Department of Civil Engineering

Institute Vision Mission

Vision

To satisfy the aspirations of youth force, who wants to lead nation towards prosperity through techno-economic development

Mission

To provide, nurture and maintain an environment of high academic excellence, research and entrepreneurship for all aspiring students, which will prepare them to face global challenges maintaining high ethical and moral standards.

Department of Civil Engineering

Department Vision Mission

Vision

To satisfy the aspirations of youth force, especially who wants to lead nation towards prosperity through Civil Engineering Education.

Mission

To provide, nurture and maintain an environment through high academic excellence, research, consultancy and entrepreneurship for all aspiring students, which will prepare them to face global challenges maintaining high ethical and moral standards.

Department of Civil Engineering

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The department of Civil Engineering has as its PEOs to produce graduate who:

1. Function successfully in a professional environment through use of appropriate technology towards holistic development of urban, rural and industrial amenities/infrastructure with consideration of safety, sustainability, economical feasibility and environmental impact related issues.

2. Demonstrate leadership, professional ethics, proper project management and finance related attributes as employees or employers.

3. Demonstrate effective communication in the society through leadership skills and contribute at individual as well as multidisciplinary team levels.

4. Engage in enrichment of knowledge and skills through life-long learning to evolve innovative, economic solutions in Civil Engineering.

5. Demonstrate a sense of ethical and societal responsibility in various sectors such as Construction Management, Structural design water supply, sanitation, transportation, irrigation, flood control etc.

Department of Civil Engineering

(A) PROGRAMME OUTCOMES

Engineering Graduates will be able to:

1	**Engineering knowledge**	**Apply the knowledge of mathematics, science, engineering fundamentals, and Civil Engineering principles to the solution of complex problems in Civil Engineering.**
2	Problem analysis	Identify, formulate, research literature, and analyze complex Civil Engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences.
3	Design/development of solutions	Design solutions for complex Civil 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	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.
5	Modern tool usage	Use the techniques, skills, and modern software tools necessary for profession particularly in the areas of environmental / water resources geotechnical, structural and transportation engineering.
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.
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.
8	Ethics	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	Individual and team work	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
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.
11	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.
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.

(B) PROGRAMME SPECIFIC OUTCOMES

Civil Engineering Graduates will be able to:

1	Survey, plan estimate and design various Civil Engineering structures, components or processes to meet desired needs within the realistic constraints such as economic, environmental, social, regulatory, ethical, health, safety, manufacturability and sustainability.
2	Conduct laboratory experiments and analyze a result critically related to Concrete technology, Geotechnical, Fluid Mechanics, Environmental, Transportation and Civil Engineering Materials.
3	Adopt the techniques, skills, and apply modern tools necessary for profession especially in the areas of Construction Management, Structure, Geotechnical and Transportation Engineering.

Department of Civil Engineering

COURSE OUTCOMEs (COs)

SEMESTER I

Subject Code	Subject	Course Outcomes (COs) statement
Second Year- Civil Engineering	
201001	Building Technology & Materials	Civil Engineering Graduates will be able to: 1. Identify types of building and basic requirements of building components. 2. Explain types of masonry, formwork, casting procedure and necessity of underpinning and scaffolding. 3. Elucidate different types of flooring and roofing materials. 4. Describe types of doors, windows, arches and lintel, Fire safety measures.
207001	Engineering Mathematics-III	Civil Engineering Graduates will be able to: 1. Solve higher order linear differential equation and apply to modeling and analyzing mass spring systems. 2. Solve system of linear equations using direct and iterative numerical techniques and develop solutions to ordinary differential equations using single step and multistep methods applied to structural systems. 3. Apply statistical methods like correlation, regression analysis and probability theory for analysis and prediction of a given data. 4. Perform vector differentiation and integration to analyze the vector fields and apply to fluid flow problems. 5. Solve various partial differential equations such as wave equation, one and two dimensional heat flow equations.
201006	Surveying	Civil Engineering Graduates will be able to: 1. Operate and use surveying equipment 2. Draw plan or map of the existing permanent features on the ground. 3. Classify the ground features from the map or plan. 4. Analyze temporary adjustments and check permanent adjustments of the Theodolite.
201002	Strength of Materials	Civil Engineering Graduates will be able to: 1. Explain stress strain diagram and bending and shear stresses 2. Identify torsion and strain energy. 3. Illustrate principle stresses, strain, SFD and BMD. 4. Analyze axially and eccentrically loaded column.
201003	Geotechnical Engineering	Civil Engineering Graduates will be able to: 1. Understanding Soil structure types in Geotechnical engineering with their properties like Permeability and seepage.

		2. Demonstrate Compaction and Stress distribution in Soils. 3. Analyze shear strength of soil with various methods. 4. Explain earth pressure, stability of slopes of soil and Geo-environmental Engineering.
	Audit Course 1 Awareness to Civil Engineering Practices	Civil Engineering Graduates will be able to: 1. Summarize awareness from lectures by professionals. 2. Correlate construction works, architectural aspects and structural engineering through site visits. 3. Illustrate various issues such as sustainability, ecofriendly techniques. 4. Conclude issues directly related to techno-economic development of society.
Third Year- Civil Engineering		
301001	Hydrology & Water Resources Engineering	Civil Engineering Graduates will be able to: 1. Explain precipitation, its measurement, abstraction of precipitation with stream gauging. 2. Classify irrigation methods, canal revenue assessment methods and analyze delta, duty and irrigation efficiency. 3. Evaluate yield from wells, runoff and floods. 4. Assess reservoir planning and explain water management.
301002	Infrastructure Engineering & Construction Technique	Civil Engineering Graduates will be able to: 1. Understand concept of infrastructure and railway engineering 2. Understand and apply the knowledge of construction techniques (i.e. dredging, dewatering, underwater drilling and blasting, grouting etc) 3. Understand component of docs and harbor and tunneling methodology 4. Analyze the performance of construction equipment and its application
301003	Structural Design-I	Civil Engineering Graduates will be able to: 1. Explain relevant IS specification for steel sections and illustrate tension member and its design. 2. Analyze axially loaded columns and eccentrically loaded columns 3. Design of beams under various load condition for flexure, shear, buckling and deflection 4. Analyze gantry girder and roof trusses under various loads
301004	Structural Analysis-II	Civil Engineering Graduates will be able to: 1. Analyze statically indeterminate structures using Classical methods 2. Analyze statically indeterminate structures using matrix method. 3. Analyze deflection problems of determinate beams by finite difference method. 4. Analyze multi-storied multi-bay 2 - D rigid jointed fames using approximate methods. 5. Familiarity with Shape function concept of local and global stiffness matrix, finite element method, discretization.
301005	Fluