी भाषा का उचित प्रयोग कर सकेंगे।</p> <p>4. छात्र व्यवहार में हिंदी भाषा का उचित प्रयोग कर सकेंगे।</p>

Sr. No.	Semester	Course Code	Course Name	Course Outcome
42.	IV	SH2174	Environmental Science	1. Apply interdisciplinary knowledge from various fields of science and engineering to address environmental issues.
				2. Evaluate environmental impacts of human activities on the environment.
				3. Use scientific approach to identify and solve environment related problems.
				4. Design sustainable solutions to address environmental challenges.
				5. Participate in group work to become acquainted with the importance of teamwork, collaboration
				6. Develop presentation and report writing skills.
43.	IV	ME2204	Fluid Mechanics and Turbomachinery Lab	1. Select proper measuring device and Measure pressure and discharge in fluid system.
				2. Calculate various losses through pipes.
				3. Evaluate various efficiencies of pumps, compressors and turbines.
				4. Draw performance characteristic curves for pumps, compressors and turbines.
44.	IV	ME2224	CAD Modeling Lab	1. List the different CAD software used for mechanical engineering
				2. Model machine parts using CAD software
				3. Assemble machine Parts by using CAD tool
				4. Generate detailed drawing views
				5. Create surface features using surfacing tools
45.	IV	ME2244	Material Science & Metallurgy Lab	1. Evaluate mechanical properties of materials using Destructive tests
				2. To measure micro-hardness of various delicate samples.
				3. To explain non-destructive testing methods.
				4. Correlate mechanical properties with microstructures of steel and cast iron.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				5. To estimate composition of various ferrous and non-ferrous metals.
				6. Heat treat given specimen to modify the properties.
46.	IV	ME2344	Workshop Practice -II	1. Demonstrate proficiency in using various lathe operations to fabricate composite parts (by performing boring, taper turning, threading etc.) and to assemble them with close dimensional tolerance, ensuring proper alignment and fit.
				2. Perform cylindrical grinding and surface grinding process to achieve better surface quality.
				3. Analyze material removal and profile generation during milling operations and enhance surface finish and material removal efficiency.
				4. Analyze Surface contouring during shaping operations, demonstrating the ability to create complex shapes and profiles.
				5. Perform operations on Turret lathe and drilling machine for engineering applications.
47.	IV	ME2364	Technical Aptitude -II	1. Apply the fundamental knowledge to solve mechanical engineering problems.
				2. Develop the ability of problem solving.
48.	V	ME3013	Dynamics of Machines	1. Apply the theoretical knowledge to balance the rotary and reciprocating systems
				2. Identify and investigate the stability of spinning bodies due to the gyroscopic effect
				3. Apply different principles to convert the physical vibratory system into a mathematical model
				4. Identify the effect of external excitation on the system and effect of dampers to control the system vibration
				5. Recognize the suitable method for minimizing or eliminating the vibration from the system

Sr. No.	Semester	Course Code	Course Name	Course Outcome
49.	V	ME3033	Design of Machine Elements	1. Identify the customers need, formulate the problem and draw the design specifications.
				2. Design a machine component using theories of failure.
				3. Design a simple machine components like joints, shafts, keys, couplings
				4. Design a spring and power screw
				5. Select belt drives for given application
				6. Design a flywheel for different applications.
50.	V	ME3053	Metrology & Control Engineering	1. Apply knowledge of various tools and techniques to determine geometry and dimensions of components in engineering applications.
				2. Design system to meet desire needs within realistic constraints.
				3. Analyze and interpret data by using QC tools.
				4. Explain feedback control system.
				5. Represent control system mathematically and by using block diagrams and determine their response to various input conditions.
51.	V	ME3073	Heat Transfer	1. Explain modes of heat transfer and analyze steady state heat conduction.
				2. Examine heat transfer from extended surfaces.
				3. Formulate and Solve problems on heat conduction with heat generation and unsteady heat conduction.
				4. Illustrate different concepts in radiation mode of heat transfer.
				5. Develop and use various correlations to solve heat convection problems.
				6. Design an indirect tube type heat exchanger.
52.	V	ME3513	Workshop Practice- III	1. Demonstrate effect of variables such as speed, feed and depth of cut on machining process

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				<p>2. Produce given job with proper taper fitting and within dimensional tolerances <math>\pm 0.1</math> mm on diameter and <math>\pm 0.2</math> mm on length. (Job A)</p> <p>3. Produce bearing diameter on job a maintaining fit H7g6.</p> <p>4. Produce Gear Teeth - Job B on Milling Machine as per specifications.</p> <p>5. Produce Job C to fit Job A with proper threading fitting on Turret. Prepare process sheet for all Jobs</p>
53.	V	ME353	Kinematics and Dynamics of Machinery Lab	<p>1. Estimate moment of inertia of Irregular shape bodies.</p> <p>2. Analyse the controlling force and stability of governor.</p> <p>3. Investigate the stability of spinning bodies due to gyroscopic effect.</p> <p>4. Apply the theoretical knowledge to balance the rotary systems</p> <p>5. Determine the natural frequency, vibration level, damped frequency and resonant frequency of any vibratory system</p> <p>6. Recognize the whirling speed conditions of shaft and methods to eliminate</p>
54.	V	ME3553	Metrology and Measurement lab	<p>1. Use Vernier Calliper, Vernier Height Gauge, and Micrometre, V- block for accurate linear and angular Measurement</p> <p>2. Measure screw thread terminology by using use the Tool Makers Microscope.</p> <p>3. Measure the straightness using Autocollimator</p> <p>4. Measurement of screw thread parameter using floating carriage micrometre.</p> <p>5. Determine amount of variation in the process by using Measurement System Analysis</p> <p>6. Useload cell for measurement of Force.</p> <p>7. Select suitable tachometer for speed measurement</p>

Sr. No.	Semester	Course Code	Course Name	Course Outcome
55.	V	ME3573	Heat Transfer Lab	1. Analyze heat conduction experimentally
				2. Compare heat transfer coefficient in natural as well as forced convection environment.
				3. Determine emissivity and Stefan Boltzmann constant for the case of radiation
				4. Evaluate the performance of heat exchanger.
				5. Determine critical heat flux of material
56.	V	ME3593	CAD Modeling Lab	1. List the different CAD software used for mechanical engineering.
				2. Create sketches of machine parts.
				3. Model machine parts using CAD software.
				4. Assemble machine Parts by using CAD tool.
				5. Generate detailed drawing views.
				6. Create surface features using surfacing tools.
57.	V	ME3613	Technical Aptitude -III	1. Apply the knowledge acquired during the course work.
				2. Develop the ability of problem solving.
58.	V	SH3033	Scholastic Aptitude-I	1. Develop a logical approach towards solving Aptitude and Reasoning problems.
				2. Analyze usage of basic aptitude terms of percentages, averages, ratios and applications of business aptitude terms of profits and interests
				3. Develop a bridge in analogies, series and visualizing directions.
				4. Apply various short cuts & techniques to manage speed and accuracy to get equipped for various competitive and campus recruitment exams
59.	V	ME3633	Summer Internship	1. Apply the Technical knowledge in real industrial situations.
				2. Formulate Technical reports/projects.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				3. Develop and refine oral and written communication skills.
				4. Explain the activities and functions of business professionals.
				5. Discuss knowledge of the industry in which the internship is done.
60.	V	SH3013	Indian Constitution	1. Create awareness about law depiction and importance of Constitution
				2. Define Fundamental Rights and Fundamental Duties of the Indian Citizen to instill morality, social values, honesty, dignity of life and their social Responsibilities.
				3. Create Awareness of their Surroundings, Society, Social problems and their suitable solutions while keeping rights and duties of the citizen keeping in mind.
				4. Recognize distribution of powers and functions of Local Self Government.
				5. Comprehend the National Emergency, Financial Emergency and their impact on Economy of the country.
61.	V	ME3313	Mechanics of Composite Material	1. Choose suitable composite materials based on field applications
				2. Explain different fabrication processes and perform cost comparison
				3. Compute composite properties for given fraction of fibers and matrix
				4. Design lamina to bring tailor maid properties in composite material
				5. Predict failure of composite laminates by selecting appropriate failure criteria
				6. Design laminate for given loading conditions
62.	V	ME3333	Solid Mechanics	1. Analyze the mechanical components based on stress or strain approach

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				<p>2. Use energy methods to solve continuum mechanics problems.</p> <p>3. Illustrate various membrane analogies to investigate torsion in non-circular cross section.</p> <p>4. Describe the effect of shear center in symmetrical and unsymmetrical bending of beams</p>
63.	V	ME3353	Biomechanics	<p>1. Apply fundamental principles of Bio- mechanics to activities like jumping, running, swimming, etc.</p> <p>2. Model anatomical systems in to mechanical system and perform force analysis</p> <p>3. Analyze the effect of viscosity on type of blood flow in blood vessels</p> <p>4. Examine the behavior of arterial wall as a membrane subjected to uniaxial, biaxial and torsion loading</p> <p>5. Outline the relationship between cardiac muscles and parameters like force, length, velocity and calcium concentration</p> <p>6. Estimate the parameters like displacement, velocity, acceleration and energy consumed in a particular activity through GAIT analysis.</p>
64.	V	ME3373	Energy Conservation and Management	<p>1. Summarize energy scenario and the need for energy conservation.</p> <p>2. Conduct energy audit of a system</p> <p>3. Illustrate various techniques of waste heat recovery and cogeneration.</p> <p>4. Identify energy conservation measures in various thermal utilities.</p> <p>6. Summarize different financial terms and techniques used in Energy Conservation.</p>
65.	V	ME3393	Nuclear Power Engineering	<p>1. Understand the nuclear fuel cycle to design reactors.</p> <p>2. Apply numerical methods to solve energy technology problems.</p>



Sr. No.	Semester	Course Code	Course Name	Course Outcome
				<p>3. Develop mathematical models to design equipments, plants processes and systems.</p> <p>4. Analyse different techniques to optimize overall nuclear power plant.</p>
66.	V	ME3413	World Class Manufacturing	<p>1. Explain characteristics of world class organization.</p> <p>2. Explain WCM tools.</p> <p>3. Plot control charts and comment on the process.</p> <p>4. Elaborate the concept of TQM.</p> <p>5. Explain the 8 pillars of Total productive maintenance (TPM).</p> <p>6. Explain the 13 pillars of Toyota production system (TPS).</p> <p>7. Explain the six sigma methodologies.</p>
67.	V	ME3433	Non Traditional Machining Processes	<p>1. Compare the various nontraditional machining processes.</p> <p>2. Discuss the operational principles, advantages applications, limitations of the various non-traditional machining processes</p> <p>3. Explain the material removal mechanism, effect of parameters/ factors associated with the processes on the machining performance.</p> <p>4. Select a process /a combination of processes for a specific application/ need/situation depending upon the availability of sources.</p>
68.	V	ME3453	Advanced Engineering Materials	<p>1. Select suitable material for engineering applications.</p> <p>2. Justify the selection of composite materials for engineering applications.</p> <p>3. Explain various applications of polymeric materials.</p> <p>4. Categorize various modern materials for selective applications.</p> <p>5. Explain the use of smart materials for bio- engineering applications.</p>

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				6. Explain the use of semi and super conducting materials for various applications.
69.	V	ME3473	Industrial Organization and Management	<p>1. Recognize the factors that influence business environment and visualize their effect on business</p> <p>2. Appraise the scope and objectives of functional areas of business and their integration</p> <p>3. Formulate an effective and efficient solution for business problems</p> <p>4. Identify several ways in which financial accounting information is used to make business decisions</p> <p>5. Apply engineering economics principles for evaluation of a business</p>
70.	VI	ME3023	Machine Design	<p>1. Apply the principle of Spur &amp; Helical gear design for industrial application</p> <p>2. Design Bevel &amp; Worm gear considering design parameters as per design standards.</p> <p>3. Apply principles of interaction of materials processing and design.</p> <p>4. Select &amp; design Rolling and Sliding Contact Bearings from manufacturer's catalogue for a typical application considering suitable design parameters.</p> <p>5. Elaborate various modes of operation, degree of hybridization and allied terms associated with hybrid electric vehicles</p>
71.	VI	ME3043	Fluid and Turbo Machinery	<p>1. Explain construction and working of different types of turbines, centrifugal pump &amp; compressors.</p> <p>2. Calculate different efficiencies; power developed and Discharge requirement of turbine.</p> <p>3. Draw velocity triangles &amp; calculate different heads on pumps, discharge of pump, various efficiency of pump, power required to drive the pump</p> <p>4. Explain necessity &amp; concept of model testing.</p>

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				5. Draw & Explain performance characteristics of the turbine & pump.
				6. Compute different efficiencies of compressor & solve numerical problems.
				7. elect proper fluid & turbo Machine for particular operation
72.	VI	ME3063	Finite Element Method	1. Apply various approximate methods to solve Linear differential equations appearing in the field of solid mechanics and heat transfer from the perspective of finite element analysis
				2. Formulate the structural problems and illustrate the use of interpolation function to derive shape functions
				3. To develop stiffness matrix and load vectors of problems related to elasticity and heat transfer
				4. Compare linear element with higher order element and comment on significance of using higher order element
73.	VI	SH3021	Biology for Engineers	1. Apply biological engineering principles, procedures needed to solve real-world problems
				2. Describe the functions of biological systems
				3. Analyze biological phenomena and compute work done at microscale.
				4. Explain working of different biomedical instruments
				5. Select the sensors for given biological applications
				6. Explain relevant aspect of movement control process.
74.	VI	ME348	Design Engineering Lab	1. Design a mechanical system using standard design procedure.
				2. Use design data books, hand books and design standards.
				3. Develop production drawing with conventions.
				4. Print 3D object of designed component on 3D printer.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
75.	VI	ME350	Python Programming Lab	1. Use loops, functions, different libraries, custom functions.
				2. Develop Python programs to solve engineering problems.
				3. Handle different file operations
				4. Interpret the data by plotting the graphs
76.	VI	ME352	Fluid & Turbo Machinery lab	1. Conduct trial & analyze performance parameters of fluid and turbo machinery.
				2. Draw and compare actual performance characteristics curves with standard.
77.	VI	ME3543	Software Training-I	1. Use software effectively related to design / manufacturing and synthesis of mechanical systems and components.
				2. Develop solution for the mechanical engineering problem using program / software
78.	VI	ME3563	Technical Aptitude -IV	1. 1. Apply the knowledge acquired during the course work.
				2. Develop the ability of problem solving.
79.	VI	ME3583	Capstone Project Phase I	1. Convert an open-ended problem statement into a statement of work or a set of design specifications
				2. Identify the literature gap by conducting a survey of several available literatures in the preferred field of study.
				3. Decompose problem/task into subtasks, prioritizes subtasks, and establishes a timetable and milestones by which progress may be evaluated.
				4. Select and apply the appropriate design of experiments, experimental setup, models, or simulation technique for the project task.
				5. Collaborates with team members of diverse backgrounds and perspectives to achieve a common goal.
				6. Produce usable documents of record regarding the design

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				process and design state and communicate effectively.
80.	VI	SH304	Psychology for Engineers	<ol style="list-style-type: none"> <li>1. Interpreted human behavior as a system from psychological perspective.</li> <li>2. Evaluate human behavior in terms of “Engineer-In- Environment” from a psycho-social approach in problem-solving with individuals, groups and organizations.</li> <li>3. Apply systems theories, research and other theories and knowledge regarding human behavior and emotional intelligence in assessing and interacting with individuals, groups and organizations.</li> </ol>
81.	VI	SH3062	Scholastic Aptitude - II	<ol style="list-style-type: none"> <li>1. Develop a logical approach towards solving Aptitude and Reasoning problems.</li> <li>2. Analyze usage of basic aptitude terms of percentages, averages, ratios and applications of business aptitude terms of profits and interests</li> <li>3. Develop a bridge in analogies, series and visualizing directions.</li> <li>4. Apply various short cuts &amp; techniques to manage speed and accuracy to get equipped for various competitive and campus recruitment exams</li> </ol>
82.	VI	ME3643	Condition Monitoring	<ol style="list-style-type: none"> <li>1. Apply maintenance schemes in industries.</li> <li>2. Monitor and analyze condition of rotating machinery using vibration based techniques.</li> <li>3. Apply oil analysis techniques to diagnose the wear debris.</li> <li>4. Apply temperature monitoring techniques to diagnose the faults in mechanical applications.</li> <li>5. Apply modern technologies for effective plant maintenance.</li> </ol>
83.	VI	ME3663	Tribology	<ol style="list-style-type: none"> <li>1. Determine tribological parameters of mechanical systems analytically by using suitable</li> </ol>

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				<p>theories of friction and theories of wear.</p> <p>2. Select hydrostatic step bearing for real life application in mechanical engineering based on axial load applied and lubricant available.</p> <p>3. Calculate the maximum load carrying capacity and pressure equation for hydrodynamic thrust bearing by using engineering principles.</p> <p>4. Evaluate elastohydrodynamic lubrication occurred in gears, cams and rolling element bearing by using hertz and ertel- grubin equation.</p> <p>5. Estimate pressure distribution in gas lubricated bearings by applying reynolds equation for gas lubrication within elastic limits</p>
84.	VI	ME3683	Fracture Mechanics	<p>1. Apply the basic principles of Linear elastic fracture mechanics.</p> <p>2. Design the engineering components using elastic-plastic fracture mechanics principles.</p> <p>3. Explain the process of crack growth and arrest in the presence of creep.</p> <p>4. Compare the fracture behavior in metals and non-metals.</p> <p>5. Analyze the crack growth under fatigue loading.</p> <p>6. Choose the suitable computational fracture mechanics approach to solve the real mechanical engineering problem</p>
85.	VI	ME3743	Steam Engineering	<p>1. Classify different types of boilers.</p> <p>2. Design a steam nozzle for a particular application.</p> <p>3. Calculate turbine performance at various loads</p> <p>4. Justify the use of impulse and reaction turbines</p> <p>5. representation on T-s and h-s diagram</p>

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				6. State the use of reheating of steam.
86.	VI	ME3763	Gas Turbine and Jet Propulsion	1. Compare ideal and real cycles of gas turbines
				2. Illustrate different techniques used in jet propulsion
				3. Explain centrifugal compressor used in gas turbines and jet propulsion
				4. Design axial flow compressor used in gas turbines and jet propulsion
				5. Analyze combustion system of the gas turbines
				6. Evaluate the different turbines used in gas turbine and jet propulsion
87.	VI	ME3783	Power Plant Engineering	1. Explain economics of power generation and energy scenario
				2. Explain improvisations in Rankine cycle and its effect on performance
				3. Analyze thermodynamics gas power cycles and effect of various parameter on efficiency.
				4. Analyze different techniques for improvement of efficiency of gas turbine plant
				5. Explain construction and working of nuclear power plants and its subsystems
				6. Explain construction and working of different renewable energy power plants
88.	VI	ME3803	Additive Manufacturing	1. Recognize the Importance of AM technologies in Manufacturing
				2. Classify and select additive manufacturing processes for a given application.
				3. Design for manufacturing of AM and conduct Process Analysis
				4. Identify software issues related to additive manufacturing process.
				5. Discuss the Different methods for Post- processing of AM parts

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				6. Recognize the Applications of AM in Automobile, Aerospace, and Bio-medical etc.
89.	VI	ME3823	Computer Integrated Manufacturing Systems	<ol style="list-style-type: none"> <li>1. Describe and classify computer integrated manufacturing systems (CIMS)</li> <li>2. Recognize socio- economic impact of CIMS</li> <li>3. Explain principle of operation of CNC machine</li> <li>4. Describe part family forming methods</li> <li>5. Perform quantitative analysis of Flexible Manufacturing Systems (FMS)</li> <li>6. Analyze various computer integrated planning and control techniques</li> <li>7. Explain use of IoT in manufacturing</li> </ol>
90.	VI	ME3843	Industrial Hydraulics and Pneumatics	<ol style="list-style-type: none"> <li>1. Describe the structure and function of common hydraulic and pneumatic components such as cylinders, valves, pumps and motors etc.</li> <li>2. Model and Analyze common hydraulic and pneumatic components such as cylinders, valves, pumps and motors.</li> <li>3. Create simple hydraulic and pneumatic circuit diagrams for different applications.</li> <li>4. Create and Analyze simple hydraulic and pneumatic systems.</li> </ol>
91.	VI	ME3882	Precision Engineering	<ol style="list-style-type: none"> <li>1. Describe meaning and importance of precision machining</li> <li>2. Explain the requirements of machine network elements to achieve precision in the components.</li> <li>3. Select different precision engineering processes in actual field</li> <li>4. Explain Various methods precision manufacturing</li> <li>5. Explain various methods of micromachining using LASER and other processes</li> </ol>



Sr. No.	Semester	Course Code	Course Name	Course Outcome
92.	VI	ME3883	Total Productive Maintenance	1. Predict the maintenance issues for system effectiveness
				2. Schedule the work related to preventive maintenance
				3. Apply concepts of condition monitoring techniques
				4. Use the TPM concepts for online monitoring of processes
93.	VI	OE3263	Aircraft Systems	1. Get an exposure to the Aircraft and Aerospace Industry.
				2. Understand Aircraft Control Systems and Engine Control System.
				3. Know the need and functioning of Environmental Control System.
				4. Explain and conceptually design Fuel, Hydraulic and Pneumatic systems for Aircraft.
				5. Explain and conceptually design Electrical System of Aircraft.
				6. Evaluate and decide avionics and information system for aircraft.
94.	VI	OE3283	Supply Chain Management	1. Identify the role and key issues in the supply chain management.
				2. Select appropriate SC strategies under given situations.
				3. Design the inventory system and level at various locations in supply chain.
				4. Select the distribution and transportation options.
				5. Develop appropriate strategic alliances for enhancing the performance of SC.
				6. Describe the use of Information technology to improve SC performance
95.	VI	ME3303	New Product Design and Development	1. Identify the new product opportunities and sources of new product ideas.
				2. Elaborate the product life cycle and product design process.
				3. Integrate the customer and end-consumer needs into design process.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				<p>4. Apply the concepts and tools like DFMA, VE and QFD in design process</p> <p>5. Assimilate the various product characteristics to design a novel product</p> <p>6. Participate in group work sessions and teams to become acquainted with the importance of teamwork and collaboration that is critical to new product success.</p>
96.	VI	OE3323	Entrepreneurship Development	<p>1. Identify, analyze &amp; select business opportunity to suit his personality based on SWOT analysis</p> <p>2. Make market research &amp; survey for selected business</p> <p>3. Prepare and apprise detailed Project Report</p> <p>4. Formulate plan for financial management of project.</p> <p>5. Apply managerial inputs for starting &amp; establishing his own business</p>
97.	VI	OE334	Research Methodology	<p>1. Select, analyze and interpret research evidences published on a topic to establish a suitable research problem/issue or opportunity to explore further.</p> <p>2. Design the research study using a suitable paradigm, associated methodologies and methods of data collection and analysis.</p> <p>3. Write a research proposal (research blueprint) describing the topic.</p> <p>4. Demonstrate the ability to use the statistical software to solve problems</p>
98.	VII	ME4014	Industrial Engineering	<p>1. Apply various methods of method study and time study to improve productivity.</p> <p>2. Use value analysis technique in engineering projects.</p> <p>3. Select the plant location and design appropriate type of layout along with material handling system.</p>

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				<p>4. Plan production activities using tool like capacity and aggregate planning</p> <p>5. Design the inventory system using appropriate inventory model</p> <p>6. Implement project management knowledge, tools and techniques to achieve project success.</p>
99.	VII	ME4113	Engineering Acoustics	<p>1. Determine acoustic parameters in terms of decibel levels for pressure, power, intensity and impedance.</p> <p>2. Calculate sound levels by applying 1-d wave equation for air-borne and structure borne sound</p> <p>3. Estimate absorption coefficient for different acoustic materials.</p> <p>4. Measure sound levels for mechanical systems and reduce it up to audible range by using suitable method.</p>
100	VII	ME4153	Machine Tool Design	<p>1. Select &amp; design proper transmission system for machine tool</p> <p>2. Decide layout of machine tool</p> <p>3. Select proper speed &amp; feed boxes &amp; design the same.</p> <p>4. Design machine tool structure-Bed, Columns &amp; Housings, Select &amp; Design Guide ways &amp; slide ways, spindle.</p> <p>5. Determine dynamic characteristics of machine tool &amp; carry stability analysis using FEA</p> <p>6. Design control systems in machine tools and SPM.</p>
10	VII	ME4153	Mechanical System Design	<p>1. Select brake and clutch based on functional requirements of automobile transmission systems.</p> <p>2. Calculate the stresses induced in pressure vessel subjected to various types of loading</p> <p>3. Apply design principles and obtain suitable dimensions for IC Engine components.</p>

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				4. Design the flat belt conveyor systems for suitable applications. 5. Design the machine tool gear box for different speeds and torques at driven shaft. 6. Apply statistical considerations for design.
10	VII	ME4173	Alternative Fuels	1. Justify the need of alternative fuels for IC engines 2. Select alternative fuels to IC engines 3. Analyze engine performance using blended fuels 4. Explain the working of electrical and solar- powered vehicles
10	VII	ME4192	Cryogenics	1. Summarize the applications of low temperature engineering in various fields. 2. Discuss the properties of materials and cryogenic fluids at low temperature. 3. Compare cryogenic Liquefaction systems. 4. Describe Cryogenic Refrigeration and Measurement Systems. 5. Calculate performance of gas separation systems. 6. Explain the methods of fluid storage, transfer, insulation and vacuum technology in cryogenics.
10	VII	ME4213	Solar Energy	1. Explain energy scenario and necessity of solar energy 2. Illustrate basic of solar radiation 3. Explain effect of solar energy transmission on various structures / surfaces. 4. Design and compare solar collector 5. Write different application of solar energy 6. Explain various solar electric conversion system
10	VII	ME4232	Industrial Automation and Robotics	1. Explain manufacturing automation. 2. Analyze transfer lines for its efficiency and effect of break downs

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				3. Analyze automated assembly lines for its efficiency and effect of defective components 4. Analyze forward and reverse kinematics of robot. 5. Perform economic analysis of robot
10	VII	ME4253	Production and operations Management	1. Select appropriate production and operation strategies based on situation 2. Plan the capacity based on the demand pattern and prepare the manufacturing schedule based on the production plan 3. Apply Lean tools for manufacturing and services operation 4. Implement recent production management trends like just in philosophy and lean manufacturing in manufacturing field 5. Apply engineering economics, principles for managing production function
10	VII	ME4313	Mechanical Vibrations	1. Define and use the fundamental terms of vibration in design. 2. Find natural frequencies and mode shapes of 2DOF and Multi DOF systems. 3. Describe methods of vibration control. 4. Select instrument and transducers for vibration measurement 5. Analyze and interpret vibration data.
10	VII	ME4333	Experimental Mechanics	1. Select the appropriate method of stress analysis to solve the mechanical engineering problem 2. Apply the concept of transmission photo elasticity and determine the principle stress and direction at the critical point 3. Use the principle of three dimensional photo elasticity and estimate the state of stress 4. Evaluate pertinent stress detail at a point by employing stress

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				frizzing and slicing technique in the three dimensional component
				5. Determine stress and strain by using photo elastic coating or brittle coating technique
				6. Design the experimental methodology to measure the strain by using strain gauge technology
10	VII	ME4352	Automobile Engineering	1. Explain anatomy of an automotive vehicle with location of different parts and systems
				2. Expound various configurations of transmission systems and auxiliary components
				3. Compute different performance parameters of an automobile
				4. Differentiate between various types of braking system with its specific features
				5. Explain various steering and suspension system.
				6. Elucidate working of automotive electronic components and electrical systems.
11		ME4373	I. C. Engine	1. Differentiate between various configuration of engine and draw valve timing and port timing diagram
				2. Analyse and differentiate between theoretical air standards, theoretical fuel air and actual cycles
				3. Calculate the design and operating parameters of fuel- supply system of SI engine and analyses mixture requirement at different loads and speeds
				4. Compare different types of ejection systems and calculate quantity of fuel and size of nozzle orifice
				5. Explain the stages of combustions I SI and CI engines and effect of various operating parameters on combustion
				6. Explain methods of Measurement different performance parameters and prepare heat balance sheet

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				7. Recognize alternative fuels for IC engines with properties and compare different pollution norms
				8. Correlate various recent trends in IC Engines
11	VII	ME4393	Refrigeration and Air Conditioning	1. Apply basic laws to analyze various types of refrigeration systems
				2. Determine the psychometric properties of moist air
				3. Calculate the cooling load of given building/application
				4. Select the fan for given application
				5. Design a duct for given air conditioning application
				6. Choose the suitable AHU component such as air inlet, outlet devices etc.
11	VII	ME4413	Mechatronics System Design	1. Demonstrate the importance of integration of Mechanical, Electronics, computers and control in the design of Mechatronics system.
				2. Describe/identify key elements of sensors and transducers and techniques of interfacing with PLC, Microprocessor, Microcontroller etc.
				3. Apply a systematic approach to the design process for Mechatronics systems. (Concurrent engineering).
				4. Create system modeling of basic models and analyze.
				5. Demonstrate the practical application of mechatronics systems in areas such as manufacturing, automobile systems and robotics.
				6. Develop the capacity to think creatively and independently about new design problems and challenges.
11	VII	ME4433	Manufacturing Simulation	1. Explain concepts of Modelling and simulation
				2. Develop model frameworks for discrete –event simulation

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				3. Analyze input and output data of simulation model 4. Construct software models for manufacturing, logistics and material handling problems 5. Develop simulation model for a system and verify, validate the model
114	VII	ME4453	Casting Design and Simulation	1. To select the proper casting technique 2. To develop casting process for new product 3. To design the gating / risering system for casting
115	VII	ME4553	Mechanical Vibrations Lab	1. Estimate natural frequencies and mode shapes of given machine component. 2. Find modal parameters of vibratory system. 3. Control the vibration by using principle of DVA. 4. Use vibration measurement technique for fault diagnosis and machinery health monitoring
116	VII	ME4573	Experimental Stress Analysis Lab	1. Use Photo elastic technique to measure state of stress in the machine component 2. Apply strain gauge technique to determine state of strain at the critical location in the structural member
117	VII	ME4593	Automobile Engineering Lab	1. Explain the structure of an automobile. 2. Describe and Design transmission systems of an automobile. 3. Demonstrate and select different types of an automobile systems. 4. Test wheel balancing and wheel alignment. 5. Model any automobile system/component
118	VII	ME4613	I. C. Engine Lab	1. Recognize the various parts, systems of IC engine, and disassemble IC engine 2. Perform various tests on different engines: plot various operating characteristics and compare it with standards.



Sr. No.	Semester	Course Code	Course Name	Course Outcome
				3. Demonstrate and differentiate between fuel system of SI and CI engines. 4. Measure and correlate various engine emission with standards
11	VII	ME4633	Refrigeration and Air Conditioning	1. Analyze the performance of various refrigeration system and air conditioning system / process 2. Plot various refrigeration system and air conditioning processes using charts and tables. 3. Trouble shoot the refrigeration system and air conditioning system
12	VII	ME4653	Mechatronics System Lab	1. Demonstrate/select proper types of sensors/transducers for given task. 2. Design signal conditioning circuits for various signal conditioning processes like signal level change, signal form change, filters, bridge circuits etc. 3. Demonstrate ability of control and automation of simple devices such as motors, cylinders using PLC. 4. Demonstrate the ability to create microcontroller programs and properly
12	VII	ME4673	Manufacturing Simulation Lab	1. Describe the nature of discrete-event simulation and the types of simulation models 2. Illustrate the board applicability of discrete-event simulation to solve basic manufacturing systems problems. 3. Design model considering as per constraints given 4. Simulate the essential steps of the simulation methodology & interpret the result
12	VII		Casting Design and Simulation Lab	1. Develop/Select appropriate orientation of the casting & parting plane 2. Calculate modulus of casting & number of cavities in the mold 3. Calculate of riser & gating system design 4. Calculate the yield of the casting

Sr. No.	Semester	Course Code	Course Name	Course Outcome
12	VII	ME4323	Material Handling Systems	1. Explain the flow and type of movement of industrial goods
				2. Apply general rules for
				3. the type of movement, and
				4. Identify the appropriate material handling systems to suit the said requirement
12	VII	ME4343	Aircraft Conceptual Design	5. Explain current trends in material handling.
				1. Understand the design process of aircraft and decide the aircraft configuration.
				2. Choose type of power plant as per flight regime.
				3. Decide the fuselage layout as per type of aircraft.
				4. Design the wing for type of aircraft and its wing loading.
				5. Accurately evaluate lift, drag and mass for design synthesis process.
12	VII	ME4353	Process Equipment Design	6. Examine the influence of various design requirements on the configuration of an aircraft to derive an optimized design.
				1. Apply the role of design engineer in designing procedures of various process equipments.
				2. Design important components like flange coupling, heat transfer equipment, Distillation columns, absorber, extractor.
				3. Develop the heat exchanger data sheet and test the design for safety.
				4. Design storage vessels, pressure vessels and various parts of vessels to apply key criteria involved in the design of internal pressure vessels as per IS code.
12	VII	ME4383	Autotronics and Vehicle Intelligence	5. Develop relation between equipment design, safety and environment.
				1. Comprehensive fundamental and technical knowledge of sensors and transducers used in auto vehicles and vehicle intelligence
				2. Ability to understand, analyze and use various SI and CI management systems.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				3. Become familiar with advanced comfort and safety systems and electric hybrid vehicles. 4. To acquire the knowledge in intelligent technologies applied in modern automotive systems
12	VII	ME4403	Special Purpose Vehicles	1. Explain special purpose vehicle and different systems used in them 2. Understand constructional & working features of earth moving machines 3. Select instruments for special purpose vehicles 4. Understand farm tractors and working features of farm equipments 5. Understand mobile cranes & it's working 6. Understand tracking, articulated and multi – axle vehicles.
12	VII	ME4423	Hybrid & Electrical Vehicles	1. Understand the need of hybrid vehicles in today's context 2. Understand working of electric Vehicles and recent trends 3. Describe design steps of a hybrid vehicle for given requirements 4. Explain hybrid drive trains 5. Discuss different Energy sources and drives required for hybrid vehicles. 6. Discuss fuel cell technology for hybrid vehicle application
12	VII	ME4443	Cogeneration and Waste Heat Recovery	1. Summaries energy scenario and need for energy conservation 2. Illustrate various techniques of waste heat recovery 3. Describe the various methods of cogeneration 4. Explain the various measures for energy conservation and financial applications for various thermal utilities
13	VII	ME4463	Total Quality Management	1. Explain principles of TQM and contribution of TQM Gurus. 2. Select appropriate tools and techniques for controlling, improving and measuring quality

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				3. Apply DMAIC process of six sigma for the quality improvements 4. Appraise the organizational, Communication and teamwork requirements for effective quality management 5. Use statistical tools for quality Control 6. Select suitable Quality Management System for the given industry
13	VII	ME4483	Microelectromechanical Systems (MEMS)	1. Discuss basics, nature and applications of MEMS and Microsystem for various Fields 2. Identify and select specific material for manufacturing of MEMS and its packaging 3. Analyze and select the different techniques in MEMS technology as per requirement of application 4. Choose micromachining technique, such as bulk micromachining and surface micromachining for a specific MEMS fabrication process 5. Design and develop MEMS for various applications 6. Design packaging of MEMS as per requirement
13	VIII	OE4361	Engineering Management & Economics (Online Course)	1. Develop administrative, organizational and planning skills to execute engineering project. 2. Develop bar chart/mile stone chart for the project. 3. Analyze profit/cost data and carry out economic analysis to take optimal decision. 4. Calculate depreciation as per various methods.
13	VIII	OE4381	Finance for Engineers (Online Course)	1. Discuss the fundamental aspects of accounting and finance. 2. Apply rules of accounting while recording transactions. 3. Prepare financial statements and analyze financial position of the firm by applying various techniques.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				4. Describe the various long term sources of finance available for the business organization.
13	VIII	IP4023	Internship & Project	<p><b>1. Internship</b></p> <p>1. Examine the functioning of the company on the terms of inputs, transformation process and the outputs (products and services)</p> <p>2. Develop an attitude to adjust with the company culture, work norms, code of conduct.</p> <p>3. Recognize and follow the safety norms, Code of conduct.</p> <p>4. Demonstrate the ability to observe, analyse and document the details as per the industry practices.</p> <p>5. Interpret the processes, systems and procedures and to relate to the theoretical concepts- studies.</p> <p>6. Develop the leadership abilities, communication.</p> <p>7. Demonstrate project management and finance sense</p> <p><b>2. Project</b></p> <p>1. Identify the project/problem in the domain of a program relevant for the company.</p> <p>2. Compile the information to the pertaining to the problem identified.</p> <p>3. Analyze the information using the statistical tools/ techniques.</p> <p>4. develop the feasible solution for given problem.</p> <p>5. Analyze the impact of the project on the performance of company/department.</p>
13	VIII	RE4043	Research Project	<p>1. Investigate the technical literature.</p> <p>2. Recognize and evaluate theories, practices, and/or research on a chosen topic by conducting a thorough literature review and submitting a written integrative, critical summary of the current literature.</p>

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				3. Design a research problem and develop a methodology.
				4. Develop and implement an advanced original research or creative project.
				5. Develop the ability to explain the conceptual viability of the project and describe the major components involved.
				6. Develop the ability to explain how the project will impact the relevant body of work.
				7. Develop advanced discipline-relevant skills and competencies.
				8. Construct an accurate record of research performed.
				9. Write a research report and paper.
130	VIII	ED4103	Project Management	1. Prepare business Plan for selected business.
				2. Make risk analysis & market analysis of selected project.
				3. Make risk analysis & market analysis of selected project
				4. Make financial appraisal of selected project.
131	VIII	ED4043	Commercial Aspects of the Project	1. Interpret basic Financial Terminologies.
				2. Prepare & analyze financial statements.
				3. Prepare financial Plan for venture.
				4. Apply basic principles of marketing for various products.
				5. Prepare market survey.
				6. Apply knowledge of marketing management for selected business.
132	VIII	ED4063	Entrepreneurship Development Program (EDP)	1. Apply knowledge of engineering, economics, marketing and finance for formulation of business plan, starting & managing new business.
133	VIII	ED4083	Entrepreneurship Development Project	1. Apply knowledge of engineering, economics, marketing and finance for preparation of project report.
				2. Make commercial, technical and financial appraisal of project.



## PG Program

- **Department Name :- Mechanical Engineering Department**
- **PG Program Name :- M. Tech Design Engineering**
- **Vision and Mission :-**

<b>Vision</b>	To transform the department into center of excellence by synergizing teaching, learning and research to produce globally competent, innovative and entrepreneurial Mechanical Engineers
<b>Mission</b>	<ul style="list-style-type: none"> <li>• To develop state-of-the-art facilities to stimulate faculty, staff and students to create, analyze, apply and disseminate knowledge.</li> <li>• To build the competency to transform students into globally competent mechanical engineers by imparting quality education.</li> <li>• To collaborate with research organizations, reputed educational institutions, industries and alumni for excellence in teaching, research and consultancy practices</li> </ul>

Sr. No.	Program Outcomes
20.	Independently carry out research /investigation and development work to solve practical problems.
21.	Write and present a substantial technical report/document
22.	Demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program
23.	Accomplish collaborative and multi-disciplinary scientific research with consideration of professional, legal, and ethical issues.
24.	Manage the projects and its financial aspects on the strength of engineering knowledge and management principles.
25.	Engage in lifelong learning to address contemporary issues through independent and reflective learning.

### Programme Educational Objective (PEO):

**PEO1:** - Students will apply knowledge of design engineering to pursue successful career in the field of Mechanical Engineering.

**PEO2:** - Students will become innovators, entrepreneurs to design and develop products and services to address social, technical and business challenges.

**PEO3:** - Students will engross in lifelong learning such as higher studies, research and other continuous professional development activities

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1	I	MDE1015		Co:1 Analyze mechanical components based on stress and strain point of view.



			Advanced Solid Mechanics	<p>Co:2 Formulate constitutive matrix for isotropic materials and establish the relationship between elastic constants.</p> <p>Co:3 Use energy methods to solve structural problem.</p> <p>Co:4 Select appropriate analogy like membrane, fluid flow, electrical to solve torsion problem.</p> <p>Co:5 Design pressure vessel and rotating disks under given constraints</p> <p>Co:6 Evaluate deformation and stresses between two contact bodies with point and line contact.</p>
2	I	MDE1025	Finite Element Methods	<p>Co:1 Apply the knowledge of mathematics and engineering to solve problems in stripped structural and thermal engineering by approximate and numerical methods</p> <p>Co:2 Solve problems in 1-D structural systems involving bars, trusses, beams, and frames.</p> <p>Co:3 Develop 2-D and 3-D FE formulations involving triangular, quadrilateral elements and higher order elements.</p> <p>Co:4 Apply the knowledge of FEM for stress analysis, model analysis, heat transfer analysis and flow analysis.</p> <p>Co:5 Develop algorithms and FE code for solving design problems and adapt commercial packages for complex problems</p>
3	I	MDE1035	Computer Aided Design	<p>Co:1 Describe the principles of CAD systems, the implementation of these principles, and its connections to CAM and CAE systems.</p> <p>Co:2 Demonstrate 2D, 3D transformations and projection transformations.</p> <p>Co:3 Describe various approaches of geometric modelling.</p> <p>Co:4 Represent 2D and 3D entities mathematically.</p>
4	I	MDE1045	Mechanics of Composite Materials (Programme Elective - I)	<p>Co:1 Understand the basic concepts and difference between composite materials with conventional materials.</p> <p>Co:2 Apply the knowledge of constituent materials in defining the average properties and response of composite materials on macroscopic level.</p> <p>Co:3 Apply knowledge for finding failure envelopes and stress-strain plots of laminates.</p> <p>Co:4 Develop a clear understanding to utilize subject knowledge using computer programs to solve problems at structural level.</p>
5	I	MDE1055	Design for Manufacturing & Assembly	<p>Co:1 Apply the proper manufacturing process to a new product development process.</p> <p>Co:2 Identify the factors contributing reduction in assembly time and to incorporate assembly &amp; disassembly guidelines in product design.</p>

			(Programme Elective - I)	Co:3 Utilize reliability concepts, failure analysis tools and techniques and accelerated life test methods for improving product life cycle.
				Co:4 Calculate the factors controlling cost and time required for the product maintenance and utilize this information for design for maintenance.
6	I	MDE1065	Experimental Mechanics (Programme Elective - I)	Co:1 Determine direction and magnitude of principal stresses by using various techniques of Experimental Stress Analysis.
				Co:2 Solve two and three dimensional problems of stress-strain analysis in the field of mechanical engineering.
				Co:3 Formulate solutions using digital image processing technique.
7	I	MDE1075	Reliability Engineering (Programme Elective - I)	Co:1 Apply the concepts of Reliability, Availability and Maintainability.
				Co:2 Develop hazard-rate models to know the behaviour of components.
				Co:3 Build system reliability models for different configurations.
				Co:4 Assess reliability of components and systems using field and test data.
				Co:5 Implement strategies for improving reliability of repairable and non-repairable systems
8	I	MDE1290	Reverse Engineering and Benchmarking (Programme Elective - I)	Co:1 Interpret the Reverse Engineering (RE) Methodology
				Co:2 Appraise the Computer Aided Reverse Engineering Technology
				Co:3 Design experiments to evaluate a Reverse Engineering tool
				Co:4 Analyse disassemble products and specify the interactions between its subsystems and their functionality
9	I	MDE1085	Advanced Engineering Materials (Programme Elective - II)	Co:1 Analyse the importance of various engineering materials (metals, polymers, ceramics, composites, Semi-conductor).
				Co:2 Recite polymers, ceramics and composites, their manufacturing techniques, properties and applications.
				Co:3 Propose appropriate ceramics, glass, plastics and polymers for different applications.
				Co:4 Understand and apply Electrical, Thermal, Optical and Magnetic Properties of metals, ceramics, polymers and composites for various applications.
				Co:5 Adapt economic considerations in usage and recycling of materials in human use.
				Co:6 Apply nano materials and nanocomposites for various applications.

10	I	MDE1095	Industrial Tribology (Programme Elective - II)	Co:1 Determine tribological parameters of mechanical systems analytically by using suitable theories of friction and theories of wear.
				Co:2 Select hydrostatic step bearing for real life application in mechanical engineering based on axial load applied and lubricant available.
				Co:3 Calculate the maximum load carrying capacity and pressure equation for hydrodynamic thrust bearing by using engineering principles.
				Co:4 Evaluate elasto-hydrodynamic lubrication occurred in gears, cams and rolling element bearing by using hertz and ertel-grubin equation.
				Co:5 Estimate pressure distribution in gas lubricated bearings by applying reynolds equation for gas lubrication within elastic limits.
11	I	MDE1105	Advanced Mathematical Methods in Engineering (Programme Elective - II)	Co:1 Evaluate Fourier Series for given function and apply it to solve the partial differential equations in Engineering problems.
				Co:2 Apply the specific method of solution of partial differential equations for solving the given problems
				Co:3 Formulate and solve a boundary value problem (Partial differential equation, boundary and initial conditions).
				Co:4 Estimate numerically the solution of given algebraic equation.
12	I	MDE1115	Smart Materials and Systems (Programme Elective - II)	Co:1 Describe the behaviour and applicability of various smart materials.
				Co:2 Demonstrate knowledge of the physical principles underlying the behaviour of smart materials.
				Co:3 Describe the basic principles and mechanisms of the stimuli-response for the most important smart materials.
				Co:4 Design simple models for smart structures & materials.
13	I	MDE1300	Safety Engineering and Management (Programme Elective - II)	Co:1 List out and describe the various functions and activities of safety engineering department.
				Co:2 Provide knowledge on design features for a process industry and safety in the operation of various equipment in industry
				Co:3 Carry out a safety audit and prepare a report for the audit.
				Co:4 Prepare an accident investigation report and estimate the cost due to accident.
				Co:5 Evaluate the safety performance of an organization from accident records.
				Co:6 Identify various agencies, support institutions and government organizations involved in safety training and promotion.

14	I	MDE1125	Stress Analysis Software Lab	Co:1 Solve 1D, 2D and 3D structural analysis problems using the ANSYS software
				Co:2 Evaluate dynamic behavior of components
				Co:3 Appraise Linear buckling concept in Design of members which are succumbed to buckling
				Co:4 Solve structural analysis problems subjected to fatigue load.
				Co:5 Appraise steady state and transient thermal concept in design of members.
				Co:6 Apply basics of MATLAB programming for Engineering applications.
15	I	MDE1135	Design Engineering Lab-I	Co:1 Determine and analyze the stresses and strains in machine component.
				Co:2 Analyze the stresses and strains on combined bending and torsion.
				Co:3 Experiment on demonstration of photoelastic techniques.
				Co:4 Calibration of the photoelastic constant, determination of the stress field in a beam under bending.
				Co:5 Determine stress and strain fields using DIC.
				Co:6 Measure friction and wear using pin on disc.
				Co:7 Find lubricant properties using 4-ball tester.
16	I	SHP5511	Technical Communication	Co:1 Use grammatically correct sentences in different types of technical writings.
				Co:2 Apply technical writing skills to improve readability of documents.
				Co:3 Demonstrate professional skills required in job interviews and at workplace.
17	II	MDE1145	Mechanical Vibrations	Co:1 Derive and interpret equation of motions of multi-degrees of freedom systems.
				Co:2 Derive and interpret equation of motions of continuous systems.
				Co:3 Derive and interpret response of the system subjected to Transient vibrations.
				Co:4 Analyze the systems with Non-linear vibrations.
				Co:5 Select suitable instrument and transducers for vibration measurement.
18	II	MDE1155	Advanced Design of Mechanisms	Co:1 Design mechanism to meet certain motion as per defined application.
				Co:2 Apply the graphical and analytical techniques commonly used in the synthesis of mechanisms.
				Co:3 Design higher pair kinematic linkages for a given applications.
19	II	MDE1165	Acoustics and Noise Control (Programme)	Co:1 Determine acoustic parameters in terms of decibel levels for pressure, power, intensity and impedance.
				Co:2 Formulate 1- d wave equation for air-borne sound.

			Elective - III)	Co:3 Estimate absorption coefficient for different acoustic materials.
				Co:4 Measure sound levels for mechanical systems and reduce it up to audible range by using suitable method.
20	II	MDE1175	Fracture Mechanics (Programme Elective - III)	Co:1 Apply the basic principles of Linear elastic fracture mechanics.
				Co:2 Design the engineering components using elastic-plastic fracture mechanics principles.
				Co:3 Explain the process of crack growth and arrest in the presence of creep.
				Co:4 Compare the fracture behavior in metals and non-metals.
				Co:5 Analyze the crack growth under fatigue loading.
				Co:6 Choose the suitable computational fracture mechanics approach to solve the real mechanical engineering problem.
21	II	MDE1185	Product Design and Development (Programme Elective - III)	Co:1 Explore and analyse product development processes used in product design and development.
				Co:2 Apply various product development techniques.
				Co:3 Analyse, evaluate and apply design consideration like concurrent engineering, aesthetic and ergonomics for industrial product design.
				Co:4 Apply different methods, tools and technique to create new product design for consumer product.
22	II	MDE1195	Additive Manufacturing (Programme Elective - III)	Co:1 Describe the Importance of AM technologies in Manufacturing.
				Co:2 Classify and select additive manufacturing processes for a given application.
				Co:3 Design for manufacture for AM and carry out Process Analysis.
				Co:4 Point out the software issues addressed in additive manufacturing process.
				Co:5 Identify the Different methods for Post-processing of AM parts.
				Co:6 Suggest the Applications of AM in Automobile, Aerospace, and Bio-medical etc.
23	II	MDE1310	Design of Pressure Vessels and Piping (Programme Elective - III)	Co:1 Apply the design consideration of pressure vessel.
				Co:2 Design the support of the pressure vessel.
				Co:3 Design nozzle for pressure vessel.
				Co:4 Design piping system for pressure vessel.
24	II	MDE1205	Rotor Dynamics (Programme	Co:1 Model the Rotor bearing systems and formulate the governing equations.
				Co:2 Describe the role of damping, gyroscopic, centrifugal, stiffness and inertial effects on rotors

			Elective - IV)	Co:3 Compute the critical speeds and stability limits for rotors under axial, transverse and torsional modes Co:4 Analyse the rotor bearing systems using transfer matrix method and Finite Element Method. Co:5 Compute the transient response of rotors.
25	II	MDE1215	Design for Optimization (Programme Elective - IV)	Co:1 Identify and apply mathematical models in optimization method. Co:2 Recognize the suitable method of optimization in nonlinear programming with and without constraints. Co:3 Apply optimization method for static and dynamic applications. Co:4 Apply knowledge of design of experiment to complex system. Co:5 Use genetic algorithm, ANN and Fuzzy logic to optimize various design parameters.
26	II	MDE1225	Robotics (Programme Elective - IV)	Co:1 Comprehend basic terminologies and concepts associated with Robotics and Automation. Co:2 Demonstrate comprehension of various Robotic sub-systems. Co:3 Compute kinematics and dynamics to explain exact working pattern of robots. Co:4 Design and select robots for Industrial and Non - Industrial applications.
27	II	MDE1235	Multi-Body Dynamics (Programme Elective - IV)	Co:1 Derive equations of motion for interconnected bodies in multi-body systems with three dimensional motion. Co:2 Implement and analyze methods of formulating equations of motion for interconnected bodies. Co:3 Write programs to solve constrained differential equations for analyzing multi-body systems. Co:4 Simulate and analyze all types of static and dynamic behaviours of the multi-body systems. Co:5 Lead team projects in academic research or the industry that require modelling and simulation of multi-body systems.
28	II	MDE1320	Process Equipment Design	Co:1 Apply the role of design engineer in designing procedures of various process equipments. Co:2 Design of pressure vessels as per standard codes. Co:3 Develop the process equipments and test the design for safety. Co:4 Apply the procedure for the planning of erection of process equipments.
29	II	MDE1245	Research Methodology & IPR	Co:1 Formulate a research problem. Co:2 Analyse research related information. Co:3 Prepare and present research proposal/paper by following research ethics.

				Co:4 Make effective use of computers and computing tools to search information, analyze information and prepare report.
				Co:5 Describe nature and processes involved in development of intellectual property rights.
30	II	MDE1330	Python Programming Lab	Co:1 Use loops, functions, different libraries, custom functions.
				Co:2 Develop Python programs to solve engineering problems.
				Co:3 Develop Python program to solve problems on Numerical methods.
				Co:4 Handle different file operations.
				Co:5 Interpret the data by plotting the graphs.
31	II	MDE1265	Design Engineering Lab II	Co:1 Estimate natural frequency, damping factor, modal density of given component experimentally.
				Co:2 Find experimental mode shapes of plates.
				Co:3 Predict fault of machine by vibration and sound measurement.
				Co:4 Solve and interpret the vibration engineering problems by using MATLAB codes.
32	II	MDE1275	Mini Project	Co:1 Identify structural engineering problems reviewing available literature.
				Co:2 Study different techniques used to analyze complex structural systems.
				Co:3 Work on the solutions given and present solution by using his/her technique applying engineering principles.
33	II	MDE1285	Seminar	Co:1 Survey the literature such as books, national/international refereed journals and contact resource persons for the selected topic of Seminar.
				Co:2 Learn to write technical reports.
				Co:3 Develop oral and written communication skills to present and defend their work in front of Department Post Graduate Committee.
34	II	SHP552	Framework of Indian Constitution	Co:1 Realise the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.
				Co:2 Identify the importance of fundamental rights as well as fundamental duties.
				Co:3 Understand the functioning of Union, State and Local Governments in Indian federal system.
				Co:4 Learn procedure and effects of emergency, composition and activities of election commission and amendment procedure.
35	III	MDE2015	Industry Internship	Co:1 Identify the real applications and practices of courses studied, at industry level
				Co:2 Recognize various modeling, analysis and validation techniques adopted at industries
				Co:3 Demonstrate the issues at design, manufacturing and assembly levels

				Co:4 Summarize and present technical data in report format.
36	III	MOE2011	Artificial Intelligence – Machine Learning (Open Elective)	Co:1 Describe central machine learning methods and techniques and how they relate to artificial intelligence.
				Co:2 Differentiate between supervised and unsupervised learning techniques.
				Co:3 Apply the ML algorithms to a real-world problem.
				Co:4 Optimize the models learned and report on the expected accuracy that can be achieved by applying the models.
				Co:5 Evaluate a given problem and apply appropriate machine learning technique.
37	III	MOE2021	Creative Thinking: Tools & Techniques (Open Elective)	Co:1 Comprehend importance in tackling global challenges as well as in everyday problem-solving scenarios.
				Co:2 Apply different brainstorming techniques in group activities.
				Co:3 Be proficient in the application of the 6 thinking hats tool in different life scenarios.
				Co:4 Develop a systematic approach to idea generation through the use of morphological analysis.
				Co:5 Innovate on an existing product, service or situation applying the SCAMPER method.
				Co:6 Get confident with the theory of inventive problem solving, called TRIZ.
38	III	MOE2031	MOOC Course (Open Elective)	Co:1 Identify the real applications and practices of courses studied, at industry level
				Co:2 Recognize various modelling, analysis and validation techniques adopted at industries.
				Co:3 Demonstrate the issues at design, manufacturing and assembly levels.
				Co:4 Summarize and present technical data in report format.
39	III	MOE2041	Condition Monitoring and Signal Processing (Open Elective)	Co:1 Identify the maintenance scheme, their scope and limitations – apply the maintenance strategies to various problems in the industrial sectors.
				Co:2 Analyze for machinery condition monitoring and explain how this compliments monitoring the condition.
				Co:3 Develop an appreciation for the need of modern technological approach for plant maintenance to reduce the maintenance expenditure.
				Co:4 Emphasizes on case studies that require gathering information using the modern testing equipment and processing it to identify the malfunction in that system.



				Co:5 Identify vibration measurement, lubrication oil analysis.
40	III	MOE2051	Aircraft Conceptual Design (Open Elective)	Co:1 Analyze the design process of aircraft and decide the aircraft configuration.
				Co:2 Choose type of power plant as per flight regime.
				Co:3 Design the fuselage layout as per type of aircraft.
				Co:4 Design the wing for type of aircraft and its wing loading.
				Co:5 Evaluate lift, drag and mass for design synthesis.
				Co:6 Examine the influence of various design requirements on the configuration of an aircraft to derive an optimized design.
41	III	MDE2060	Augmented Reality and Virtual Reality (Open Elective)	Co:1 Define the basic concepts of Virtual and Augmented Reality
				Co:2 Identify the differences in AR/VR concepts and technologies
				Co:3 Describe the fundamental concepts relating to Virtual Reality such as presence, immersion, and engagement
				Co:4 Evaluate usability of AR/VR applications and critique their use of AR/VR capabilities
				Co:5 Design and prototype effective AR/VR applications using UNITY platform for various application.
42	III	MDE2070	Industrial Instrumentation (Open Elective)	Co:1 Elaborate working principal of different transducers.
				Co:2 Select suitable transducer/sensor for specific application.
				Co:3 Justify the use of specific measurement technique for specific task.
				Co:4 Evaluate the Calibration and Interfacing of the transducers.
43	III	MDE2080	Advanced Mechatronics Systems (Open Elective)	Co:1 Explain Mechatronics System.
				Co:2 Analyze the Mechatronics Based System.
				Co:3 Model, simulate, and verify the mechatronics systems.
				Co:4 Identify Electrical, Hydraulic and Pneumatic Components.
44	III	MDE2024	Dissertation Stage-I	Co:1 Explain the contributions of various researchers in the field of design engg after carrying out literature survey from reputed journals.
				Co:2 Recognize the gap in the research and define a problem statement.
				Co:3 Explain significance and applicability of problem statement.
				Co:4 Summarize and present technical data in report format.

45	III	MDE2034	Dissertation Stage-II	Co:1 Outline the work plan for problem statement.
				Co: 2 Identify the proper modelling and analysis tool.
				Co:3 Reproduce the preliminary results of problem statement.
				Co:4 Summarize and present technical data in report format.
46	IV	MDE2044	Dissertation Stage-III	Co:1 Explain the issues related to method adopted in solving the problem
				Co:2 Select proper technique in solving the problem
				Co:3 Compare the results with available literature
47	IV	MDE2054	Dissertation Stage-IV	Co:1 Design new methodology to address the problem
				Co:2 Justify the results obtained from new methodology
				Co:1 Write technical report and defend work

## PG Program

- **Department Name :-** Mechanical Engineering Department
- **PG Program Name :-** Mechanical Engineering (Thermal Engineering)
- **Vision and Mission :-**

<b>Vision</b>	To transform the department into center of excellence by synergizing teaching, learning and research to produce globally competent, innovative and entrepreneurial Mechanical Engineers
<b>Mission</b>	<ul style="list-style-type: none"><li>• To develop state-of-the-art facilities to stimulate faculty, staff and students to create, analyze, apply and disseminate knowledge.</li><li>• To build the competency to transform students into globally competent mechanical engineers by imparting quality education.</li><li>• To collaborate with research organizations, reputed educational institutions, industries and alumni for excellence in teaching, research and consultancy practices</li></ul>

<b>Sr. No.</b>	<b>Program Outcomes</b>
1.	To independently carry out research /investigation and development work to solve practical problems
2.	To write and present a substantial technical report/document
3.	To demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.
4.	To accomplish collaborative and multi-disciplinary scientific research with consideration of professional, legal, and ethical issues.
5.	To Manage the projects and its financial aspects on the strength of engineering knowledge and management principles.
6.	To Engage in lifelong learning to address contemporary issues through independent and reflective learning.

### **Programme Educational Objectives for the M. Tech Mechanical (Thermal Engineering)**

PEO1: - Graduates will apply concepts of thermal engineering to design, model, simulate and solve problems to develop energy efficient systems to pursue successful career in the field of Mechanical Engineering and allied sciences.

PEO2: - Graduates will have technical competency in thermal engineering or related areas to become innovators, academicians and provide services to address technical, business and social challenges.

PEO3: - Graduates will involve in lifelong learning such as higher studies, research to maintain professionalism and ethical standards.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1	I	SHP5132	Numerical Methods and Optimization Techniques	Co:1 Apply the methods for solving algebraic, transcendental and linear equations.
				Co:2 Solve single variable optimization problems
				Co:3 Apply the methods for curve fitting using regression and interpolation techniques.
				Co:4 Apply the methods to solve differentiation and integration numerical.
				Co:5 solve ordinary and partial differential equations
				Co:6 Analyze the variance and explain the different research designs.
2	I	MTE1012	Classical and Statistical Thermodynamics	Co:1 Explain different behaviour of gases and thermodynamic relations
				Co:2 Interpret thermodynamics property relations to various mixtures and solutions.
				Co:3 Compare thermodynamics equilibrium of system
				Co:4 Explain the kinetic theory of gases.
				Co:5 Apply the principle of statistical thermodynamics to the various processes.
				Co:6 Develop and analyze the various thermodynamic cycles.
3	I	MTE1022	Advanced Heat Transfer	Co:1 Analyze heat conduction and Radiation
				Co:2 Develop a solution to heat convection to external laminar flow
				Co:3 Formulate heat convection to internal laminar flow.
				Co:4 Examine heat convection in turbulent flow
				Co:5 Interpret convection with phase change
				Co:6 Solve heat transfer problem numerically
4	I	MTE1032	Energy Conservation and Management	Co:1 Analyze present energy scenario and the need for energy conservation.
				Co:2 Conduct energy audit of any system

			( Program Elective I )	Co:4 Illustrate various techniques of waste heat recovery and cogeneration.
				Co:5 Identify energy conservation measures for various thermal utilities.
				Co:6 Summarize different financial terms and techniques used in Energy Conservation.
5	I	MTE1042	Design of Pumps, Compressor and Blower  ( Program Elective I )	Co:1 Select suitable pump, blower, fan and compressor for a given application.
				Co:2 Design pump, blower, fan or compressor for a given application.
				Co:3 Analyze the performance of compressor and pump
				Co:4 Model and simulate pump, blower, fan and compressor.
6	I	MTE1052	Gas Turbine and Jet Propulsion  ( Program Elective I )	Co:1 Describe the ideal and real thermodynamic cycles of air-breathing engines and Industrial gas turbines.
				Co:2 Design the blading, study the velocity triangles and estimate the performance of centrifugal and axial flow compressors.
				Co:3 Explain the combustion process and design the combustion chamber of a gas turbine.
				Co:4 Design the blading, study the velocity triangles and estimate the performance of axial and radial in-flow turbines.
				Co:5 Analyze off-design performance and matching of the components of a gas turbine.
7	I	MTE1062	Finite Element Method for Thermal Engineering  ( Program Elective I )	Co:1 Establish the mathematical model for the complex analysis problems and predict the nature of the solution.
				Co:2 Formulate element characteristic matrices and vectors.
				Co:3 Identify the boundary conditions and their incorporation into FE equation
				Co:4 Analyze simple geometry problems for Thermal and stress analysis.
				Co:5 Interpret the analysis results for the improvement or modification of the system

8	I	MTE1072	Advanced I. C. Engines and Electric Vehicles ( Program Elective II )	Co:1 Analyze the gas exchange and charge motion in engines.
				Co:2 Design and develop basic schemes of electric vehicles and hybrid electric vehicles.
				Co:3 Choose proper energy storage systems, electric machine and drive train for vehicle applications.
				Co:4 Analyze various communication protocols and technologies used in vehicle networks.
9	I	MTE1082	Experimental Methods in Thermal Engineering ( Program Elective II )	Co:1 Identify the suitable instrument for measuring transport parameters and estimate error
				Co:2 Detect suitable range of pressure gauge and compute its dynamic response.
				Co:3 Distinguish different flow visualization methods and temperature measurements.
				Co:4 Determine thermal conductivity in solids, liquids and gases and radiation measurements
				Co:5 Develop transfer function of given mechanical system by using concept of control system.
				Co:6 Explain applications of thermal materials.
10	I	MTE1092	Alternative Fuel Technology ( Program Elective II )	Co:1 To Identify the need for alternate fuels and characterize prospective alternate fuels.
				Co:2 To Interpret the properties and performance characteristics of liquid fuels like gasoline, alcohol, vegetable oils in both SI and CI engines.
				Co:3 To Compare the properties and performance characteristics of gaseous fuels like LPG, CNG, and Hydrogen.
				Co:4 To Judge the scope and limitation of different alternate fuels.
11	I	MTE1102	Power Plant Engineering ( Program Elective II )	Co:1 Explain analytical and technological aspects of power plant design, systems and their effects.
				Co:2 Analyze and explain various power plants.
				Co:3 Summarize advanced power cycles.
				Co:4 Recognize environmental issues.
				Co:5 Estimate economics of power plants.

12	I	MTE1112	Modelling Lab	Co:1 Model the components of thermal system using suitable software.
				Co:2 Create computational domain for selected geometry.
				Co:3 Generate mesh and refine mesh elements of given geometry.
13	I	MTE1122	Thermal Engineering Lab - I	Co:1 Conduct test and interpret the theoretical and experimental data of conduction and convection experiments.
				Co:2 Relate the theory and the experimentation pertaining to thermal system.
				Co:3 Examine various thermal systems
14	I	MTE1132	Computational Engineering Lab	Co:1 Develop codes for numerical methods to tackle simple thermal problems.
				Co:2 Simulate codes of computational methods of given conditions.
				Co:3 Analyze and validate output of written codes with analytical solution.
15	I	SHP5511	Technical Communication	Co:1 Use grammatically correct sentences in different types of technical writings.
				Co:2 Apply technical writing skills to improve readability of documents.
				Co:3 Demonstrate professional skills required in job interviews and at workplace.
16	II	MTE2012	Computational Fluid Dynamics	Co:1 Derive governing equations for fluid dynamics and heat transfer.
				Co:2 Develop finite difference algorithms for fluid flow and heat transfer problems.
				Co:3 Develop finite volume algorithms for fluid dynamics equations.
				Co:4 Select appropriate grid generation methods for CFD analysis.
				Co:5 Apply different CFD Techniques to various fluid flow problems
17	II	MTE2022	Design of Thermal System	Co:1 Illustrate basic principles of modeling and optimization of design of thermal systems.
				Co:2 Design thermal systems.

				Co:3 Analyze thermal system.
18	II	MTE2032	Design of Heat Transfer Equipment ( Program Elective – III )	Co:1 Select suitable heat exchanger for particular application.
				Co:2 Design of heat exchanger.
				Co:3 Design and analyse boiler furnace.
				Co:4 Analyse different heat transfer equipments.
19	II	MTE2042	Cryogenics Engineering ( Program Elective – III )	Co:1 Apply the basic principles of low temperature engineering.
				Co:2 Explain the behaviour of solids and liquid at low temperatures
				Co:3 Analyze cryogenic systems.
				Co:4 Discuss gas separation systems.
				Co:5 Design Heat Exchangers for Cryogenic System.
20	II	MTE2052	Food Processing, Preservation and Transport ( Program Elective – III )	Co:1 Analyze mechanism of food spoilage
				Co:2 Design suitable food processing and preservation system
				Co:3 Select suitable cold storage system
				Co:4 Design and analysis transport system of preserved foods
				Co:5 Model the preservation system
21	II	MTE2062	Battery Thermal Management System ( Program Elective – III )	Co:1 Illustrate major functions and parts of a battery-management system.
				Co:2 Design various configurations of battery pack and recent trends in battery pack.
				Co:3 Compute stored energy in a battery pack.
				Co:4 Measure and control current, temperature, and isolation in battery-management system
22	II	MTE2072	Heating Ventilation Air Conditioning and Refrigeration Systems ( Program Elective – IV )	Co:1 Explain different vapor compression refrigeration system and refrigerants.
				Co:2 Design of cooling and heating components of refrigeration system
				Co:3 Explain fundamentals of air conditioning and estimate cooling load on the building by considering various heat sources



				Co:4 Illustrate various air conditioning systems.
				Co:5 Design ducting systems and select air distribution system.
				Co:6 Explain air handling units in various applications.
23	II	MTE2082	Theory and Technology of Fuel Cells ( Program Elective – IV )	Co:1 Demonstrate various configuration of fuel cell.
				Co:2 Explain Low and high temperature fuel cell and modelling practices.
				Co:3 Analyse operating parameters of fuel cell
				Co:4 Explain various fuelling technologies.
				Co:5 Illustrate fuels, processing and systems.
				Co:6 Analyse Fuel cycles and give its applications.
24	II	MTE2092	Cogeneration and Waste Heat Management ( Program Elective – IV )	Co:1 Estimate and quantify available waste heat
				Co:2 Explore different waste heat recovery systems
				Co:3 Explain economics of cogeneration and waste heat recovery systems
				Co:4 Illustrate different cogeneration techniques.
25	II	MTE2102	Advanced Thermal Storage Technology ( Program Elective – IV )	Co:1 Select thermal storage systems and the storage materials
				Co:2 Develop a model and analyze the thermal storage systems
				Co:3 Explain applications of thermal storage systems
26	II	MTE2112	Research Methodology & IPR	Co:1 Formulate a research problem.
				Co:2 Analyse research related information.
				Co:3 Prepare and present research proposal/paper by following research ethics.
				Co:4 Make effective use of computers and computing tools to search information, analyze information and prepare report.
				Co:5 Describe nature and processes involved in development of intellectual property rights
27	II	MTE2122		Co:1 Formulate problems in fluid flow and heat transfer.

			Computational Fluid Dynamics Lab	Co:2 Apply initial and boundary conditions to solve heat transfer problems.
				Co:3 Use ANSYS-Fluent for solving real life engineering problems
28	II	MTE2132	Thermal Engineering Lab-II	Co:1 Evaluate COP of different refrigeration systems.
				Co:2 Estimate cooling load needed for given space.
				Co:3 Design a refrigeration and air conditioning system for given application.
				Co:4 Calculate efficiency and effectiveness of different types of heat exchangers.
29	II	MTE2142	Seminar	Co:1 Review of literature related to thermal engineering
				Co:2 Write technical reports.
				Co:3 Develop skills to present the findings.
30	II	SHP552	Framework of Indian Constitution	Co:1 Realise the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution.
				Co:2 Identify the importance of fundamental rights as well as fundamental duties.
				Co:3 Understand the functioning of Union, State and Local Governments in Indian federal system.
				Co:4 Learn procedure and effects of emergency, composition and activities of election commission and amendment procedure.
31	III	MTE3012	Industry Internship	Co:1 Identify the real applications and practices of courses studied, at industry level
				Co:2 Recognize various modeling , analysis and validation techniques adopted at industries.
				Co:3 Demonstrate the issues at design, manufacturing and assembly levels.
				Co:4 Summarize and present technical data in report format.
32	III	MOE2011	Artificial Intelligence – Machine Learning (Open Elective)	Co:1 Describe central machine learning methods and techniques and how they relate to artificial intelligence.
				Co:2 Differentiate between supervised and unsupervised learning techniques.

				Co:3 Apply the ML algorithms to a real-world problem.
				Co:4 Optimize the models learned and report on the expected accuracy that can be achieved by applying the models.
				Co:5 Evaluate a given problem and apply appropriate machine learning technique.
33	III	MOE2021	Creative Thinking: Tools & Techniques (Open Elective)	Co:1 Comprehend importance in tackling global challenges as well as in everyday problem-solving scenarios.
				Co:2 Apply different brainstorming techniques in group activities.
				Co:3 Be proficient in the application of the 6 thinking hats tool in different life scenarios.
				Co:4 Develop a systematic approach to idea generation through the use of morphological analysis.
				Co:5 Innovate on an existing product, service or situation applying the SCAMPER method.
				Co:6 Get confident with the theory of inventive problem solving, called TRIZ.
34	III	MOE2031	MOOC Course (Open Elective)	Co:1 Identify the real applications and practices of courses studied, at industry level
				Co:2 Recognize various modelling, analysis and validation techniques adopted at industries.
				Co:3 Demonstrate the issues at design, manufacturing and assembly levels.
				Co:4 Summarize and present technical data in report format.
35	III	MOE2041	Condition Monitoring and Signal Processing (Open Elective)	Co:1 Identify the maintenance scheme, their scope and limitations – apply the maintenance strategies to various problems in the industrial sectors.
				Co:2 Analyze for machinery condition monitoring and explain how this compliments monitoring the condition.
				Co:3 Develop an appreciation for the need of modern technological approach for plant maintenance to reduce the maintenance expenditure.

				Co:4 Emphasizes on case studies that require gathering information using the modern testing equipment and processing it to identify the malfunction in that system.
				Co:5 Identify vibration measurement, lubrication oil analysis.
36	III	MOE2051	Aircraft Conceptual Design (Open Elective)	Co:1 Analyze the design process of aircraft and decide the aircraft configuration.
				Co:2 Choose type of power plant as per flight regime.
				Co:3 Design the fuselage layout as per type of aircraft.
				Co:4 Design the wing for type of aircraft and its wing loading.
				Co:5 Evaluate lift, drag and mass for design synthesis.
				Co:6 Examine the influence of various design requirements on the configuration of an aircraft to derive an optimized design.
37	III	MDE2060	Augmented Reality and Virtual Reality (Open Elective)	Co:1 Define the basic concepts of Virtual and Augmented Reality
				Co:2 Identify the differences in AR/VR concepts and technologies
				Co:3 Describe the fundamental concepts relating to Virtual Reality such as presence, immersion, and engagement
				Co:4 Evaluate usability of AR/VR applications and critique their use of AR/VR capabilities
				Co:5 Design and prototype effective AR/VR applications using UNITY platform for various application.
38	III	MDE2070	Industrial Instrumentation (Open Elective)	Co:1 Elaborate working principal of different transducers.
				Co:2 Select suitable transducer/sensor for specific application.
				Co:3 Justify the use of specific measurement technique for specific task.

				Co:4 Evaluate the Calibration and Interfacing of the transducers.
39	III	MDE2080	Advanced Mechatronics Systems (Open Elective)	Co:1 Explain Mechatronics System.
				Co:2 Analyze the Mechatronics Based System.
				Co:3 Model, simulate, and verify the mechatronics systems.
				Co:4 Identify Electrical, Hydraulic and Pneumatic Components.
40	III	MTE3022	Dissertation Phase I	Co:1 Explain the contributions of various researchers in the field of thermal engineering after carrying out literature survey from reputed journals
				Co:2 Recognize the gap in the research and define a problem statement
				Co:3 Explain significance and applicability of problem statement
				Co:4 Summarize and present technical data in report format
41	III	MTE3032	Dissertation Phase II	Co:1 Outline the work plan for problem statement
				Co:2 Identify the proper modeling and analysis tool
				Co:3 Reproduce the preliminary results of problem statement
				Co:4 Summarize and present technical data in report format
42	IV	MTE4012	Dissertation Phase III	Co:1 Explain the issues related to method adopted in solving the problem
				Co:2 Select proper technique in solving the problem
				Co:3 Compare the results with available literature.
43	IV	MTE4022	Dissertation Phase - IV	Co:1 Design new methodology to address the problem
				Co:2 Justify the results obtained from new methodology
				Co:3 Write technical report and defend work.

# **Mechatronics Engineering**

- **Department Name: - Mechatronics Engineering**
- **UG Program Name: -B. Tech**

- Vision and Mission: -

Our Vision - To serve as a pioneering transdisciplinary department dedicated to transform students to professional graduate to cater the needs of Industry and Society.

Our Mission-

1. Preparing graduates to meet industry demands through the provision of high-quality education.
2. Creating an educational environment that nurtures research, innovation, creativity, and entrepreneurship.
3. Nurturing professionalism, ethical standards, core human values, and the culture of lifelong learning.

<b>Sr. No.</b>	<b>Program Outcomes</b>
97.	Apply the knowledge of mathematics, science, engineering fundamentals, and mechanical engineering to the solution of complex engineering problems.
98.	Identify, formulate, review research literature, and analyze complex mechanical engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
99.	Design solutions for complex mechanical engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
100.	Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
101.	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex mechanical engineering activities with an understanding of the limitations.
102.	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
103.	Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
104.	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
105.	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
106.	Communicate effectively on complex mechanical engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
107.	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
108.	Recognize the need for, and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological change.

<b>Sr. No.</b>	<b>Program Specific Outcomes</b>
8.	Innovate & design mechatronics systems & components using national and international standards like IS BS, SAE, ISO, ASTM to meet required specifications.

9.	Ensure optimized system performance by analyzing & constant improvement in design & enhancing intelligence capability of the system.
10.	Lead professional practices in Industries or as an entrepreneur by applying management principles & practices.

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1.	III	MC2011	Mathematics for Mechatronics Engineering	1.Illustrate curve fitting concepts in Mechatronics related problems.
				2.Compute problems on probability distribution by using different formulae.
				3.Evaluate differential equation using appropriate concept.
				4.Analyze the problem and apply the concept of partial differential equations.
				5.Evaluate Laplace & inverse Laplace transform of function and solve ordinary differential equations and linear time invariant systems.
				6.Develop Fourier series of periodic functions.
2.	III	MC2031	Analog and Digital Electronics	1.Explain working principles of electronic devices
				2.Illustrate applications of analog and digital electronic circuits.
				3.Analyze various analog and digital circuits.
				4.Design applications using electronic devices and circuits
3.	III	MC2051	Industrial Fluid Power	1.Describe the structure and function of common hydraulic and pneumatic components such as cylinders, valves, pumps, and motors etc.
				2.Model and analyze common hydraulic and pneumatic components such as cylinders, valves, pumps, and motors.
				3.Create & simulate basic hydraulic and pneumatic circuit diagrams for different applications.
				4.Design, develop & analyze simple hydraulic and pneumatic systems for given task.
4.	III	MC2071	Engineering Mechanics	1.Calculate resultant force of coplanar force system.
				2.Analyze engineering problems applying conditions of equilibrium.



				3.Determine centroid & moment of inertia of the geometrical plane lamina.
5.	<b>III</b>	<b>ATMD201</b>	<b>Automobile Systems</b>	<p>1.Explain constructional details and operation of the automotive systems.</p> <p>2.Interpret the influence of various technical parameters on the behavior of the automotive systems.</p> <p>3.Configure the systems and its elements for integrating into drivetrain/chassis systems appropriate for given automotive application.</p> <p>4.Present in detail the technological advancements of the automotive systems.</p>
6.	<b>III</b>	<b>CEMD201</b>	<b>Building Construction and Planning</b>	<p>1.Suggest appropriate materials for building construction applications.</p> <p>2.Prepare a functional design of components of the building.</p> <p>3.Design and draw residential building using principles of planning and byelaws.</p> <p>4.Prepare plumbing and electrification plan for the building.</p> <p>5.Explain properties of building finishing materials and application procedure.</p>
7.	<b>III</b>	<b>AIMD201</b>	<b>Object Oriented Programming</b>	<p>1.Understand the basic object-oriented programming concepts and apply them in problem solving.</p> <p>2.Illustrate inheritance concepts for reusing the program.</p> <p>3.Implement program using loops, decision statements and functions in Python.</p> <p>4.Plot data using appropriate Python visualization libraries.</p>
8.	<b>III</b>	<b>CSMD201</b>	<b>Introduction to Data Structures</b>	<p>1.Compare between linear and nonlinear data structures</p> <p>2.Describe the characteristics of various data structure such as stacks, queues, trees, graphs and Hash tables.</p> <p>3.Analyze various searching and sorting algorithms and apply it to solve particular problem.</p> <p>4.Determine a suitable data structure and algorithm to solve a real world problem</p>

9.	<b>III</b>	<b>CIMD201</b>	<b>Data Structures</b>	1.Describe the basic terminologies of data structures.
				2.Examine the linear data structure array with its types.
				3.Demonstrate the working of stack, queue performed on data structures.
				4.Illustrate the working of linked list.
				5.Discuss Tree terminologies and their applications.
				6.Elaborate Graph terminologies with their types.
10.	<b>III</b>	<b>EEMD201</b>	<b>Electrical Power Generation</b>	1.List the main components of different power plants
				2.Describe the operation of various power plants used for electrical power generation.
				3.Explain working principles of various power plants
				4.Compare different power plants based on advantages, limitations and future prospects
				5.Draw layout of electrical power plants.
				6.Explore alternate electrical energy resources for future needs and challenges.
11.	<b>III</b>	<b>MEMD201</b>	<b>Materials and Applications</b>	1.Describe crystal structures and crystal imperfections.
				2.Illustrate plotting of Equilibrium diagrams from Cooling Curves and its fundamentals.
				3.Explain different Ferrous, Nonferrous alloys, their properties and applications by referring equilibrium diagrams.
				4.Explain properties and applications of Smart Materials, Magnetic Materials and Electronic materials.
				5.Explain properties and applications of Powder Metallurgy
				6.Select suitable material for given engineering application.
12.	<b>III</b>	<b>MCMD 201</b>	<b>Fundamentals of Mechatronics</b>	1.Identify various elements of mechatronics systems.
				2.Select appropriate sensor/Actuator/controller/control algorithm for different applications.
				3.Develop PLC/ microcontroller-based applications.
13.		<b>SH2174</b>	<b>Environmental Science</b>	1.Apply interdisciplinary knowledge in environmental

				<p>science by integrating concepts and principles from various fields of science and engineering to address environmental issues.</p> <p>2.Evaluate environmental impacts of human activities on ecosystems and on the environment.</p> <p>3.Use scientific approach to identify and solve environment related problems.</p> <p>4.Design sustainable solutions to address environmental challenges by considering renewable energy sources, waste management strategies conservation measures, and environmental policies.</p> <p>5.Participate in group work to become acquainted with the importance of teamwork, collaboration.</p> <p>6.Develop presentation and report writing skills.</p>
14.	<b>III</b>	<b>MC2511</b>	<b>Analog and Digital Electronics Lab</b>	<p>Analyze electronic circuits as per requirements.</p> <p>Conduct an experiment to observe response.</p> <p>Calculate different parameters from experimental results and plot the response.</p> <p>Interpret results of experiment and compare with measured values.</p> <p>Improve the ability to communicate effectively through written lab journals.</p>
15.	<b>III</b>	<b>MC2531</b>	<b>Industrial Fluid Power Lab</b>	<p>1.Demonstrate &amp; identify various components of Hydraulics &amp; Pneumatic System along with standard symbols.</p> <p>Design &amp; analyze basic hydraulic and pneumatic circuits using training kits</p> <p>Design &amp; analyze electrohydraulic and electropneumatic circuits using training kits.</p> <p>Use Automation Studio software to design &amp; simulate the fluid power circuits.</p>
16.	<b>III</b>	<b>MC2551</b>	<b>Workshop Practice –I (Electrical Machines Lab)</b>	<p>1.Perform experiments on AC and DC machines.</p> <p>2.Demonstrate testing and control of various electrical machines.</p> <p>3.Plot the characteristics of various electrical machines.</p> <p>4.Analyse the performance parameters of electrical machines.</p>

				5.Compare the performances of the electrical machines.
17.	<b>III</b>	<b>MC2571</b>	<b>Machine Drawing and CAD Modeling Lab</b>	1.List and draw different standard parts like fasteners and keys. 2.Inspect Limit, fits and tolerances from sketches of machine parts. 3.Model machine parts using CAD software. 4.Assemble machine Parts by using CAD tool. 5.Generate detailed drawing views. 6.Create surface features using surface tools.
18.	<b>III</b>	<b>MC2591</b>	<b>Engineering Mechanics Lab</b>	1.Verify law of polygon of forces, law of triangle of forces and principle of moment. 2.Verify Lami's theorem. 3.Compare the coefficient of friction of various surfaces in contact. 4.Correlate theoretical and practical results of support reactions and Centroid of plane lamina. 5.Analyze a simple truss
19.	<b>III</b>	<b>MC2611</b>	<b>Technical Aptitude -I</b>	1.Apply the knowledge acquired during the course work. 2.Develop the ability of problem solving.
20.	<b>III</b>	<b>SH2634</b>	<b>Professional Leadership Skills</b>	1.Explain the traits of a leadership through real life examples. 2.Exhibit the ability to work effectively in team. 3.Prepare a presentation as per the audience and context requirements.
21.	<b>III</b>	<b>SH2614</b>	<b>Interpersonal Skills</b>	1.Exhibit interpersonal communication skills. 2.Demonstrate decision-making skills. 3.Apply conflict resolution styles appropriate in different situations. 4.Demonstrate skills to manage balance in work and life. 5.Apply Jeevanvidya wisdom in day to day life.
22	<b>III</b>	<b>SH2694</b>	<b>Innovation Tools and Methods for Entrepreneurs</b>	1.Explain structured approach to define the problem with every possible detail, identify conflicts and solve them

				<p>2. Apply User Journey Map to the selected problem to show user interaction at various stages</p> <p>3. Analyze the solutions provided by competitors for effectiveness and gaps if any.</p>
22.	<b>III</b>	<b>SH2594</b>	<b>Personal Effectiveness and Body Language</b>	<p>1. Develop skills to build self-esteem and positive attitude.</p> <p>2. Develop interpersonal skills characterized by effective communication and conflict resolution.</p> <p>3. Discover ways to overcome procrastination.</p> <p>4. Demonstrate responsiveness towards stress and health issues.</p> <p>5. Interpret the non-verbal behaviour of a person.</p>
23	<b>III</b>	<b>SH2734</b>	<b>German Language- Level III</b>	<p>1. Interpret the language if the next person is speaking slowly and clearly.</p> <p>2. Make use of the language in routine life with the routing topics like family, shopping, work etc.</p> <p>3. Demonstrate the language by self-introduction in German with simple sentences.</p>
24	<b>III</b>	<b>SH2714</b>	<b>Japanese Language - Level III</b>	<p>1. Make use of basic conversations in various situations.</p> <p>2. Identify the sentence patterns.</p> <p>3. Explain insights about the communication required for living in Japan.</p> <p>4. Interpret Japanese work ethics required in their professional career.</p>
25	<b>IV</b>	<b>MC2021</b>	<b>Strength of Materials</b>	<p>1. Determine different types of stresses and strains induced in any machine component.</p> <p>2. Develop shear force and bending moment diagram for different types of beam.</p> <p>3. Determine stress distribution for various cross sections of beam.</p> <p>4. Estimate the deflection of beams by analytical and graphical method</p> <p>5. Analyze axially loaded column for different end conditions.</p>
26	<b>IV</b>	<b>MC2041</b>		Understand the fundamentals of embedded systems.

			<b>Microcontrollers and Embedded systems</b>	Write embedded C programs for on chip and off chip peripherals.
				Interface peripherals with microcontroller.
				Design the embedded system using microcontroller.
27	<b>IV</b>	<b>MC2061</b>	<b>Kinematics &amp; Dynamics of Machines</b>	1.Select suitable mechanisms for given application
				2.Analyze the mechanism for velocity and acceleration
				3.Design the CAM for given condition
				4.Apply appropriate power transmission method for mechanical system
				5.apply different techniques to balance the rotary and reciprocating systems
				6.Evaluate and analyze the parameters affecting on stability of spinning bodies due to gyroscopic effect
28	<b>IV</b>	<b>MC2081</b>	<b>Manufacturing Technologies</b>	1.Explain casting as manufacturing process suitable for the component design and production volume.
				2.Select appropriate joining process for given application.
				3.Select suitable Engineering forming process for production of component of required specification.
				4.Select machine tools for metal cutting operations.
				5.Describe the non-traditional machining processes.
29	<b>IV</b>	<b>ATMD202</b>	<b>I. C. Engines</b>	1.Perform a primary thermodynamic analysis of Otto and diesel cycle engines.
				2.Select appropriate engine for specific application.
				3.Select proper fuel system for IC engine.
				4.Identify abnormal combustion in engine and remedy over it.
30	<b>IV</b>	<b>CEMD202</b>	<b>Building Estimation and Valuation</b>	1. Explain the types and basic requirements of the estimate.
				2. Explain measurement sheet, abstract sheet, and detailed specifications of different construction items.

				<p>3. Prepare detailed estimate of load bearing structure and framed structure.</p> <p>4. Prepare rate analysis and bar bending schedule of different construction items.</p> <p>5. Explain the tenders and contracts.</p> <p>6. Describe basic terms of valuation.</p>
31	IV	CSMD202	Problem Solving using JAVA	<p>1. Understand the basic object-oriented programming concepts and apply them in problem solving.</p> <p>2. Apply concept of inheritance for code reusability.</p> <p>3. Develop Programs using multithreading.</p> <p>4. Develop data-centric applications using JDBC.</p> <p>5. Design the basics of java console and GUI based programming</p>
32	IV	EEMD202	Power System	<p>1. Write the basic working principles of different generating sources.</p> <p>2. Analyze different types of loads</p> <p>3. Explain importance of power factor and tariffs in power system.</p> <p>4. Identify various components in power transmission and distribution system.</p> <p>5. Select substation equipments as per requirement.</p>
33	IV	ECMD202	Electronics Communication Systems	<p>1. Describe different communication systems.</p> <p>2. Explain applications of analog and digital modulation techniques.</p> <p>3. Analyze different modulation and demodulation techniques.</p> <p>4. Explain the use of satellite communication.</p>

34	IV	CIMD202	Computer Algorithms	1. Analysing asymptotically the performance of algorithms.
				2. Compare and analyse searching and sorting algorithms.
				3. Apply different algorithm design techniques to solve problems like job sequencing, knapsack, TSP, finding shortest path etc.
				4. Apply backtracking method to solve problems like N-queens, graph coloring, sum of subsets etc.
				5. Describe computational complexity theory to classify computational problems according to their inherent difficulty.
35	IV	MEMD202	Design and Drawing of Machine Components	1. Produce the production drawing of simple mechanical assemblies.
				2. Design the machine components subjected to static loading.
				3. Design of spur gear and selection of roller bearing.
				4. Design a component against fluctuating load
36	IV	MCMD202	Industrial Fluid Power	1. Describe the structure and function of common hydraulic and pneumatic components such as cylinders, valves, pumps, and motors etc.
				2. Model and analyze common hydraulic and pneumatic components such as cylinders, valves, pumps, and motors.
				3. Create & simulate basic hydraulic and pneumatic circuit



				<p>diagrams for different applications.</p> <p>4. Design, develop &amp; analyze simple hydraulic and pneumatic systems for given task.</p>
37	IV	AIMD202	<b>Data Structures &amp; Algorithms</b>	<p>1. Compare between linear and nonlinear data structures</p> <p>2. Describe the characteristics of various data structure such as stacks, queues, trees, graphs and Hash tables.</p> <p>3. Analyze various searching and sorting algorithms and apply it to solve particular problem.</p> <p>4. Determine a suitable data structure and algorithm to solve a real world problem</p>
38	IV	SH202	मराठी भाषिक कौशल्यविकास	<p>भाषा आणि व्यक्तिमत्व विकास यांमधील सहसंबंध स्पष्ट करू शकेल</p> <p>२. भाषिक कौशल्यविकास करू शकेल</p> <p>३. कथा या मराठी साहित्य प्रकाराचे विश्लेषण करू शकेल</p> <p>४. एकांकिका या मराठी साहित्य प्रकाराच्या विश्लेषणाची क्षमता प्राप्त करेल</p>
39	IV	SH204	हिंदी कथा साहित्य एवं प्रयोजमूलक हिंदी	<p>4. विद्यार्थियों में मानवीय संवेदनाओं के विकास के साथ नवीन सामाजिक सांस्कृतिक बोध और जीवन मूल्यों का विकास होगा।</p> <p>5. विद्यार्थियों में साहित्य के माध्यम से कलात्मक गुणों की अभिवृद्धि होगी कला की साहित्यिक विधाओं के प्रति अभिरुचि जागृत होगी तथा रचनात्मक कौशल्य को बढ़ावा मिलेगा।</p> <p>6. विद्यार्थियों में नए वैश्विक मूल्यों के प्रति सजगता को</p>

				<p>बढ़ावा मिलेगा एवं मूल्यवादी दृष्टि के प्रति दायित्व बोध उत्पन्न होगा। छात्र व्यवहार में हिंदी भाषा का उचित प्रयोग कर सकेंगे।</p>
				<p>7. छात्र व्यवहार में हिंदी भाषा का उचित प्रयोग कर सकेंगे।</p>
40	IV	MC2501	Microcontrollers and Embedded System Lab	<p>1. Write embedded C programs for on chip and off chip peripherals.</p> <p>2. Interface peripherals with PIC microcontroller.</p> <p>3. Compile debug and test logic on PIC microcontroller.</p>
41	IV	MC2521	Python Programming Lab.	<p>1. To understand the basic concepts of scripting and the contributions of scripting language.</p> <p>2. Ability to explore python data structures like Lists, Tuples, Sets and dictionaries.</p> <p>3. Ability to create practical and contemporary applications using Functions, Modules and Regular Expressions.</p>
42	IV	MC2541	Workshop Practice –II	<p>1. Demonstrate effect of variables such as speed, feed, and depth of cut on machining process.</p> <p>2. Produce given joint by MIG welding process.</p> <p>3. Produce welding run on S.S. by TIG welding.</p> <p>4. Produce given job with proper taper and V threading within dimensional tolerances <math>\pm 0.2</math> mm. on diameter and <math>\pm 0.5</math> mm. on length. (Job – A)</p>
43	IV	MC2561	Technical Aptitude -II	<p>Apply the knowledge acquired during the course work.</p> <p>2. Develop the ability of problem solving.</p>
44	IV	SH 2644	German Language - Level IV	<p>1. Interpret the language if the next person is speaking slowly and clearly.</p>

				<p>2. Make use of the language in routine life with the routing topics like family, shopping, work etc.</p>
				<p>3. Demonstrate the language by self-introduction in German with simple sentences.</p>
45	<b>IV</b>	<b>SH2624</b>	<b>Japanese Language - Level IV</b>	<p>1) To be able to make basic conversations in various situations.</p>
				<p>2) To recognize the sentence patterns.</p>
				<p>3) To improve Japanese Language proficiency.</p>
				<p>4) To give students insights about the communication required for living in Japan.</p>
				<p>5) To expose students to the Japanese work ethics required in their professional careers.</p>
46	<b>V</b>	<b>MC3011</b>	<b>Industrial Automation</b>	<p>Explore the architecture of PLC and its functions.</p>
				<p>Execute the various instructions and logic in PLC.</p>
				<p>Develop the PLC program for various applications.</p>
				<p>Design and develop the SCADA, DCS system for various applications.</p>
47	<b>V</b>	<b>MC3031</b>	<b>Sensor and Instrumentation</b>	<p>1. Explain the fundamental principles of various sensors and transducers.</p>
				<p>2. Analyze the characteristics, advantages, and limitations of different sensor types.</p>
				<p>3. Select and integrate sensors into mechatronic systems for real-time data acquisition and control.</p>
				<p>4. Apply appropriate signal conditioning techniques to improve sensor output accuracy.</p>
				<p>5. Develop mechatronic systems using appropriate</p>

				sensors for real-life applications.
48	V	MC3051	Control Engineering	1. Design mathematical model for electrical, mechanical and electromechanical system.
				2. Evaluate transient and steady state behaviour of systems using standard test signals.
				3. Solve the linear and non-linear systems for absolute stability and relative stability.
				4. Design a stable control system satisfying requirements of stability and reduced steady state error.
				5. Analyse of control systems using the state space approach.
49	V	MC3071	Database Management systems	1. Illustrate the design principles for database design, ER model and normalization.
				2. Demonstrate the basics of query evaluation and heuristic query optimization techniques.
				3. Apply Concurrency control and recovery mechanisms for the desirable database problem.
				4. Compare the basic database storage structure and access techniques including B Tree, B+ Trees and hashing.
				5. Review the fundamental view on unstructured data and its management.
50	V	MC3091	Condition Monitoring	1. Explain the maintenance techniques for condition monitoring in industries.
				2. Select the methods of vibration control.

				<p>3. Accumulate the data for analysis using vibration acquisition equipment.</p> <p>4. Apply modern technologies for effective signal analysis and fault diagnosis.</p> <p>5. Monitor and analyze the method of failure analysis used for different applications.</p>
51	V	MC3111	Battery And Fuel Cell Technology	<p>1. Explain the electric vehicle and hybrid vehicles technology, environmental and current status.</p> <p>2. Justify Energy Storage Requirement in Hybrid and Electric Vehicles and elaborate the Battery Fundamental Characteristics</p> <p>3. Discuss the construction, electrochemistry, technology, and applications of selected primary batteries.</p> <p>4. Discuss the construction, electrochemistry, technology, and applications of selected Secondary batteries.</p> <p>5. Evaluate different batteries or fuel cells in order to select a suitable battery or fuel cell for given application.</p> <p>6. Select suitable, membrane, fuel (for fuel cell) and drive line for developing electric vehicles.</p>
52	V	MC 3131	Industrial Organization and Management	<p>1. Recognize the factors that influence the business environment and visualize their effect on business.</p>

				<p>2. Evaluate the scope and objectives of functional areas of business and their integration.</p>
				<p>3. Formulate an effective and efficient solution for business problems.</p>
				<p>4. Identify several ways in which financial accounting information is used to make business decisions.</p>
				<p>5. Apply engineering economics principles for evaluation of a business.</p>
53	V	MC3151	Material Handling Systems	<p>1. Explain fundamental principles and concepts of material handling systems.</p>
				<p>2. Select and apply specific material handling system for respective applications.</p>
				<p>3. Choose an automatic transfer mechanisms and feed mechanism in material handling systems.</p>
				<p>4. Analyze usage of RGV's, AVG's, storage, retrieval Systems and use of recent technologies in advanced material handling systems.</p>
54	V	OE353	Factory Automation	<p>1. Recognise various automation technologies in manufacturing and process industries.</p>
				<p>2. Select various automation tools and methods in the manufacturing industry.</p>
				<p>3. Implement various control and automation methods in process industries.</p>
				<p>4. Analyse automation systems for</p>

				manufacturing and process industries.
55	V	OE355	Cyber Physical Systems	<ol style="list-style-type: none"> <li>1. Understand the need and purpose of the different components of CPS</li> <li>2. Design physical system depends on its requirements</li> <li>3. Develop the ability to interact with cyber-physical systems protocols</li> <li>4. Analyze common methods used to secure cyber-physical systems</li> </ol>
56	V	ATMD301	Automotive Safety & Ergonomics	<ol style="list-style-type: none"> <li>1. Discuss the basics of vehicle collision and its effects.</li> <li>2. Summarize the various safety concepts used in passenger cars.</li> <li>3. Explain use of ergonomics in automotive design.</li> <li>4. Explain the human response to impact.</li> <li>5. Explain the use of various systems used in automobiles for safety &amp; ergonomic considerations</li> </ol>
57	V	CEMD301	Infrastructure Engineering	<ol style="list-style-type: none"> <li>1. Apply the knowledge of geometric design in road construction.</li> <li>2. Identify the quality parameters of pavement materials and various methods of road construction.</li> <li>3. Discuss the various aspects of airport engineering.</li> <li>4. Explain design parameters of railway engineering and it's component parts.</li> <li>5. Summaries the different offshore structures for dock and harbors.</li> </ol>
58	V	CSMD301	Fundamentals of Database Systems	<ol style="list-style-type: none"> <li>1. Describe the purpose and nature of the database system for</li> </ol>

				<p>storing and fast access to the data</p> <p><b>2.</b> Identify various protocols, issues, and techniques related to transaction management for a consistent &amp; and stable database</p> <p><b>3.</b> Draw E-R models to represent simple database application scenarios</p> <p><b>4.</b> Design the queries to manipulate and access data using procedural and non-procedural languages</p> <p><b>5.</b> Apply relational database design concepts to remove data redundancy and to retrieve data easily</p> <p><b>6.</b> Perform operation on Unstructured data.</p>
59	V	EEMD301	Electrical Machines	<p>1. Describe behavior of dc machine.</p> <p>2. Explain the working principle of 1-Phase and 3-Phase transformers.</p> <p>3. Explain working of different induction motors.</p> <p>4. Select the relevant electrical machines for different applications</p> <p>5. Interpret the relevant fractional horsepower motor for different applications</p>
60	V	ECMD301	Advanced Communication Techniques	<p><b>1.</b> Explain the principles of antenna and wave propagation.</p> <p><b>2.</b> Understand basic antenna parameters and their types.</p> <p><b>3.</b> Discuss the evolution, requirements, and challenges of 5G communication systems.</p>



				<p><b>4.</b> Understand and compare various communication techniques.</p> <p><b>5.</b> Communicate effectively on complex engineering topics related to modern communication techniques.</p>
61	<b>V</b>	<b>CIMD301</b>	<b>Introduction of DBMS</b>	<p><b>1.</b> Describe the fundamental elements of relational database management systems.</p> <p><b>2.</b> Design ER-models to represent simple database application scenarios.</p> <p><b>3.</b> Write SQL query to perform various operations on the database.</p> <p><b>4.</b> Analyze principle of integrity constraints, Hashing and Indexing on databases.</p>
62	<b>V</b>	<b>MEMD301</b>	<b>Manufacturing and Assembly Processes.</b>	<p><b>1.</b> Select appropriate manufacturing process suitable for the component design and production volume</p> <p><b>2.</b> Select appropriate joining process for given application.</p> <p><b>3.</b> Select appropriate machine tools for machining operations.</p> <p><b>4.</b> Select appropriate finishing process for given product.</p> <p><b>5.</b> Explain concept of automation in manufacturing.</p> <p><b>6.</b> Explain and select appropriate Non-Traditional machining process and machine with constructional details for engineering component.</p>

63	V	MCMD301	Sensor and Instrumentation	1. Explain the fundamental principles of various sensors and transducers.
				2. Analyze the characteristics, advantages, and limitations of different sensor types.
				3. Select and integrate sensors into mechatronic systems for real-time data acquisition and control.
				4. Apply appropriate signal conditioning techniques to improve sensor output accuracy.
				5. Develop mechatronic systems using appropriate sensors for real-life applications.
64	V	AIMD301	Machine Learning	1. Utilize machine learning techniques and understand the basic theory underlying machine learning.
				2. Articulate supervised, unsupervised and reinforcement learning
				3. Identify the basic concepts of learning and decision trees.
				4. Utilize Bayesian techniques for problems appear in machine learning
				5. Perform statistical analysis of machine learning techniques.
65	V	ATMD303	Automotive Engineering Lab.	1. Differentiate between S.I. and C.I. engines.
				2. Test engines and plot performance characteristics curves.
				3. Describe the working of various automotive systems.
66	V	CEMD303	Smart Cities & Sustainable Development	1. Develop a critical understanding of the different concept and ideologies of smart cities.
				2. Analyse the different approaches toward planning and development of smart cities on global level.

				<p>3. Assess the existing state and approach of Smart city Mission in India.</p>
				<p>4. Comprehend the concept of resilience and sustainable development and its measurement.</p>
				<p>5. Evaluate the present status of sustainability and rating systems initiatives within the Indian context.</p>
67	V	CSMD303	<b>Object-oriented Programming in Python</b>	<p>1. Demonstrate a comprehensive understanding of Python syntax, data types, and basic operations.</p>
				<p>2. Make use of common Python libraries for data manipulation.</p>
				<p>3. Implement lists, tuples, sets, and dictionaries for effective data handling.</p>
				<p>4. Apply principles of OOP, including classes, objects, inheritance, and polymorphism.</p>
68	V	EEMD303	<b>Electrical Technology Lab</b>	<p>1. Demonstrate speed control methods of electrical machines.</p>
				<p>2. Analyze performance of DC motor and induction motor for speed control applications.</p>
				<p>3. Implement power electronic circuits for given application.</p>
				<p>4. Measure electrical quantities using electrical and electronic instruments.</p>
69	V	ECMD303	<b>Electronics Product Design</b>	<p>1. Elaborate product design processes.</p>
				<p>2. Explain various aspects of PCB design.</p>
				<p>3. Differentiate product-testing methods.</p>

				<ol style="list-style-type: none"> <li>4. Create various documents for the product.</li> </ol>
70	V	CIMD303	<b>OOP using Java</b>	<ol style="list-style-type: none"> <li>1. Explain the concepts and terminologies in object-oriented concepts and java programming language.</li> <li>2. Apply object-oriented programming features and concepts for solving given problem.</li> <li>3. Develop the java application using the collection framework to solve real word problem.</li> <li>4. Apply the concepts exception handling to develop error free codes.</li> <li>5. Utilize the concepts of package to develop efficient codes.</li> </ol>
71	V	MEMD303	<b>Refrigeration and Air Conditioning</b>	<ol style="list-style-type: none"> <li>1. Explain the basic laws of thermodynamics, working of various RAC systems, psychrometric process of air, applications of RAC systems.</li> <li>2. Summarise the properties of refrigerants.</li> <li>3. Calculate performance of refrigeration and air conditioning system.</li> </ol>
72	V	MCMD303	<b>Industrial Automation</b>	<ol style="list-style-type: none"> <li>1. Explore the architecture of PLC and its functions.</li> <li>2. Execute the various instructions and logic in PLC.</li> <li>3. Develop the PLC program for various applications.</li> <li>4. Design and develop the SCADA, DCS system for various applications.</li> </ol>
73	V	AIMD303	<b>Business Intelligence</b>	<ol style="list-style-type: none"> <li>1. Articulate data pre-processing techniques</li> <li>2. Analyze the data</li> </ol>

				<p>modeling required for business intelligence related tasks</p>
				<p>3. Determine the role of statistical techniques in data analysis tasks</p>
				<p>4. Identify big data analysis techniques</p>
				<p>5. Utilize different reporting/visualization tool</p>
74	V	MC3511	Industrial Automation Lab	<p>1. Develop the PLC program for the implementation of logic gates</p>
				<p>2. Develop the PLC program for controlling the parameters and applications like Pressure, bottle filling, cylinder actuation and elevator control.</p>
				<p>3. Develop the PLC program for various applications like identifying the necessity of using Supervisory Control and Data Acquisition (SCADA) for complex projects.</p>
				<p>4. Develop HMI, SCADA programme for various applications.</p>
75	V	MC3531	Sensors and Instrumentation Lab	<p>1.To understand tem1s and sensors used in engineering applications.</p>
				<p>2. Able to design necessary signal conditioning circuits for various sensors.</p>
76	V	MC3551	Control Engineering lab	<p>1. Develop transfer function of block diagrams using MATLAB.</p>
				<p>2. Analyze response of control systems to various input conditions.</p>
				<p>3. Design a control system using root locus method.</p>
				<p>4. Prepare state space representation for given control system using various programming methods.</p>

77	V	MC3571	Technical Aptitude-III	1. Apply the knowledge acquired during the course work.
				2. Develop the ability of problem solving.
78	V	SH3034	Scholastic Aptitude-I	1. Develop a thorough conceptual understanding and develop a logical approach towards solving Aptitude and Reasoning problems.
				2. Understand usage of basic aptitude terms of percentages, averages, ratios and applications of business aptitude terms of profits and interests
				3. Develop a bridge in analogies, series and visualizing directions.
				4. Apply various short cuts & techniques to manage speed and accuracy to get equipped for various competitive and campus recruitment exams.
79	V	MC3591	Summer Internship	1. Apply the Technical knowledge in real industrial situations.
				2. Formulate Technical reports/projects.
				3. Develop and refine oral and written communication skills.
				4. Explain the activities and functions of business professionals.
				5. Discuss knowledge of the industry in which the internship is done.
80	VI	MC3021	Machine Design	7. Identify the customers need, formulate the problem and draw the design specifications.
				8. Apply the theories of failure for designing the machine elements.
				9. Design a simple machine component like levers, bolted & welded

				<p>joints, shafts, keys and springs.</p> <p>10. Select a bearing and power transmission elements for given application</p> <p>11. Design a spur gear for a given application</p> <p>12. Design a component against fluctuating load.</p>
81	<b>VI</b>	<b>MC3041</b>	<b>Power Electronics and Drives</b>	<p>1. Explain the characteristics, ratings and applications of power devices.</p> <p>2. Calculate the performance parameters of the converters and drives.</p> <p>3. Analyze the operation of power electronics converters and drives.</p> <p>4. Design power converters to meet the given requirements.</p>
82	<b>VI</b>	<b>MC3061</b>	<b>Research Methodology</b>	<p>1. Select on the literature in the field, analyze and interpret research evidence published on a topic to establish a suitable research problem/issue or opportunity to explore further.</p> <p>2. Design the research study using a suitable paradigm, associated methodologies and methods of data collection and analysis.</p> <p>3. Write a research proposal (research blueprint) describing the topic.</p> <p>4. Demonstrate the ability to use the statistical software to solve problems.</p>
83	<b>VI</b>	<b>MC3081</b>	<b>Finite Element Methods</b>	<p>1. Apply the finite element method for solid mechanics</p>

				<p>and Heat transfer problems to develop the models.</p> <p>2. Solve problems in one-dimensional structures including trusses and beams.</p> <p>3. Formulate FE characteristic equations for two-dimensional and three-dimensional problems.</p> <p>4. Analyze field problems like heat transfer and torsion by deriving element matrices and applying FEM formulations.</p>
84	<b>VI</b>	<b>MC310</b>	<b>Thermal Management of Mechatronics System.</b>	<p>1. Apply the fundamentals of conduction heat transfer.</p> <p>2. Distinguish between the basic modes of heat transfer.</p> <p>3. Design simple heat transfer systems using electric circuit elements.</p> <p>4. Analyse forced and free convection heat transfer situations.</p>
85	<b>VI</b>	<b>MC3121</b>	<b>Additive Manufacturing</b>	<p>1. Recognize the Importance of AM technologies in Manufacturing.</p> <p>2. Classify and select additive manufacturing processes for a given application.</p> <p>3. Design for manufacturing of AM and conduct Process Analysis</p> <p>4. Identify software issues related to additive manufacturing process.</p> <p>5. Select the suitable method for Post-processing of AM parts</p> <p>6. Identify the Applications of AM in Automobile, Aerospace, and Bio-medical etc.</p>
86	<b>VI</b>	<b>MC3141</b>	<b>Digital Signal Processing</b>	<p>1 Characterize the signals mathematically in continuous time, discrete-</p>



				time, and in the frequency domain.
				2. Analyze discrete-time systems using different transforms.
				3. Explain the digital signal processing algorithms.
				4. Design of different types of digital filters for various applications.
87	<b>VI</b>	<b>MC3161</b>	<b>Industry 4.0 Technologies and IIoT</b>	1. Recognise the role of Industry 4.0 and its historical evolution.
				2. Identify and describe the core technologies that underpin Industry 4.0, including IoT, Big Data, Cloud Computing, and Cyber-Physical Systems.
				3. Analyze the components of smart manufacturing systems, including digital twins, additive manufacturing, robotics, and automation.
				4. Investigate the fundamental concepts and architectures of IIoT.
				5. Analyze the role of sensors, communication protocols, and data analytics in IIoT implementations.
88	<b>VI</b>	<b>MC3181</b>	<b>Wireless Sensor Network</b>	1. Analyze single node network architecture of WSN.
				2. Classify routing and MAC layer protocol in WSN.
				3. Develop specific requirement applications in wireless sensor networks.
89	<b>VI</b>	<b>MC3201</b>	<b>Microelectromechanical Systems (MEMS)</b>	1. Discuss the fundamentals, characteristics, and applications of MEMS and Microsystems across various domains.
				2. Identify and select specific material for

				<p>manufacturing of MEMS and its packaging.</p> <p>3. Analyze and select the different techniques in MEMS technology as per requirement of application.</p> <p>4. Compare and choose a micromachining technique, such as bulk micromachining and surface micromachining for a specific MEMS fabrication process.</p> <p>5. Design and develop MEMS solutions tailored to meet the requirements of diverse applications.</p> <p>6. Design packaging solutions for MEMS devices based on specified criteria and application needs.</p>
90	<b>VI</b>	<b>MC3221</b>	<b>Process Control</b>	<p>1.Introduce technical terms and nomenclature associated with Process control domain.</p> <p>2.Build models using first principles approach as well as analyze models.</p> <p>3.Design, tune and implement PID Controllers to achieve desired performance for various processes</p> <p>4.Analyze Systems and design &amp; implement control Schemes for various Processes.</p> <p>5.Identify, formulate, and solve problems in the Process Control Domain.</p>
91	<b>VI</b>	<b>OE344</b>	<b>Supply Chain Analytics</b>	<p>1. Identify the role and key issues in the supply chain management.</p> <p>2. Explain the important supply chain drivers and their significance in strategic planning.</p> <p>3. Estimate the demand using suitable demand forecasting method.</p>

				<p>4. Design the inventory system and level at various locations in supply chain.</p> <p>5. Design the supply chain network using appropriate network design methodology for the given problem.</p> <p>6. Describe the importance of handling uncertainty in supply chain using decision tree.</p>
92	<b>VI</b>	<b>OE346</b>	<b>Mobile Robotics</b>	<p>1. Identify and explain the main components of a robot, including sensors, actuators, and control systems.</p> <p>2. Solve forward and inverse kinematics problems for mobile robots.</p> <p>3. Apply basic motion planning algorithms such as A* and Dijkstra's algorithm.</p> <p>4. Apply Simultaneous Localization and Mapping.</p> <p>5. Implement inter-robot communication and human-robot interaction.</p>
93	<b>VI</b>	<b>ATMD302</b>	<b>Electric Vehicles</b>	<p>1. Articulate the need of EVs and HEVs in today's transportation context.</p> <p>2. Design an electric vehicle for given requirements.</p> <p>3. Design a hybrid electric vehicle for given requirements.</p> <p>4. Elaborate fuel cell technology for vehicular application.</p>
94	<b>VI</b>	<b>CEMD302</b>	<b>Environmental Engineering</b>	<p>1. Explain importance of water and wastewater analysis for various parameters.</p>

				<p>2. Discuss impact of pollution on man, animal and plants.</p> <p>3. Prepare layout of water and wastewater treatment process.</p> <p>4. Design Water and Wastewater Treatment Plant.</p> <p>5. Apply AI tools for impact of humans on environment.</p>
95	<b>VI</b>	<b>CSMD302</b>	<b>Artificial Intelligence</b>	<p>1. Understand the basic concepts and techniques of Artificial Intelligence.</p> <p>2. Apply AI algorithms for solving typical practical problems.</p> <p>3. Describe appropriate knowledge representation schemes in AI.</p> <p>4. Apply reasoning schemes in AI.</p> <p>5. Analyze the planning schemes for goal stack.</p> <p>6. Evaluate performance of solution for constraint satisfaction problem.</p>
96	<b>VI</b>	<b>EEMD302</b>	<b>Smart Grid</b>	<p>1. Summarize the concept and future of smart grid</p> <p>2. Develop smart grid architecture</p> <p>3. Compile various smart grid technologies</p> <p>4. Identify communication and information technologies for smart grid</p> <p>5. Elaborate distributed generation and storage technologies</p> <p>6. Recommend smart metering and distribution automation</p>
97	<b>VI</b>	<b>ECMD302</b>	<b>Industrial Electronics</b>	<p>1. Identify basics Power Electronics devices and components.</p> <p>2. Illustrate use of Power Electronics.</p> <p>3. Develop PLC logic using ladder programming.</p>

				<p><b>4.</b> Analyze industrial electronics applications.</p>
98	<b>VI</b>	<b>CIMD302</b>	<b>Software Engineering</b>	<p>1. Describe fundamental concepts in software engineering and project management</p> <p>2. Practice software process models for the undertaken software problems</p> <p>3. Design function-oriented and object-oriented models using modern tools.</p> <p>4. Identify classes and build the domain model using advanced concepts in object, dynamic and functional modeling.</p> <p>5. Analyze existing software systems using function and object-oriented analysis.</p> <p>6. Design models using UML diagrams for software systems: use case, class, sequence, collaboration, activity, state chart diagrams, component and deployment.</p>
100	<b>VII</b>	<b>MC401</b>	<b>Industrial Robotics</b>	<p>1. Explain the basic concepts of robots.</p> <p>2. Model forward and inverse kinematics of robot manipulators.</p> <p>3. Select an end effector and sensor for particular application</p> <p>4. Program a robot to perform tasks in industrial applications.</p>
101	<b>VII</b>	<b>MC451</b>	<b>Industrial Robotics Lab</b>	<p>1. To explain the basic principles of Robotic technology, configurations, control and programming of Robots.</p> <p>2. To choose the appropriate Sensor and Machine vision system for a given application</p> <p>3. To explain the basic principles of programming and apply it for typical Pick &amp; place, loading &amp; unloading and palletizing applications</p>
102	<b>VII</b>	<b>MC453</b>	<b>Software Training Lab</b>	<p>1. Use effectively modules of the software related to design, analysis and synthesis</p>

				2.Develop solution for the Mechanical engineering problem using the software.
103	VII	MC455	Circuit Simulation and PCB Design Lab	1.Understand circuit simulation and PCB design tools
				2.Design electronics circuit using simulation tool
				3.Fabricate PCB using various tools
				4.Build electronics application
104	VII	MC457	Capstone Project Phase II	1.Select and apply the appropriate design of experiments, experimental setup, models, or simulation technique for the project task.
				2.Fabricate project or experimental setup or model and analyze the output of models/simulations to provide information for decisions
				3.Perform feasibility analysis and uses results to choose candidate solutions and evaluate the quality of solutions to select the best one
				4.Collaborates with team members of diverse backgrounds and perspectives to achieve a common goal.
				5.Write a technical report and communicate effectively.
105	VII	MC 411	Building Automation	1.Design building automation system by applying basic knowledge of electrical and electronics.
				2.Design HVAC system for buildings
				3.Apply different techniques for fire alarm techniques
				4.Access control system for building automation system
				5.Introduce digital simulation for development of application oriented logic circuits
106	VII	MC413	Machine Tool Design	1.Select & design proper transmission system for machine tool

				<p>2. Decide layout of machine tool</p> <p>3. Select proper speed &amp; feed boxes &amp; design the same.</p> <p>4. Design machine tool structure-Bed, Columns &amp; Housings, Select &amp; Design Guide ways &amp; slide ways, spindle.</p> <p>5. Determine dynamic characteristics of machine tool &amp; carry stability analysis using FEA</p> <p>6. Design control systems in machine tools and SPM.</p>
107	VII	MC415	<b>Fuzzy Logic and Neural Networks</b>	<p>1. Identify the need of different soft computing models.</p> <p>2. Distinguish between classical and fuzzy sets with examples.</p> <p>3. Apply fuzzy inference systems for solving real world problems.</p> <p>4. Compare different neural network architectures.</p> <p>5. Apply back propagation algorithms and optimizers for real world problems.</p> <p>6. Compare neural networks and deep learning models.</p>
108	VII	MC417	<b>Hybrid &amp; Electrical Vehicles</b>	<p>1. Understand the need of hybrid vehicles in today's context.</p> <p>2. Understand working of Electric Vehicles and recent trends.</p> <p>3. Describe design steps of a hybrid electric vehicle for given requirements.</p> <p>4. Explain hybrid drive trains.</p> <p>5. Discuss different Energy sources and drives required for hybrid vehicles.</p> <p>6. Discuss fuel cell technology for hybrid vehicle application.</p>
109	VII	MC419	<b>Reliability and Maintenance Engineering</b>	<p>1. Use statistical tools to characterize the reliability of an item and determine the reliability of a system.</p>

				<p>2.Establish maintenance strategies according to system characteristics and design transition programs to implement these strategies.</p> <p>3.Formulate suitable maintenance strategies to enhance system reliability of a manufacturing system</p> <p>4.Apply concepts of TPM, RCM, &amp; FMECA in managing the manufacturing organization with highest possible levels of reliability/ availability.</p>
110	VII	MC421	<b>Industrial Engineering</b>	<p>1.Apply various methods of method study and time study to improve productivity.</p> <p>2. Use value analysis technique in engineering projects.</p> <p>3. Select the plant location and design appropriate type of layout along with material handling system.</p> <p>4. Plan production activities using tools like capacity and aggregate planning</p> <p>5. Design the inventory system using appropriate inventory model</p> <p>6.Implement project management knowledge, tools and techniques to achieve project success.</p>
111	VII	MC425	<b>Computer Network and Cyber Security</b>	<p>1.Describe the various networking components and topologies.</p> <p>2.Illustrate the concepts, services, and protocols used in Computer Networks.</p> <p>3.Solve problems related to IPv4 addressing.</p> <p>4.Describe fundamental terms in cybercrime and compare various cyber-attacks &amp; offences.</p> <p>5.Demonstrate cyber forensics using modern tools &amp;</p>



				techniques.
				6. Construct a strategy for creating awareness about cyber security for e-banking and legal issues among the social community.
112	VII	MC427	<b>Image Processing and Computer Vision</b>	1. Explain different concepts and processes in digital image processing
				2. Apply different image processing operations on an image
				3. Analyze various operations on image using different tools
				4. Compare various filtering, enhancement, segmentation and classification techniques used in image processing
				5. Design various applications in Image Processing
113	VII	MC429	<b>Fundamentals of Artificial Intelligence and Machine Learning</b>	1. Explain the concepts and theory of AI and ML.
				2. Identify engineering and societal problems that can be efficiently solved by artificial intelligence and machine learning techniques.
				3. Solve given problem using knowledge, reasoning and planning.
				4. Apply ML algorithms to solve the problems.
				5. Analyze the machine learning algorithms and techniques.
114	VII	MC461	<b>Computer Network and Cyber Security Lab</b>	1. Demonstrate the use of various networking tools and utilities.
				2. Use the CISCO packet tracer and Packet Capturing and Analyzing tool i.e Wireshark.
				3. Configure and test the different network services.
				4. Install and configure the Kali Operating system
				5. Demonstrate different cyber-attacks using Kali

				Linux.
				Demonstrate cyber forensic techniques using windows GUI Based tools and Kali Linux.
115	VII	MC463	Image Processing Lab	<ol style="list-style-type: none"> <li>1. Describe various algorithms and techniques used in Image Processing</li> <li>2. Demonstrate Image Enhancement and Image Filtering algorithms</li> <li>3. Verify the practical results with theoretical results</li> <li>4. Design various applications using Image Processing</li> <li>5. Improve the ability to communicate effectively through written lab journals</li> </ol>
116	VII	MC431	Condition Monitoring	<ol style="list-style-type: none"> <li>1. Apply maintenance schemes in industries.</li> <li>2. Monitor and analyze condition of rotating machinery using vibration based techniques.</li> <li>3. Apply oil analysis techniques to diagnose the wear debris.</li> <li>4. Apply temperature monitoring techniques to diagnose the faults in mechanical applications.</li> <li>5. Apply modern technologies for effective plant maintenance.</li> </ol>
117	VII	MC433	Battery and Fuel Cell Technology	<ol style="list-style-type: none"> <li>1. Choose proper energy storage systems for e-vehicle applications</li> <li>2. Explain the different types of fuel cell technologies, fuels and membrane used in it</li> <li>3. Select a suitable drive scheme for developing an electric vehicle.</li> </ol>

118	VII	MC 435	Mechatronics system Design	1. Demonstrate the importance of integration of mechanical, electronics, computer & control in the design of mechatronics system.
				2. Describe/identify key elements of sensors & transducers and techniques of interfacing with plc, microprocessor, microcontroller etc.
				3. Apply a systematic approach to the design process of mechatronics systems.
				4. Create system modelling of basic models & analyse.
				5. Demonstrate the practical applications of mechatronics systems in the areas such as manufacturing, automobile systems and robotics.
				6. Develop the capacity to think creatively and independently about new design problems and challenges.
119	VII	MC437	Wireless Sensor Network	1. Analyze single node network architecture of WSN
				2. Classify routing and MAC layer protocol in WSN
				3. Develop specific requirement applications in wireless sensor networks
120	VII	MC439	Emerging Smart Materials for Mechatronics Applications	1. Classify Engineering materials based on different properties.
				2. Apply knowledge of various smart material

				<p>and application in mechatronics.</p> <p><b>3.</b> Design Sensors and actuator using piezoelectric material.</p> <p><b>4.</b> Develop applications based on shape memory alloy.</p> <p><b>5.</b> Illustrate properties and application of Magnetostrictive materials.</p>
121	<b>VII</b>	<b>MC441</b>	<b>Microelectromechanical Systems (MEMS)</b>	<p>1. Discuss basics, nature and application of MEMS and Microsystem for various fields.</p> <p>2. Identify and select specific material for manufacturing of MEMS and its packaging.</p> <p>3. Analyze and select the different techniques in MEMS technology as per requirement of application.</p> <p>4. Choose a micromachining technique, such as bulk micromachining and surface micromachining for a specific MEMS fabrication process.</p> <p>5. Design and develop MEMS for various applications.</p> <p>6. Design packaging of MEMS as per requirement.</p>

# **Sciences and Humanities**

## Department of Sciences and Humanities

### Course Outcomes of first year courses (2023-24)

Course	COs	Statement
<b>SH1313 General Physics and Optics</b>	CO1	Compare the behavior of mechanical system under damping and external periodic force.
	CO2	Use the principles of architectural acoustics to assess the acoustical characteristics of a hall.
	CO3	Analyze the interference in thin films, wedge shaped film and Newton's rings to calculate conditions in constructive and destructive interference.
	CO4	Examine the behavior of microscopic particles using the theories in quantum mechanics such as wave particle duality, uncertainty principle, and particle in 1D infinite potential box problem.
	CO5	Compare the semiconductors based on type of charge carrier, band energy diagram, location of Fermi energy, and Hall effect
	CO6	Classify the different types of laser based on fundamentals of operation including solid state, and gas laser.
<b>SH1515 General Physics and Optics Lab</b>	CO1	Develop the skills of performing the experiments relevant to theories in optics, oscillations, semiconductors, ultrasound, and quantum mechanics .
	CO2	Use different measuring tools and techniques to conduct the experiments..
	CO3	Interpret the collected data from experiment to determine the relevant physical quantity.
	CO4	Write a lab report which communicates scientific information in clear manner
<b>SH1056 Matrices and Differential Equations</b>	CO1	Use the concepts of matrices that serve as an essential basis for several computational techniques.
	CO2	Solve the problems on ordinary differential equations analytically and numerically.
	CO3	Make use of different methods to solve simultaneous algebraic linear equations
	CO4	Apply the relevant numerical method for interpolating the polynomial.
<b>SH1101 Matrices and Differential Equations Lab</b>	CO1	Use MATLAB for interactive computations.
	CO2	Familiar with memory and file management in MATLAB.
	CO3	Generate plots and export this for use in reports and presentations.
	CO4	Familiar with strings, matrices, and their use.
<b>SH1294 Basic Electrical Engineering</b>	CO1	Solve D.C. and A.C. electric circuits.
	CO2	Illustrate the notions of magnetic circuits
	CO3	Explore switchgear for electrical installations and illumination
	CO4	Elaborate transformer and rotating electrical machines.
<b>SH1794 Basic Electrical Engineering Lab</b>	CO1	Explain the concept of circuit laws and network theorems and apply them to specific network.
	CO2	To demonstrate balanced and unbalanced star and delta connected supply and measure power in three phase circuits.

	CO3	To demonstrate characteristics equations for DC machines and single-phase transformer.
	CO4	Explain operation, features of electric machines and their applications.
	CO5	Apply the skills using electrical measuring devices.
<b>Electives SE1054 Basics of Civil Engineering</b>	CO1	Identify the components of a given type of building structure and recommend their suitability under specified soil and loading conditions.
	CO2	Prepare plan of a single storey residential building for the given requirements using building planning principles, byelaws and property document information.
	CO3	Assess the quality of different construction materials based on their engineering properties and explain the standard procedures followed for using them in the construction of building components.
	CO4	Determine included angles, areas, reduced levels and contours for the specified ground points or surfaces using the methods of horizontal and vertical measurements.
	CO5	. Describe the components of a specified infrastructure system and the functions served by them.
<b>SE1554 Basics of Civil Engineering Lab</b>	CO1	Draw dimensioned sketch/plan of building
	CO2	Plan building using principles and bye laws.
	CO3	Perform horizontal and vertical measurement.
	CO4	Use modern surveying tool/equipment for performing horizontal and vertical measurements.
<b>SE1134 Green Technology</b>	CO1	Explain the basic principles of green chemistry and ecology.
	CO2	Discuss concept of green buildings and green management.
	CO3	Compare conventional and non-conventional energy sources.
	CO4	Discuss solid waste processing techniques.
	CO5	Describe various green innovations for sustainability.
<b>SE1634 Green Technology Lab</b>	CO1	Explain the concept of green technology/green building.
	CO2	Prepare energy and water budget for a building.
	CO3	Design rainwater harvesting for a small catchment area.
	CO4	Analyze solid waste for Waste-to-Energy.
<b>SE1453 Creativity, Design Thinking and Entrepreneurial Mindset</b>	CO1	Learn structured approach to creativity, problem identification and problem solving in a new venture context
	CO2	Apply design thinking approach to identify innovation opportunities and develop solutions
	CO3	Identify, validate and define specific innovation opportunities through Jobs-to-be-Done methodology
	CO4	Develop mindset of a successful entrepreneur
<b>SE1673 Creativity, Design Thinking and Entrepreneurial Mindset Lab</b>	CO1	Learn structured approach to creativity, problem identification and problem solving in a new venture context.
	CO2	Apply design thinking approach to identify innovation opportunities and develop solutions.
	CO3	Develop mindset of a successful entrepreneur

<b>SE1751 Basics of Sensor Technology</b>	CO1	Recognize basic analog and digital devices used for different electronic applications.
	CO2	Explain working principle of various sensors
	CO3	Identify suitable sensors and transducers for real time applications
	CO4	Analyze the different sensor based electronic circuits.
<b>SE1791 Basics of Sensor Technology Lab</b>	CO1	Identify the electronics components for given values.
	CO2	Design electronic system using sensors
	CO3	Measure electrical parameters of sensors.
	CO4	Write report and communicate effectively.
<b>SH1853 Engineering Practice Lab. I</b>	CO1	Acquire skills in basic engineering practice.
	CO2	Use hand tools and power tools.
	CO3	Develop sheet metal model for specific application.
	CO4	Illustrate the various operations performed in machine shop.
	CO5	Perform different joining operations
	CO6	Perform pipe fittings operations.
<b>SE1472 Introduction to Artificial Intelligence</b>	CO1	Explain the different terminologies used in Artificial Intelligence.
	CO2	Identify engineering and societal problems that can be efficiently solved by artificial intelligence techniques.
	CO3	Demonstrate the search algorithms to solve problems.
	CO4	Apply Python Programming in AI based applications.
	CO5	Illustrate the concepts of machine learning.
	CO6	Describe the robot tasks, architecture and usage in real world.
<b>SE1692 Introduction to Artificial Intelligence Lab</b>	CO1	Identify Real Time Problems with their AI solutions.
	CO2	Demonstrate and explore the functionalities in different programming frameworks & S/W technologies.
	CO3	Solve problems using python programming concepts.
	CO4	Implement supervised learning algorithms using python programming to solve the real time problems.
<b>SE1094 Engineering Materials</b>	CO1	Classify materials on the basis of various properties.
	CO2	Estimate different mechanical properties using destructive testing methods.
	CO3	Select suitable non-destructive testing method for flaw detection in component.
	CO4	Explain composites, non ferrous materials and alloys with their applications
	CO5	Identify the recycling issues associated with various engineering materials.
<b>SE1594 Engineering Materials Lab</b>	CO1	Illustrate stress strain diagram for different materials.
	CO2	Use Rockwell Hardness testing machine to measure hardness of material.
	CO3	Measure impact strength of the metals
	CO4	Determine fatigue strength of metals.
	CO5	Determine flaws in the component using non-destructive testing methods.



	CO6	Explain working principle of emission spectrometer.
<b>SE1811 Introduction to Electric Vehicles</b>	CO1	Justify the need for EVs and HEVs from environment and policy perspectives.
	CO2	Demonstrate the knowledge of electric vehicle technology.
	CO3	Elaborate the hybrid electric vehicle technology.
<b>SE1831 Introduction to Electric Vehicles Lab</b>	CO1	Compare typical conventional powertrain and the electric powertrain.
	CO2	Evaluate the performance and sizing of typical EV electric motor and battery.
	CO3	Model and simulate the EV/HEV using MATLAB/Simulink Powertrain block set.
<b>SH1834 English Proficiency Lab. I</b>	CO1	Analyse aspects of nature and process of communication in professional contexts.
	CO2	Demonstrate reception skills of language.
	CO3	Apply speaking skills in various situations.
	CO4	Make use of English language with grammatical accuracy.
<b>SH1893 Engineering Exploration and Design Project</b>	CO1	Explain the role of an engineer as a problem solver
	CO2	Design engineering solutions to complex problems utilizing multi-disciplinary systems approach.
	CO3	Examine a given problem using process of engineering problem analysis.
	CO4	Build simple systems/prototypes using engineering design and development process.
	CO5	Analyze engineering solutions from ethical and sustainability perspectives.
	CO6	Apply basics of engineering project management skills in project development.
<b>SH 1036 Modern Engineering Chemistry</b>	CO1	Examine water quality for industrial and domestic sector and suggest remedial measures
	CO2	Distinguish the basic concepts of spectroscopic methods for characterization of advanced materials.
	CO3	Interpret components of the various systems using Phase rule concept and outline the various applications of alloys
	CO4	Identify causes of corrosion and its remedial measures.
	CO5	Explain the synthesis and applications of nanomaterials in engineering sector.
	CO6	Compare types and quality of fuels, lubricants and illustrate the applications of batteries
<b>SH1535 Engineering Chemistry Lab</b>	CO1	Examine the materials by using analytical instruments.
	CO2	Identify the quality of water for industrial and domestic purposes.
	CO3	Apply the knowledge of corrosion science for measurement of rate of corrosion.
	CO4	Apply science of polymers and nanomaterials in the synthesis of materials.
	CO5	Inspect the quality of fuel.
<b>SH1026 Calculus</b>	CO1	Solve problems on improper and multiple integrals
	CO2	Sketch the curve and use it to solve the problems on rectification and multiple integral.

	CO3	Prove the results of partial differentiation.
	CO4	Apply partial differentiation for problems on jacobian, errors and approximations, maxima and minima.
<b>SH1161 Calculus Lab</b>	CO1	Develop codes for different types integrals.
	CO2	Sketch the curves.
	CO3	Solve various problems on partial differentiation by MATLAB.
<b>SH1135 Engineering Graphics</b>	CO1	Draw the projections of line, plane and regular solids with respect to reference planes as per given conditions using AUTOCAD software.
	CO2	Generate the sectional view, true shape of the section and development of the solid with the help of AUTOCAD software.
	CO3	Prepare orthographic views of engineering components by using AUTOCAD software.
<b>SH1333 Programming for Problem Solving</b>	CO1	Explain the basic terminologies and concepts of C programming language.
	CO2	Construct the algorithm and flow chart to solve the given problem
	CO3	Write a C program for given problem statement
	CO4	Examine the given C program to remove the logical & syntax errors and predict the correct output
<b>SH1913 Programming for Problem Solving Lab</b>	CO1	Describe various terminologies and concepts of C programming language
	CO2	Construct the algorithm and flow chart to solve the given problem.
	CO3	Implement a 'C' program for given problem statement
	CO4	Test the implemented 'C' programs by removing syntax & logical errors for getting expected output on various input.
<b>SH1623 English Proficiency Lab. II</b>	CO1	Identify the need of positive attitude in interpersonal communication.
	CO2	Demonstrate conversational and comprehension skills of English language.
	CO3	Demonstrate writing skills through reports, letters, circulars, notices, and memos.
	CO4	Organize content of technical documents in specific forms.
<b>SH1643 Engineering Practice Lab II</b>	CO1	Make wooden job.
	CO2	Make Sheet metal job.
	CO3	Make job by various machining processes.
	CO4	Make job by joining processes.
<b>SH136 Biology Engineers</b> for	CO1	Apply biological engineering principles, procedures needed to solve real-world problems.
	CO2	Describe the functions of biological systems.
	CO3	Analyze biological phenomena and compute work done at microscale.
	CO4	Explain working of different biomedical instruments.
	CO5	Select the sensors for given biological applications.
	CO6	Explain relevant aspect of movement control process.

**Master of Business  
Administration (MBA)**

- **Department Name :-Department of Management Studies**
- **PG Program Name :-Master of Business Administration (MBA)**
- **Vision and Mission :-**

**Vision:**

- Achieving excellence in academics and research to develop globally competent and socially responsible managers.

**Mission:**

- To leverage innovation and excellence in academic design, delivery and assessment to ensure ethical and holistic development of students for employability, entrepreneurship and higher education.
- To design and keep the curricula updated, based on changing needs of industry and society worldwide.
- To build and maintain world-class infrastructure, for sustained learning, development and research.
- To provide an environment that encourages creativity, analysis and critical thinking.

Sr. No.	Program Outcomes
109.	<b>PO1:</b> Apply knowledge of management theories and practices to solve business problems.
110.	<b>PO2:</b> Foster Analytical and critical thinking abilities for data-based decision making.
111.	<b>PO3:</b> Ability to develop Value-based Leadership ability.
112.	<b>PO4:</b> Ability to understand, analyze and communicate global, economic, legal, and ethical aspects of business.
113.	<b>PO5:</b> Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment.
114.	<b>PO6:</b> Be capable of self-education and clearly understand the value of lifelong learning.
115.	<b>PO7:</b> Be familiar with modern statistical and software tools to analyze business problems.
116.	<b>PO8:</b> To examine critically for self-assessment and take corrective measures accordingly without external feedback.

Sr. No.	Program Specific Outcomes
11.	NA

Sr. No.	Semester	Course Code	Course Name	Course Outcome
23.	I	MGC 1013	Principles of Management	Co:1 Interpret classical & modern theories.
				Co:2 Apply functions of management in real world scenarios
				Co:3 Communicate effectively about management decisions.
				Co:4 Analyze recent trends in live management case studies
				Co:5 Evaluate the current business landscape and trends.

24.	I	MGC1033	Managerial Economics	Co:1 Evaluate microeconomic and macroeconomic variables and its implication in business decision making.
				Co:2 Identify the competitive and global market for making larger presence and leadership.
				Co:3 Assess and evaluate macroeconomic variables for selection of best alternatives to maximize profit and value of an organization
				Co:4 Identify issues related to development and governance issue that hinder the development
				Co:5 Analyse the sectoral development and policies initiated by the governments to improve.
25.	I	MGC1053	Financial Accounting and Analysis	Co:1 Comprehend the fundamental aspects concerning financial accounting and its analysis.
				Co:2 Discuss the significance of preparation of various financial statements.
				Co:3 Apply accounting theory and information for preparing various accounts and financial statements.
				Co:4 Analyze the financial information by associating the tools and techniques for solving managerial problems.
				Co:5 Evaluate financial performance of the organization for effective decision making.
26.	I	MGC1073	Legal & Business Environment	Co:1 Develop an understanding of micro and macro elements of the business environment.
				Co:2 Identify the major and minor factors affecting the functioning of the business.
				Co:3 Exhibit the understanding of essential laws that have a bearing on the conduct of business in India.
				Co:4 Evaluate the strategies adopted by the firm to deal with the various factors of the international, financial and technological environment.
				Co:5 Analyze the dynamics of the business environment and its impact on the functioning of the business.
27.	I	MGC1093	Marketing Management	Co:1 Discuss Core concept of marketing and the role of marketing in business and society.
				Co:2 Develop marketing strategies based on product, price, place and promotion.
				Co:3 Analyse marketing problems and provide solution based on a critical examination of marketing information.
28.	I	MGC1113	Organizational Behaviour	Co:1 Analyze the conceptual anchors of Organizational behavior
				Co:2 Identify personal dimensions of personality. Job satisfaction, motivation and learning
				Co:3 Demonstrate the group dynamics and its applicability
				Co:4 Explain organizational change and culture effect on working relationships
				Co:5 Apply various leadership styles and conflict management strategies used in organizations.

29.	I	MGC1133	Quantitative Analysis	Co:1 Generate mathematical models of business scenarios
				Co:2 Apply basic mathematical, statistical and optimization tools.
				Co:3 Summarize data visually and numerically.
				Co:4 Demonstrate analytical skill for solving business problems.
				Co:5 Interpret results from decision making perspectives
30.	I	MGC1153	Indian Ethos and Business Ethics	Co:1 Interpret the variable values in morality
				Co:2 Propose strategies for maximizing personal growth and productivity of employees.
				Co:3 Apply value-based management and ethical practices in all functional areas of management
				Co:4 Develop ethical decision-making capabilities
				Co:5 Comprehend and practice the way of righteousness in the Indian mythological literature
31.	I	MGC1170	Leadership	Co:1 Develop critical thinking skills
				Co:2 Explain different approaches to leadership.
				Co:3 Apply leadership theories in real world business problems.
				Co:4 Analyze leadership types and take appropriate decisions.
				Co:5 Demonstrate ethical leadership practices
32.	I	MGC1193	Business Communication Lab	Co:1 Write business letters in a proper, formal format
				Co:2 Demonstrate the methods of oral presentation both in a formal and informal environment
				Co:3 Review the importance of communication relative to securing employment, with emphasis on using both verbal and non-verbal communication and their impact
				Co:4 Prepare the student with the communication tools-verbal, non-verbal and written-and the practical applications inherent in each
33.	I	MGC1213	Microsoft Office Specialist	Co:1 Demonstrate applying themes and layouts to slides.
				Co:2 Demonstrate inserting pictures, graphics, shapes, and other things.
				Co:3 Demonstrate working with sound and videos, master slides, smart art.
				Co:4 Use existing PowerPoint presentations using advanced editing tools such as theme, layout, timing, and animation.
34.	II	MGC1023	Corporate Finance	Co:1 Discuss fundamental aspects of financial management
				Co:2 Explain different sources available for raising funds for the business.
				Co:3 Prepare various financial statement for effective decision making.
				Co:4 Apply financial theory for taking financing & investment decision.
				Co:5 Evaluate different proposals by applying various financial techniques.
35.	II	MGC1043	Operations Management	Co:1 Demonstrate fundamentals of operations management in a firm.

				Co:2 Take decisions related to facility locations & layout.
				Co:3 Analyze different aspects relating to designing & developing processes.
				Co:4 Apply various aspects in Operations Planning and Control.
				Co:5 Evaluate various modern practices in operations management
36.	II	MGC1063	Human Resource Management	Co:1 Effectively manage and plan key human resource functions within organizations
				Co:2 Identify and analyze problems in the field of HRM and provide innovative solutions
				Co:3 Appreciate the implications of increasing globalization for the management of human resources
				Co:4 Evaluate and implement the new trends in HRM
				Co:5 Analyze different current trends in compensation.
37.	II	MGC1083	Business Research Methods	Co:1 Apply the major types of research designs
				Co:2 Formulate clearly defined research questions
				Co:3 Analyze and summarize key issues and themes from existing literature
				Co:4 Evaluate and conduct research
				Co:5 Assess the ethical issues associated with the conduct of research
38.	II	MGC1103	Managing for Sustainability	Co:1 Demonstrate a multi –stakeholder perspective in viewing CSR issues.
				Co:2 Analyse the impact of CSR implementation on corporate culture.
				Co:3 Evaluate the concept of corporate governance.
				Co:4 Discuss open issues concerning the future evolution of corporate governance in the context of globalization.
39.	II	MGC1123	Management Information System	Co:1 Explain the role and significance of management information systems in business.
				Co:2 Apply the decision support tools of information system to solve business problems.
				Co:3 Identify the causes of information system success and failure.
				Co:4 Implement the information system in various functional areas of management.
				Co:5 Demonstrate the better usage of e-business, e-governance, AI etc
40.	II	MGC1143	Strategic Management	Co:1 Comprehend the basic concepts and principles of strategic management
				Co:2 Analyze the competitive situation and strategic dilemma in dealing with dynamic business environment
				Co:3 Demonstrate the knowledge and abilities in formulating strategies and strategic plans
				Co:4 Evaluate challenges faced by managers in implementing and evaluating strategies based on the nature of business, industry, and cultural differences

41.	II	MGC1163	Aptitude Skills	Co:1 Evaluate critically key issues concerns with real life situation.
				Co:2 Apply innovative thinking skill to solve the problems.
				Co:3 Demonstrate various principle involved in solving mathematical problems.
				Co:4 Evaluate assumptions used in analyzing quantitative data
42.	II	MGC1183	Data Analysis	Co:1 Develop proficiency in handling SPSS software.
				Co:2 Analyse data sets using various descriptive and inferential statistical tools
				Co:3 Develop decision making abilities
43.	II	MGC1203	Capstone Project Phase I	Co:1 Identify a Social / Business problem.
				Co:2 Prepare a Synopsis for developing or solution for the identified problem.
				Co:3 Design the survey tool
44.	II	MGP1020	International Business	Co:1 Describe the foundation of international business.
				Co:2 Discuss the business operations of international organizations and multinational corporations.
				Co:3 Analyze forms of foreign involvement.
				Co:4 Discuss and apply international trade theory.
45.	II	MGP1040	Total Quality Management for Business Excellence	Co:1 Discuss the nature, need and scope of total quality management and its relationship with operational and then business excellence
				Co:2 Explain the quality of design, off-line control, losses and costs of quality
				Co:3 Analyze statistical process control through process capability studies
				Co:4 Develop total quality relationship with environment and safety systems
46.	II	MGP1060	Global Quality System	Co:1 Comprehend fundamental concepts of customer focused Quality systems and application of strategy in business organizations
				Co:2 Analyze the role of cost of quality to detect internal and external failure cost
				Co:3 Explain fundamentals of defect preventing mechanisms and their guidelines
				Co:4 Apply quality certification system
				Co:5 Identify & correct deviations in quality and their successful implementation
47.	II	MGP1080	Cross Cultural Study	Co:1 Increase their knowledge and sensitivity to other cultures
				Co:2 Become aware of their own cultural strengths and weaknesses when working with people from other cultures
				Co:3 To carry a basic analysis of cultural differences.
				Co:4 Learn fundamental principles and acquire basic information on ways to build bridges between people from diverse cultures working together in some form of business of project.



				Co:5 Identify and negotiate the obstacles to effective communication across cultures
48.	III	MGC2013	Entrepreneurship Development	Co:1 Discuss the values, attitudes and motivation for a plunge in entrepreneurship. Co:2 Explain basic entrepreneurial skills and understanding to run a business efficiently and effectively. Co:3 Develop and strengthen their entrepreneurial quality and motivation to start their own small-scale business/enterprise. Co:4 Analyze the entrepreneurial ecosystem and design strategies accordingly
49.	III	MGE2013	Taxation Planning and Management	Co:1 Apply analytical reasoning tools to assess how taxes affect economic decisions for all taxpaying entities. Co:2 Explain components of taxable income determination across taxable entities. Co:3 Analyze tax issues by using research skills (including accessing and interpreting sources of authoritative support) to identify and evaluate strengths, weaknesses and opportunities Co:4 Discuss tax conclusions and recommendations in a clear and concise manner to relevant stakeholders. Co:5 Apply technological skills necessary to undertake tax planning, compliance and research strategies.
50.	III	MGE2023	Healthcare and Hospital Management	Co:1 Build competencies and provide expertise for hospital & healthcare management, operations and administration through learning of Hospital core and Support Services. Co:2 Provide the students an intensive, stimulating and challenging learning experience in the management and administration of Hospitals. Co:3 Acquaint the Students about Health Policy and Health Care Systems. Co:4 Acquaint the Students about different important services needed in a Hospital.
51.	III	MGE2033	Mentoring and Coaching	Co:1 Evaluate the benefits of coaching and mentoring to an organization Co:2 Assess support of coaching and mentoring programmes in achieving business objective. Co:3 Develop guidelines and protocols for programmes based on accepted coaching and mentoring theory and practice. Co:4 Conduct formal and informal coaching conversations and begin to understand formal coaching relationships. Co:5 Evaluate the impact to an organization of establishing coaching and mentoring culture
52.	III	MGE2043	Warehouse Management	Co:1 Explain the fundamental concepts of warehouse management.

				Co:2 Design warehouse layout.
				Co:3 Analyze different processes performed for managing warehouses.
				Co:4 Apply warehouse management system.
				Co:5 Discuss the role & importance of inventory & transportation in warehouse Management.
53.	III	MGE2053	Mall Management	Co:1 Analyze the concepts and aspects needed for mall management.
				Co:2 Apply the operational and tenant management principles for malls.
				Co:3 Evaluate the marketing and promotional principals for the malls.
				Co:4 Illustrate the statutory requirements for the mall operations.
54.	III	MGE2063	Change Management	Co:1 Describe in general terms a number of change management theories and how they might apply in practice.
				Co:2 Articulate what change management is and why it is important in the contemporary business environment.
				Co:3 Discriminate between different types of change process for different purposes and outcomes.
				Co:4 Identify the steps in putting together an effective change management plan.
				Co:5 Apply critical thinking and problem solving skills to the analysis and resolution of change problems
55.	III	MGE2073	Commodity Markets	Co:1 Explore the fundamental concepts of commodity market & derivative market.
				Co:2 Apply their knowledge of financial markets.
				Co:3 Analyze the dynamics of commodity exchange.
				Co:4 Explain various types of commodities.
				Co:5 Comprehend the workings of commodity market & derivative market.
56.	III	MGE2083	Food Retail Management	Co:1 Identify variables for vast International Food Markets.
				Co:2 Analyses trends in Food Retailing and the challenges present in Food Retail operation and develop CRM strategy for food retail companies.
				Co:3 Measure the brand value of Food Retail organizations and their products.
				Co:4 Apply appropriate law of conducting food business.
				Co:5 Analyze the opportunities and threat associated with GMO Foods.
57.	III	MGE2093	Human Resource Audit	Co:1 Discuss systematic methodology for evaluating HRD.
				Co:2 Examine the adequacy and appropriateness of the HRD systems, structures, styles, culture, and competencies.
				Co:3 Design Human Resource Audit Report

				Co:4 Identify the gaps between the current state and the standard.
				Co:5 Conduct the Human Resource Audit for the organization
58.	III	MGE2103	Small scales industries management	Co:1 Understand small businesses and supporting organizations for its setup.
				Co:2 Identify Business Opportunities and plan according to survey.
				Co:3 Prepare project and develop the report according to planned idea and market.
				Co:4 Analyze the basic aspects of business and understand better to prepare for the same.
				Co:5 Explain the Legal laws governing the business and environment.
59.	III	MGE2113	Total Quality Management	Co:1 Understand the fundamental principles of Total Quality Management.
				Co:2 Develop an understanding on various ISO standards and quality systems.
				Co:3 Apply the tools and techniques of quality management to manufacturing and services processes.
				Co:4 Develop analytical skills for investigating and analyzing quality management issues in the industry and suggest implementable solutions to those.
60.	III	MGE2123	Search Engine Optimization	Co:1 Discuss the search engine ranking of site by implementing the best practices.
				Co:2 Apply SEO strategies through inbound marketing.
				Co:3 Analyze new SEO innovations and changing search engine trends.
				Co:4 Apply Google Analytics and other metrics and tools to monitor progress in achieving search engine marketing goals.
61.	III	MGE2133	E-retailing	Co:1 Identify and explain fundamental e-Retailing Online Merchandising Techniques.
				Co:2 Recognize and discuss the major E-Payment Security Challenges and Solutions.
				Co:3 Assess and discuss issues including Impact of E-retailing on traditional transportation system and opportunities.
				Co:4 Demonstrate an understanding of Concept of online pricing and dynamics pricing for E- retailing.
				Co:5 Analyze the impact of E-retailing on inventory security and Quality management
62.	III	MGE2143	Tourism Management	Co:1 Apply skills associated with problem solving, creative and critical thinking, reflection and decision making to function effectively.
				Co:2 Explain range of leadership skills and abilities such as motivating others, leading changes, and resolving conflict

				Co:3 Analyze supervisory skills and competencies necessary to meet the needs of the ever demanding Travel and Tourism Industry.
				Co:4 Discuss importance of outstanding guest service quality, server-guest relationships, and ethics
63.	III	MGE2153	Export – Import Procedure & Documentation	Co:1 Explain an overall perspective on import & export management.
				Co:2 Discuss an understanding towards export and import procedure and documentation.
				Co:3 Analyze processing of export order.
				Co:4 Apply knowledge of managing risk involves in the import & export transactions.
64.	III	MGE2160	Social Media Marketing	Co:1 Discuss the evolution of social media marketing and identify related ethical issues to communicate its impact on businesses.
				Co:2 Create S.M.A.R.T. social media goals to achieve successful online campaigns.
				Co:3 Design effective social media marketing strategies for various types of industries and businesses.
				Co:4 Identify the major social media marketing portals that can be used to promote a company, brand, product, service or person.
				Co:5 Evaluate a company’s current situation, and provide solutions by identifying appropriate social media marketing portals.
65.	III	MGM2013	Sales and Distribution Management	Co:1 Develop the knowledge of Selling and Distribution process in an organization.
				Co:2 Develop proficiency in industry in actual selling process and the management of selling personnel.
				Co:3 Demonstrate the knowledge needed to generate a leads and increase the sales in terms of volume and in monetary terms.
				Co:4 Analyze critical and strategic thinking, improve analytic skills and techniques, and enhance effective decision-making in sales and Distribution.
				Co:5 Identify the management challenges to construct & design Distribution Channel to find appropriate way to reach to the customers.
66.	III	MGM2033	Services Marketing	Co:1 Identify the special management issues and unique challenges involved in marketing and managing services
				Co:2 Understand the expectations of customers and know how to translate this knowledge into genuine value for customers
				Co:3 Interpret service behavior and service consumption in the light of service-dominant marketing logic and articulate the outcome to service marketing management
				Co:4 Appreciate, modify, and/or extend new theories and concepts pertaining to explaining the characteristics

				of customers' purchasing and consumption behavior of services and service firms' marketing behavior
				Co:5 Apply new approaches to managing customer satisfaction and loyalty
67.	III	MGM2053	Retail Marketing	Co:1 Acquire and apply relevant knowledge and skills to manage retail management issues
				Co:2 Formulate creative yet feasible solutions for customer care, store care, merchandise care and retail strategies.
				Co:3 Discuss and analyze the latest strategies required for the development of retail marketing.
				Co:4 Identify and evaluate challenges and opportunities concerning the applications of the latest retail strategies.
				Co:5 Explain the factors relating to visual merchandising, such as store layouts and presentation.
68.	III	MGM2073	Consumer Behavior	Co:1 Assess the relevance of consumer behavior to the entire marketing process.
				Co:2 Analyze the causes giving rise to consumer behavior with the theories.
				Co:3 Identify the learning process of consumer at from marketing respective.
				Co:4 Design communication strategies for attracting consumers.
				Co:5 Assess the impact of socio-cultural factors on consumer behavior.
69.	III	MGM2093	Customer Relationship Management	Co:1 Explain and characterize the major concepts and framework of customer relationship management
				Co:2 Discuss the conceptual foundations of relationship marketing and its implications for further knowledge development in the field of business
				Co:3 Apply CRM practices and technologies to enhance the achievement of marketing, sales and service objectives throughout the customer life cycle.
				Co:4 Develop critical skills necessary for building and managing partnering relationships with customers and suppliers.
				Co:5 Analyze the benefits delivered by CRM, the contexts in which it is used, the technologies that are deployed and how it can be implemented
70.	III	MGM2113	Digital Marketing	Co:1 Develop a deeper understanding of the changing digital marketing landscape.
				Co:2 Apply the latest digital marketing trends and skill sets needed for today's marketer.
				Co:3 Distinguish between the functions of various digital communication channels and select solutions appropriate to the needs of the organization and the end users.

				Co:4 Analyze the impact digital technologies have on consumer behavior; consumer research and customer relationships
				Co:5 Apply to web based marketing tools with the view of incorporating new media into traditional media and marketing planning.
71.	III	MGM2133	Management of Marketing Communications	Co:1 Discuss the basic concepts and terminology in advertising, with an emphasis on IMC
				Co:2 Analyze factors and importance of reaching the target audience through the development of effective media coverage planning, including preparation and justification of an advertising budget.
				Co:3 Refine critical thinking and decision-making in advertising campaign development through class activities and assignments.
				Co:4 Perform advertising monitoring, evaluating, & feedback systems in order to ascertain campaign effectiveness.
				Co:5 Participate in the development of creative solutions to address advertising and marketing communications challenges.
72.	III	MGM2153	Strategic Marketing Management	Co:1 Apply strategic concepts and theories and their application in marketing environments.
				Co:2 Compare and contrast the key principles of marketing strategy
				Co:3 Research and analyze marketing strategies in different contexts
				Co:4 Identify and resolve well-defined problems reaching substantiated conclusions employing methods of analysis specific to marketing.
				Co:5 Employ strategies and processes, which assist independent learning.
73.	III	MGH2013	Compensation Management	Co:1 Apply the knowledge to solve compensation related problems in organizations
				Co:2 Design rational and contemporary compensation systems in modern organizations
				Co:3 Design and maintain a pay system within the organization
				Co:4 Analyze and develop incentive programs
				Co:5 Explain the legally required employee benefits.
74.	III	MGH2033	Performance and Rewards Management	Co:1 Identify and retain talent in an organization to deliver high performance.
				Co:2 Design an organization's performance management process.
				Co:3 Compare and contrast various organizational performance management programs and best practices

				Co:4 Plan effective performance management policies, practices to improve organizational, and employee performance.
				Co:5 Evaluate the relationship amongst the components of total rewards.
75.	III	MGH2053	Organizational Development and Change	Co:1 Apply theories and current research concerning individuals, groups, and organizations to the process of change
				Co:2 Identify organizational situations that would benefit from OD interventions.
				Co:3 Discuss the process of change as applied to organizational culture and human behavior
				Co:4 Explain the differences between insider and outsider approaches to consulting and OD interventions
				Co:5 Analyze ongoing activities within an organization and design the selected OD interventions.
76.	III	MGH2073	Industrial Relations and Labour Law's	Co:1 Acquire a theoretical, practical and ethical perspective on many aspects of industrial relations.
				Co:2 Apply IR competencies to contribute to organizational capability & employee wellbeing.
				Co:3 Explain the various forms and causes of Industrial disputes.
				Co:4 Assess the collective bargaining process, including preparation, negotiation, and settlement.
				Co:5 Understand the statutory provisions concerning the grievance procedure in India.
77.	III	MGH2093	Human Resource Planning	Co:1 Analyze the theory and concepts of human resource planning.
				Co:2 Identify the evolution of HRP throughout the organization.
				Co:3 Apply models and methods used in forecasting.
				Co:4 Describe the applications of a succession analysis & planning.
				Co:5 Evaluate the organization's planning program.
78.	III	MGH2113	Strategic and International Human Resource Management	Co:1 Discuss the strategic and functional roles of HRM in various international contexts, especially in areas such as recruitment and selection, performance management & training.
				Co:2 Identify opportunities and challenges pertaining to international HRM;
				Co:3 Develop competency in dealing with cross cultural situations;
				Co:4 Analyze external forces (e.g. globalization, socio cultural changes, political and economic changes) that have the potential to shape international HRM.
				Co:5 Develop generic and transferable skills-especially in diagnosing international HRM issues
				Co:6 Conduct research for solving cases related to international HRM.

79.	III	MGH2133	Training and Development	Co:1 Understand the role and functions of training and development in organizations.
				Co:2 Identify principles and their implications for the effectiveness of training programs.
				Co:3 Assess training needs & evaluate employee training programmes.
				Co:4 Outline the issues and steps involved in designing and implementing a training program.
				Co:5 Design, training and development programs that can be delivered in the form of individual and group.
80.	III	MGH2153	Cross Cultural Management	Co:1 Analyze the impact of culture on business practices.
				Co:2 Analyze the impact of national culture on organizational cultures.
				Co:3 Apply strategies for managing international teams and projects
				Co:4 Develop strategies for working in virtual and co-located multicultural teams.
				Co:5 Assess and leverage the impact of culture in management and other business functions.
81.	III	MGH2173	Conflict and Negotiation Management	Co:1 Analyze the key practical and theoretical concepts of managing and resolving conflicts.
				Co:2 Describe the nature of small and large scale conflicts.
				Co:3 Articulate the theoretical and practical components of negotiation and mediation and explain the link between effective negotiation skills and effective leadership.
				Co:4 Analyse the types of conflict management styles.
				Co:5 Explain the link between effective negotiation skills and effective leadership
82.	III	MGF2013	Indian Financial System	Co:1 Explain the key roles played in modern society by the financial products, markets and institutions, and various functions of market regulators.
				Co:2 Exhibit the understanding of the fundamentals of financial markets & define and illustrate some key financial terms, such as primary market and over-the-counter.
				Co:3 Apply the knowledge of the relative standing of the major financial services in India for various business organizations.
				Co:4 Describe the functions of banking & NBFC in the Current Scenario and discuss the various important aspects concerned with banking and non-banking organizations.
				Co:5 Analyze the need for mutual fund investment and also focus on another relative aspect of the mutual fund industry.
83.	III	MGF2033		Co:1 Interpret the role and determinants of interest rates and interaction of interest rates with money supply.



			Financial Markets & Institutions	Co:2 Assess the various theoretical concepts underlying money and capital markets.
				Co:3 Analyze the working of various markets for securities (including debt markets, equity markets, derivative markets) and its role in financial markets.
				Co:4 Comprehend significant aspects of banking business.
				Co:5 Compare and contrast the various non-bank operations.
84.	III	MGF2053	International Finance	Co:1 Explain the fundamental of international business, finance as well as international financial markets.
				Co:2 Apply the knowledge of exchange rate mechanism for decision-making.
				Co:3 Apply the risk management strategies in foreign exchange operations.
				Co:4 Discuss long term and short-term asset and liability management techniques used in international business.
85.	III	MGF2073	Working Capital Management	Co:1 Evaluate the importance of effective working capital Mgt.
				Co:2 Investigate funds flow cycles and their impact on working capital management objectives.
				Co:3 Formulate appropriate working capital management policies to achieve corporate objectives.
				Co:4 Apply corporate cash management, accounts receivable management, bank relations, and inventory management techniques to maximize the shareholders' value.
				Co:5 Evaluate comparative working capital management policies and their impact on the firm's profitability, liquidity, risk and operating flexibility.
86.	III	MGF2093	Mergers, Acquisition and Corporate Restructuring	Co:1 Identify the key issues and concepts of mergers, acquisitions and Corporate Restructuring.
				Co:2 Analyze typical valuation strategies, pre and post-merger issues and challenges
				Co:3 Assess the funding alternatives available and the various aspects of financial restructuring in case of mergers, acquisitions.
				Co:4 Discuss the revival of sick units with special reference to the Law and its Procedure
				Co:5 Examine the impact of changing business scenario worldwide on Corporate Restructuring.
87.	III	MGF2110	Behavioral Finance	Co:1 Discuss the basics of Conventional Finance.
				Co:2 Explain the cognitive biases and errors of judgment that affect financial decisions
				Co:3 Analyze behavioral influences involving individuals investment decisions
				Co:4 Evaluate behavioral influences involving corporate financial decisions

				Co:5 Discuss important developments in this new area and the associated practical insights.
88.	III	MGF2133	Cost Analysis and Control	Co:1 Discover the importance of analyzing and managing costs
				Co:2 Explain Activity-Based Costing (ABC) and Activity-Based Management (ABM)
				Co:3 Justify the importance of process costing and cost allocation
				Co:4 Develop important tools for planning and decision making
				Co:5 Evaluate and manage performance through strategic cost management
89.	III	MGB2013	Marketing Analytics	Co:1 Apply marketing theories to given research problems and types of customer data.
				Co:2 Critically evaluate business problems and of determine the most appropriate analytical technique
				Co:3 Design an appropriate course of action based on empirical evidence.
				Co:4 Formulate and communicate marketing research findings for decision-making.
90.	III	MGB2033	HR Analytics	Co:1 Explain basic concepts of HR Analytics
				Co:2 Apply Data Analytic techniques using software packages
				Co:3 Identify and use key HR Metrics.
				Co:4 Forecast budget numbers for HR costs
				Co:5 Measure workforce productivity and performance
				Co:6 Explore and visualize data
91.	III	MGB2053	Core Python Programming	Co:1 Describe the Numbers, Math functions, Strings, List, Tuples and Dictionaries in Python
				Co:2 Express different Decision-Making statements and Functions
				Co:3 Interpret Object oriented programming in Python
				Co:4 Summarize different File handling operations
				Co:5 Create and execute Python programs
92.	III	MGB2073	R Programming	Co:1 Access online resources for R and import new function packages into the R workspace
				Co:2 Import, review, manipulate and summarize data--sets in R
				Co:3 Explore data--sets to create testable hypotheses and identify appropriate statistical tests
				Co:4 Apply appropriate statistical tests using R
				Co:5 Create and edit visualizations with R
93.	III	MGB2093	Financial Analytics	Co:1 Understand different entities and products in the financial markets.
				Co:2 Apply techniques for selecting investment avenues from different securities or asset classes.
				Co:3 Demonstrate Analytical Skills to calculate Bond yields to make an investment decision.
				Co:4 Analyse real-life proposals for financial investment in a meaningful manner.

				Co:5 Compare the currency exchange rates among different currency pairs.
94.	III	MGB2113	Data Mining	Co:1 Discuss basic concept of Data Mining
				Co:2 Identify appropriate data mining algorithms to solve real world problems
				Co:3 Compare and evaluate different data mining techniques like classification, prediction, clustering and Association Rule Mining
				Co:4 Describe complex data types with respect to spatial and web mining.
95.	III	MGB2133	Business Intelligence	Co:1 Explain role of mathematical models in business intelligence
				Co:2 Describe link between strategy and business analytics
				Co:3 Apply various statistical methods on available data
				Co:4 Design physical database
				Co:5 Apply Business Intelligence System in various areas of management.
96.	III	MGO2013	Materials Management & Inventory Control	Co:1 Analyze need & importance of materials management in a firm.
				Co:2 Apply methods of classification, codification, specifications & standardization of materials.
				Co:3 Manage different issues relating to stores department.
				Co:4 Take decisions relating to inventory control by using different techniques.
				Co:5 Demonstrate the role and importance value analysis.
				Co:6 Take make or buy decisions relating to materials management.
97.	III	MGO2033	Operations Planning and Control	Co:1 Analyze need & importance of operations planning and control in a firm.
				Co:2 Forecast demand of the products by applying various methods of demand forecasting.
				Co:3 Apply aggregate planning and master production scheduling for taking managerial decision.
				Co:4 Analyze the need & importance of resource requirements planning.
				Co:5 Take decisions based on materials requirement planning & resource requirements planning.
98.	III	MGO2053	Global Operations Strategy	Co:1 Emphasize the key role of operations strategies in bringing about the growth and profitability of organizations.
				Co:2 Apply different models in relation with operations strategies.
				Co:3 Describe different key drivers used for global operations.
				Co:4 Apply competency based, resource based and process based operations strategies.
99.	III	MGO2073		Co:1 Understand the concept & philosophy of Six Sigma.

			Managing Six Sigma	Co:2 Apply quality function deployment techniques for creating customer driven organization.
				Co:3 Manage six sigma teams for achieving better results.
				Co:4 Apply different tools & techniques for managing Six Sigma.
				Co:5 Manage risk involved in the six-sigma projects.
100.	III	MGO2093	Purchase Management	Co:1 Analyze the Role & Importance of purchase management in a firm.
				Co:2 Apply different criteria for vendor analysis & selection.
				Co:3 Apply different purchase strategies for achieving better results.
				Co:4 Describe the role & importance of buyer – seller relationship.
				Co:5 Evaluate various modern purchase practices.
101.	III	MGO2113	Lean Manufacturing System	Co:1 Explain the concept & philosophy of lean manufacturing.
				Co:2 Analyze different control techniques used under lean manufacturing.
				Co:3 Describe different steps for applying lean in manufacturing and service sectors.
				Co:4 Describe the interrelationship of lean manufacturing with just in time system.
				Co:5 Analyze the role & importance of cellular manufacturing system in relation with lean manufacturing.
102.	III	MGO2133	Maintenance Management	Co:1 Analyze the role and importance of maintenance management
				Co:2 Apply maintenance planning & scheduling technique for better results.
				Co:3 Apply total productive maintenance system in a firm.
				Co:4 Describe computerized maintenance management system.
				Co:5 Manage different issues relating to safety and accident prevention.
103.	III	MGO2153	Manufacturing Systems Management	Co:1 Apply just in time manufacturing practices in a firm.
				Co:2 Analyze the role & importance of benchmarking quality improvement system.
				Co:3 Analyze the planning & implementation of flexible manufacturing systems in a firm.
				Co:4 Apply theory of constraints tools in manufacturing for better performance.
				Co:5 Apply business process reengineering system and green manufacturing practices for improving overall productivity.
104.	III	MGS2013		Co:1 Apply Enterprise tools and its role in integrating business process.

			Enterprise Resource Planning	Co:2 Demonstrate knowledge of ERP modules.
				Co:3 Summarize the concepts of reengineering.
				Co:4 Identify the management challenges to implement ERP.
105.	III	MGS2033	Software Project Management	Co:1 Apply fundamental principles of Software Project Management.
				Co:2 Explain different methods and techniques used for Software project management.
				Co:3 Identify issues that could lead to IT project success or failure.
				Co:4 Identify and describe the key phases of project management.
				Co:5 Describe the responsibilities of IT project managers.
106.	III	MGS2053	Data Warehousing & Data Mining	Co:1 Know the functionality of the various data mining and data-warehousing component.
				Co:2 Appreciate the strengths and limitations of various data mining and data warehousing models.
				Co:3 Explain the analyzing techniques of various data.
				Co:4 Describe different methodologies used in data mining and data ware housing.
				Co:5 Know the data-mining concept, application and their usage.
107.	III	MGS2073	Database Management Systems	Co:1 Explain the basic concepts and the applications of database systems.
				Co:2 Design ER-models to represent simple database application scenarios.
				Co:3 Identify the data models for relevant problems.
				Co:4 Explain & use design principles for logical design of databases, including the E -R method and normalization approach.
				Co:5 Understand the different issues involved in the design and implementation of a database system.
108.	III	MGS2093	Information System Audit and Security	Co:1 Describe fundamental concepts of systems auditing and information security.
				Co:2 Analyze the latest trend of computer security threats and defense.
				Co:3 Identify security thefts in information systems and rectify them with appropriate security mechanisms.
				Co:4 Explain the security controls in the aspects of physical, logical and operational security control.
				Co:5 Analyze the security incident with a proven audit procedure.
109.	III	MGS2113	E-Business	Co:1 Describe about the anatomy of e-commerce applications.
				Co:2 Demonstrate about the E-commerce consumer applications.
				Co:3 Describe about the digital token credit based electronic payment system.
				Co:4 Understand about the key multimedia concepts.

				Co:5 Analyze the potential impacts of different e-Business strategies.
110.	III	MGS2133	Cyber Laws and Cyber Security	Co:1 Discuss an understanding of information security fundamentals.
				Co:2 Identify the applications of cryptography.
				Co:3 Illustrate the methods for data recovery.
				Co:4 Apply the methods for preservation of digital evidence.
				Co:5 Analyze the provisions in laws to deal with cybercrime.
111.	III	MGS2153	System Analysis & Design	Co:1 Explain the roles and responsibilities of systems analysts and project managers in systems analysis and design.
				Co:2 Explain the stages of the system development life cycle model.
				Co:3 Analyze and recognize the causes of information related problems and design a new system to allay these problems.
				Co:4 Design appropriate information systems (ERD).
				Co:5 Manage the development of systems based on system specifications.
112.	III	MGR2013	Rural Banking and Microfinance	Co:1 Identify and evaluate the complexities of Rural Credit Banking policies. Analyze the role of Credit Cooperatives.
				Co:2 Analyze the Functions of Commercial Banks.
				Co:3 Evaluate progress, performance & problems of RRBs, Small Finance Bank & Payment Bank.
				Co:4 Assess the role of microfinance as a tool of socio economic development.
				Co:5 Conduct Social Assessments of MFIs, Loan Disbursement and Repayment.
113.	III	MGR2033	Rural Society and Polity	Co:1 Analyze development of rural economy & rural society and Interdependence between Rural and Urban Sectors.
				Co:2 Develop relationship among Rural Communities, Rural Institutions and Rural Environment.
				Co:3 Analyze problems of Schedule Cast, Schedule Tribe and Women.
				Co:4 Assess the impact of Social Inclusion on development.
				Co:5 Analyze the Differences related to gender, Women in Development (WID) and Works and Gender Relation.
				Co:6 Evaluate Participatory approaches to rural development and social development.
114.	III	MGR2053	Society Up-liftment Policies	Co:1 Identify and evaluate the complexities of Growth Vs Development, Rising Expectations & Development, Challenges & Opportunities in Rural Economy

				Co:2 Analyze the impact of Rural Child Development Programme.
				Co:3 Evaluate the National Rural Health Mission programme.
				Co:4 Analyze the role of Rural Housing Programme on socio economic development of rural areas.
				Co:5 Analyze the impact of Rural Women Empowerment programme.
				Co:6 Evaluate the National Rural Employment programme.
115.	III	MGR2073	ICT in Development	Co:1 Understand and analyze importance of Information, Communication and Technology in development.
				Co:2 Assess role of ICT in Sustainable development goals.
				Co:3 Develop and design ICT as an infrastructure and its relationship in managing development issues.
				Co:4 Identify opportunities in E-inclusion and its importance in development.
				Co:5 Analyze National E Governance Policy.
				Co:6 Examine the impact of ICT in Rural Project Framework.
116.	III	MGR2093	Agribusiness	Co:1 Analyze global Agribusiness Environment and scope of community-based industry.
				Co:2 Estimate demand and plan procurement method.
				Co:3 Identify opportunities in organized food retailing.
				Co:4 Analyze problems in Agri Input Markets.
				Co:5 Analyze ICT application in Agriculture Trade.
				Co:6 Create linkage with apex agriculture and farming welfare institution for getting financial assistance and support from latest research.
117.	III	MGR2113	Managing Cooperatives	Co:1 Differentiate the cooperatives with other business models.
				Co:2 Analyze the functions of short, medium and long-term credit cooperative structure and its role in financial inclusion.
				Co:3 Identify the challenges in management of cooperatives and suggest better solution for that.
				Co:4 Measure the legal aspects integrated with cooperative business.
				Co:5 Develop case study on cooperatives business models.
118.	III	MGR2133	Social Marketing and Social Entrepreneurship	Co:1 Analyze Theories & Approaches in Behavioral Modification.
				Co:2 Identify social marketing projects.
				Co:3 Manage Social marketing programme.
				Co:4 Assess the models of social Entrepreneurship and Enterprise.
				Co:5 Analyze impact of social impact investors.
119.	III	MGR2153	Governance and Development	Co:1 Analyze the relationship between Governance and Development.

				Co:2 Identify the role of environment in Governance.
				Co:3 Analyze Governance issues in Modern state and societies.
				Co:4 Evaluate Board of Director Roles and responsibilities for better corporate governance.
				Co:5 Assess Accountability and Transparency in Governance in CBOs.
120.	III	MGT2013	Engineering Management	Co:1 Understand various functions of Engineer in the organization
				Co:2 Identify the problem and find the optimal solution for that problem.
				Co:3 Make Plan for and organize technical activities.
				Co:4 Manage production and service activities
				Co:5 Understand communication process and Management information system
121.	III	MGT2033	Enterprise Productivity	Co:1 Understand and explain Enterprise level and micro level productivity
				Co:2 Apply different type technology to increase productivity
				Co:3 Understand and Explain different productivity models
				Co:4 Apply different productivity models in business.
122.	III	MGT2053	Technology Management	Co:1 Understand role of technology and core competence
				Co:2 Explain technology cycle and understand technology change
				Co:3 Identifying and evaluating the impact of relevant changing technology and managing those changes.
				Co:4 Analyze trend and understand role of TIFAC
				Co:5 Identify different patterns of technological changes
123.	III	MGT2073	R & D Management	Co:1 Understand different Managerial aspects of Innovation function.
				Co:2 Develop innovative strategy in business.
				Co:3 Measure Performance of R&D management
				Co:4 Do R & D project.
				Co:5 Understand Intellectual Property Rights
124.	III	MGT2093	Value Engineering	Co:1 Evaluate cost, worth and value.
				Co:2 Create value engineering job plan
				Co:3 Evaluate value engineering projects
				Co:4 Initiate value engineering programming
				Co:5 Use tools of value analysis
125.	III	MGT2113	Engineering Systems Simulation	Co:1 Understand system stimulation
				Co:2 Apply random numbers in simulating systems.
				Co:3 Explain engineering systems modeling and simulation
				Co:4 Conduct simulation experiments
				Co:5 Analyze simulation output
126.	III	MGT2133	Big Data Analytics	Co:1 Explain Challenges of Conventional Systems
				Co:2 Explain Stream Data Model and Architecture
				Co:3 Handle the Hadoop Distributed File System



				Co:4 Develop a Map Reduce Application
				Co:5 Set up a Hadoop Cluster
127.	III	MGT2153	Manufacturing Systems	Co:1 Explain fundamentals of manufacturing and automation
				Co:2 Analyze flow lines without storage and with storage buffer
				Co:3 Develop and implement FMS
				Co:4 Understand functions and components of CIM system
				Co:5 Plan and Schedule Functions in CIM System
128.	III	MGI2010	India's Foreign Trade And Policy	Co:1 Analyze the global business environment in terms of economic, social and legal aspects
				Co:2 Explain the concepts in trade documentation in international business with respect to foreign trade
				Co:3 Discuss Instruments of import policy and the concepts related to imports substitution and restrictions.
				Co:4 Evaluate various types of Tariffs in international trade.
129.	III	MGI2030	Export Import Procedures, Documentation And Logistics	Co:1 Comprehend export procedure and documentation.
				Co:2 Discuss importance of exports determinants and schemes in India.
				Co:3 Explain guidelines for international business negotiations.
				Co:4 Analyze nature and pattern of registration of exporters and importers and related concepts.
				Co:5 Explain Various Risks in export trade.
130.	III	MGI2050	International Economics	Co:1 Explain the introductory international economics and the terminology adopted in international economics;
				Co:2 Describe various International Trade Theories
				Co:3 Illustrate the Factor Price and trade concepts
				Co:4 Differentiate between various BOP accounts
				Co:5 Analyze the factors influencing the exchange rates.
131.	III	MGI2070	Global Competitiveness Analysis	Co:1 Discuss the complexity and the elusiveness of "competitiveness", for any country.
				Co:2 Examine the links between the concepts of competitiveness and development of a country.
				Co:3 Explain the economic, political and social determinants of competitiveness and their interdependencies.
				Co:4 Analyze different quantitative and qualitative approaches regarding the creation and measurement of competitiveness.
				Co:5 Summarize strategic and tactical decisions taken by firms to enter and compete in international markets
132.	III	MGI2090	Global Marketing Strategies	Co:1 Differentiate between Domestic markets, International Markets and Global Markets with their key characteristics and differentiation

				Co:2 Identify the Global Trading Environment with focus on social, cultural environment and regulatory issues in foreign markets
				Co:3 Relate with Global demographic profiles of ever-changing Global markets and formulate requisite pricing strategies to sustain in Globalization
				Co:4 Categorize the factors impacting pricing and media communication in global environment
				Co:5 Identify the role of Mobile commerce and digital global marketing in the 21st century trading environment and its role in handling security aspects of global trade
133.	III	MGI2110	Management of International Logistics	Co:1 Understand the issues in International Logistics.
				Co:2 Discuss Sales Contract in International Logistics.
				Co:3 Analyze models of Forecasting in Supply Chain Management.
				Co:4 Explain various methods for Demand Forecasting.
				Co:5 Apply skills for inventory management
134.	III	MGI2130	Globalization and Indian Business Scenario	Co:1 Describe the structural features of India's foreign trade
				Co:2 Explain the domestic response to globalization at a disaggregated sectorial level
				Co:3 Illustrate various threats and opportunities in doing business from an India-centric perspective in some emerging fields of global business
				Co:4 Classify the policy environment in India facilitating and/or inhibiting international business
				Co:5 Understand various policies which regulate Indian Business Environment
135.	III	MGI2150	Management of Trans-National Corporations	Co:1 Implement the conceptual tools to navigate through the mass of information about how international competition takes place.
				Co:2 Classify the differences between multi-domestic, global, International and Transnational corporations.
				Co:3 Evaluate the global strategies that will help enhance the firm's long-term profitability and value.
				Co:4 Illustrate the management of a global workforce and the challenges in managing global business across different cultures.
				Co:5 Interpret the effects of economic, cultural, financial, political, and social factors on TNCs management decisions.
136.	III	MGB2010	Insurance Planning & Management	Co:1 Comprehend the various forms of insurance and their suitability.
				Co:2 Analyze criteria for selection of various insurance products.
				Co:3 Explain the pricing mechanism of insurance products.

				Co:4 Discuss systems and procedures associated with various forms of insurance.
137.	III	MGB2030	Risk Management for Banks and Insurance Companies	Co:1 Explain risks faced by banking and insurance companies.
				Co:2 Discuss the challenges in managing banks.
				Co:3 Analyze the risk management strategies for banks and insurance companies.
				Co:4 Discuss the best practices in India and other parts of the world, in respect of 'risk management'.
138.	III	MGB2050	Retail Banking	Co:1 Impart basic banking operation skills and understanding banking types.
				Co:2 Analyze different delivery channels for banking services & products.
				Co:3 Perform activities related to Marketing/Selling of retails banking Products.
				Co:4 Create Customer Relationship Management plan for retail banking organization.
				Co:5 Solve business problems related to retail banking organization.
139.	III	MGB2070	General Insurance	Co:1 Implement the principles of General Insurance
				Co:2 Identify & Suggest the Insurance policies with risk management
				Co:3 Fix problem related to reinsurance & customer retention
				Co:4 Identify the risk management techniques in Insurance marketing & Servicing.
140.	III	MGB2090	Banking Services Operations	Co:1 Evaluate the banking operations with products & services.
				Co:2 Impart electronic banking skills and technology
				Co:3 Identify the risk factors & need of security in e-banking
				Co:4 Develop the sense of record maintenance & risk management.
				Co:5 Impart the ability of risk management strategies in banking sector
141.	III	MGB2110	Treasury Management	Co:1 Understand the concepts and functional framework treasury management
				Co:2 Apply the decisions and types of bill
				Co:3 Evaluate the operational functions of Bills financing and securities
				Co:4 Illustrate the treasury operations and manage customer investor relationships.
142.	III	MGB2130	Law's Governing Banking and Insurance	Co:1 Explain the nature and development of banking and laws.
				Co:2 Discuss Regulatory Framework related to banking and insurance businesses.
				Co:3 Apply the rules and regulations in the establishment of banking and insurance companies.

				Co:4 Demonstrate the knowledge of understanding of important provisions of major acts related to banking and insurance businesses.
				Co:5 Apply due process in claim settlements and understand semi judiciary role of insurance Board in claim settlement
143.	III	MGB2150	Funds Management in Banking and Insurance	Co:1 Get an insight into the liquidity management in commercial Banking business and discuss the necessity of adequate capital fund.
				Co:2 Explain different types of reserves & different factors affecting on its requirement.
				Co:3 Understand the different aspects related with Management of Bank loan.
				Co:4 Evaluate the performance of Bank on the basis of deposit mobilization, credit deployment & profitability.
				Co:5 Discuss different functions & principles of life & non-life insurance. Also describe role of insurance & risk management policies related with non-life insurance.
144.	III	MGC2053	Capstone Project Phase II	Co:1 Prepare the research design and preparation of tool of data collection
				Co:2 Use acquired theoretical knowledge into practical experience and reveal an understanding of the ideas, concepts and skills gained through their MBA program.
				Co:3 Formulate innovative approaches, models and supports actions that enhance innovation
145.	III	MGC2073	Summer Internship Project	Co:1 Apply knowledge and skills learned in the classroom in a work setting.
				Co:2 Develop a greater understanding about career options while more clearly defining personal career goals.
				Co:3 Analyze the activities and functions of business professionals.
				Co:4 Develop and refine oral and written communication skills.
				Co:5 Identify areas for future knowledge and skill development
146.	IV	IPMB2YYY	Online Course-I/Self learning course-I	Co:1 Develop capability of self-education
				Co:2 Demonstrate lifelong learning skills
				Co:3 Assess self critically
				Co:4 Adopt corrective measures for self-improvement
147.	IV	IP2043	Project Management (Online Course)	Co:1 Acquire an understanding of the fundamentals of project management.
				Co:2 Analyze the projects proposal by applying feasibility studies.
				Co:3 Take decisions relating to project cost management.
				Co:4 Identify and manage different issues relating to human aspect in projects.

				Co:5 Taking decisions based on risk management in the projects.
148.	IV	IP2063	Internship & Project	Co:1 Develop industry required skill sets
				Co:2 Develop an attitude to adjust with the company culture, work norms, code of conduct
				Co:3 Demonstrate the ability to observe, analyse and document the details as per the industry practices
				Co:4 Improve the leadership abilities, communication
149.	IV	ED2023	Project Management (Online Course)	Co:1 Acquire an understanding of the fundamentals of project management.
				Co:2 Analyze the projects proposal by applying feasibility studies.
				Co:3 Take decisions relating to project cost management.
				Co:4 Identify and manage different issues relating to human aspect in projects.
				Co:5 Taking decisions based on risk management in the projects.
150.	IV	ED2043	New Venture Finance Startup Funding For Entrepreneurs	Co:1 Apply the strategic aspects of entrepreneurial finance.
				Co:2 Identify various sources of finance from sources like venture capital, angel financier, private equity and hedge funds and their working procedures,
				Co:3 Conduct valuation of companies by venture capitalist
				Co:4 Compare different sources of finance and select the appropriate source for financing needs.
151.	IV	ED2063	Entrepreneurship Development Program (EDP)	Co:1 Apply knowledge of management, economics, marketing and finance for formulation of business plan, starting & managing new business.
152.	IV	ED2083	Entrepreneurship Development Project	Co:1 Apply knowledge of Management for preparation of project report.
				Co:2 Make commercial, technical and financial appraisal of project.

**MBA-Innovation,  
Entrepreneurship and Venture  
Development [MBA-IEV]**

- **Department Name :- Department of Management Studies**
- **PG Program Name :- MBA-Innovation, Entrepreneurship and Venture Development [MBA-IEV]**
- **Vision and Mission :-**

**Vision:-**

Achieving excellence in academics and research to develop globally competent and socially responsible managers.

**Mission:-**

1. To leverage innovation and excellence in academic design, delivery and assessment to ensure holistic development of students for employability, entrepreneurship and higher education.
2. To design and keep the curricula updated, based on changing needs of industry and society worldwide.
3. To build and maintain world-class infrastructure, for sustained learning, development and research.
4. To provide an environment that encourages creativity, analysis and critical thinking.

<b>Sr. No.</b>	<b>Program Outcomes</b>
117.	Apply knowledge of business theories and practices to solve business problems.
118.	Foster Analytical and critical thinking abilities for data-based decision making.
119.	Develop Value-based Leadership.
120.	Analyze and communicate global, economic, legal, and ethical aspects of the business.
121.	Lead themselves and others in the achievement of organizational goals

<b>Sr. No.</b>	<b>Program Specific Outcomes</b>
12.	NA

<b>Sr. No.</b>	<b>Semester</b>	<b>Course Code</b>	<b>Course Name</b>	<b>Course Outcome</b>
153.	I	MIV 1011	Introduction to Entrepreneurship	Co:1 Analyze the DNA of an entrepreneur and assess their strengths and weaknesses from an entrepreneurial perspective
				Co:2 Apply leadership principles in various forms of business organizations.
				Co:3 Connect entrepreneurial principles to non-profit, government and larger corporate organizations.
				Co:4 Analyze common early stage pitfalls and design measures of control
				Co:5 Design value propositions for the products and services.
154.	I	MIV 1031	Entrepreneurial Economics	Co:1 Evaluate the concepts and analytical tools from micro economic theory that are useful for entrepreneurs in making decisions at the firm level

				Co:2 Identify the competitive relationship between demand and supply
				Co:3 Evaluate the microeconomic variables of production function and role in decision making
				Co:4 Identify the issues related to markets and selection of best alternatives to maximize the profit
				Co:5 Analyze the role of International trade and sectoral development
155.	I	MIV 1050	Marketing Research	Co:1 Apply the basics of marketing principles.
				Co:2 Formulate, organize and conduct a marketing research project
				Co:3 Apply and evaluate different sources of marketing information
				Co:4 Apply and evaluate various data collection and analysis techniques
				Co:5 Write a comprehensive market research report
156.	I	MIV 1071	Idea Generation & Validation	Co:1 Identify problems and apply innovative solutions through the mode of ideation
				Co:2 Create ways and identify convergence tools to boost creative process
				Co:3 Apply various brainstorming techniques to break down ideas and visualize it create and assess business ideas
				Co:4 Apply core and basic concept of idea generation and creativity
157.	I	MIV 1081	People Management	Co:1 Recruit, train, and appraise the performance of employees
				Co:2 Manage human resources through rewards and recognition.
				Co:3 Design compensation and salary administration
				Co:4 Align talent management with organizational benefits.
158.	I	MIV 1111	Capstone project I- Idea Generation and Proof of concept	Co:1 Identify a Social / Business problem.
				Co:2 Develop an idea for solution of the identified problem.
				Co:3 Design the visualization exercise to verify the potential real-life application of an idea.
				Co:4 Provide hands on approach to model building
159.	I	MIV 1131	Skill Development Lab I: Business Communication	Co:1 Demonstrate applying themes and layouts to slides.
				Co:2 Demonstrate inserting pictures, graphics, shapes, and other things.
				Co:3 Demonstrate working with sound and videos, master slides, smart art.



				Co:4 Use existing PowerPoint presentations using advanced editing tools such as theme, layout, timing, and animation.
160.	II	MIV 1020	Organizational behavior	Co:1 To apply the conceptual foundation and theories of organizational behaviour.
				Co:2 To develop a good working environment for an individual for the smooth running of the organisation.
				Co:3 To analyse inefficiency and weakness in individual and apply various measures to improve it in the organisation.
				Co:4 To analyze how to develop coordination and teamwork in the organisation.
				Co:5 To apply how to use organisation power and politics in an effective manner.
161.	II	MIV 1041	Pricing Management	Co:1 Apply the key economic, analytical, and behavioral concepts associated with costs, customer behavior and competition.
				Co:2 Apply advanced pricing techniques.
				Co:3 Comprehend pricing strategies of different products, lifecycles, and companies.
				Co:4 Analyze price strategies of competitors in indifferent market situations through case study scenarios
162.	II	MIV 1061	New Venture Establishment and Management	Co:1 Apply the knowledge to generate idea for starting new ventures
				Co:2 Assess the market potential and design strategies to reach out to potential customers, partners, suppliers and experts.
				Co:3 Analyze the legal challenges in setting up new business.
				Co:4 Create a business plan using a business model canvas
				Co:5 Apply strategies for scaling the new ventures.
163.	II	MIV 1091	Entrepreneurial Finance	Co:1 Discuss the fundamental aspects of accounting and finance.
				Co:2 Apply accounting theory and information as a tool for taking managerial decisions.
				Co:3 Prepare various financial statements of the firm.
				Co:4 Analyse and interpret the financial statements by associating the tools and techniques for effective decision making.
164.	II	MIV 1101	Skill Development Lab-II NOC: Legal Compliance for Incorporating	Co:1 Develop capability of self-education
				Co:2 Demonstrate skills for incorporating legal aspects in their startups
				Co:3 Assess self critically
				Co:4 Adopt corrective measures for self-improvement

			Startup - Video course	
165.	II	MIV 1121	Skill Development Lab III: Business Communication	Co:1 Write business letters in a proper, formal format
				Co:2 Demonstrate the methods of oral presentation both in a formal and informal environment
				Co:3 Review the importance of communication relative to securing employment, with emphasis on using both verbal and non-verbal communication and their impact
				Co:4 Prepare the student with the communication tools-verbal, non-verbal and written-and the practical applications inherent in each
166.	II	MIV 1141	Capstone Project-Formulation of Business Plan & Development of Business Model	Co:1 Create a business plan
				Co:2 Develop a business model
				Co:3 Develop a feasibility analysis in to business plan
				Co:4 Analyze various business entry strategies
167.	III	MIV 2011	Venture Growth and Strategy	Co:1 Identify and evaluate opportunities to scale an organization
				Co:2 Apply game theory to analyze, assess, and respond to competitors
				Co:3 Assess the impact of a potential merger and acquisition and avoid common pitfalls of this type of growth
				Co:4 Build an innovative capability to add value from innovation to determining an innovation strategy
168.	III	MIV 2031	Incubation Internship	Co:1 Apply knowledge and skills learned in the classroom in a work setting.
				Co:2 Develop a greater understanding about career options while more clearly defining personal career goals.
				Co:3 Analyze the activities and functions of business professionals.
				Co:4 Develop and refine oral and written communication skills.
				Co:5 Identify areas for future knowledge and skill development
169.	III	MIM 2011	Digital Marketing	Co:1 Apply the digital marketing techniques in a real life situation
				Co:2 Assess the role of digitalization in the development of an entrepreneurship venture.
				Co:3 Evaluate how contemporary marketing techniques can be used for maximizing entrepreneurial success.

				Co:4 Design and evaluate the effectiveness of interactive web sites and analyze digital marketing strategies through SEO
170.	III	MIM 2031	Entrepreneurial Marketing & Sales Strategy	Co:1 Apply Marketing mix of an enterprise Co:2 Design Growth and marketing strategies Co:3 Frame Market Development strategies Co:4 Analyze Contemporary issues in Entrepreneurial marketing.
171.	III	MIM 2051	Business to Business Marketing	Co:1 Analyse firm specific issues in B2B markets. Co:2 Design strategies and structures to effectively serve the B2B market. Co:3 Apply a systematic approach to problem solving and decision making in business marketing organizations. Co:4 Develop a business-marketing plan for a real local company that mainly targets business customers.
172.	III	MIM 2071	Consumer Behavior	Co:1 Assess the relevance of consumer behavior to the entire marketing process. Co:2 Analyze the causes giving rise to consumer behavior with the theories. Co:3 Explain the impact of consumer behavior on the development of marketing strategies including marketing communication, segmentation and target marketing. Co:4 Apply the concepts and theories covered in the course to devise effective solutions in enhancing business performance.. Co:5 Collaborate with other classmates productively on the group work, communicate and present information effectively.
173.	III	MIM 2090	Export – Import Procedure & Documentation	Co:1 Explain an overall perspective on import & export management. Co:2 Discuss an understanding towards export and import procedure and documentation. Co:3 Analyze processing of export order. Co:4 Apply knowledge of managing risk involves in the import & export transactions.
174.	III	MIF 2011	Venture Capital Financing	Co:1 Identify the role that venture capital plays in financing innovation. Co:2 Explain how the structure of entrepreneurial financing arrangements alleviates some of the difficulties in funding new firms. Co:3 Illustrate valuation of companies by venture capitalist.

				Co:4 Analyse, compare different sources of finance, and select the appropriate source for financing needs.
175.	III	MIF 2031	Investment Analysis & Portfolio Management	Co:1 Demonstrate a comprehensive understanding of the complex current issues relevant to the investment market.
				Co:2 Apply appropriate methods in portfolio management.
				Co:3 Develop a logical mathematical approach to solving complex problems.
				Co:4 Apply stock valuation models in portfolio management
176.	III	MIF 2051	Financial Analysis And Business Valuation	Co:1 Apply the financial statements for analysis.
				Co:2 Apply appropriate measures for executing the financial analysis.
				Co:3 Demonstrate fundamental analysis for understanding the business valuation.
				Co:4 Interpret the statements for managerial decision making
				Co:5 Evaluate the results for setting business strategies
177.	III	MIF 2071	Working Capital Management	Co:1 Evaluate the importance of effective working capital Mgt.
				Co:2 Investigate funds flow cycles and their impact on working capital management objectives.
				Co:3 Formulate appropriate working capital management policies to achieve corporate objectives.
				Co:4 Apply corporate cash management, accounts receivable management, bank relations, and inventory management techniques to maximize the share holders' value.
				Co:5 Evaluate comparative working capital management policies and their impact on the firm's profitability, liquidity, risk and operating flexibility.
178.	III	MIF 2090	Tax Planning and Management	Co:1 Identify the relevance of tax planning with reference to setting up a new business and various management decisionst.
				Co:2 Identify the areas for tax planning and different types of taxes levied
				Co:3 explain different types of incomes and their taxability and expenses and their deductibility.
				Co:4 Take financial decisions based on the taxes and their impact
	III	MIH 2010	HR Analytics	Co:1 Explain basic concepts of HR Analytics

				Co:2 Apply Data Analytic techniques using software packages
				Co:3 Identify and use key HR Metrics.
				Co:4 Forecast budget numbers for HR costs
				Co:5 Measure workforce productivity and performance
				Co:6 Explore and visualize data
179.	III	MIH 2030	Group Dynamics for Teams	Co:1 Demonstrate familiarity with different types of groups, including their formation, structure and function.
				Co:2 Apply critical thinking skills to evaluate group dynamics and team processes.
				Co:3 Evaluate team skills within the context of the class project.
				Co:4 Analyze the issues facing teams including conflict, power and social influence.
				Co:5 Analyze the skills for understanding group dynamics and working effectively in groups.
180.	III	MIH 2050	Human Resource Planning	Co:1 Analyze the theory and concepts of human resource planning.
				Co:2 Identify the evolution of HRP throughout the organization.
				Co:3 Apply models and methods used in forecasting.
				Co:4 Describe the applications of a succession analysis & planning.
				Co:5 Evaluate the organization's planning program.
181.	III	MIH 2070	Industrial Psychology	Co:1 Analyze how perceptions of difference contribute to disparate educational opportunities and work environments.
				Co:2 Conduct a conflict analysis.
				Co:3 Apply leadership lessons to class teams and team assignments.
				Co:4 Communicate effectively on business topics and concepts.
182.	III	MIH 2090	Leadership	Co:1 Develop critical thinking skills
				Co:2 Explain different approaches to leadership.
				Co:3 Apply leadership theories in real world business problems.
				Co:4 Analyze leadership types and take appropriate decisions.
				Co:5 Demonstrate ethical leadership practices
183.	IV	IPMI2YYY	Skill Certification- Online courses Relevant to the Chosen business	Co:1 Develop capability of self-education
				Co:2 Demonstrate lifelong learning skills
				Co:3 Assess self critically
				Co:4 Adopt corrective measures for self-improvement
184.	IV	MIV 2021		Co:1 Establish their startup.

			Startup Establishment & Incubation Spaces Access	Co:2 Avail incubation space access in or outside campus
				Co:3 To develop a robust implementable business plan
185.	IV	MIV 2041	Project Management (Online Course)	Co:1 Acquire an understanding of the fundamentals of project management.
				Co:2 Analyze the projects proposal by applying feasibility studies.
				Co:3 Take decisions relating to project cost management.
				Co:4 Identify and manage different issues relating to human aspect in projects.
				Co:5 Taking decisions based on risk management in the projects.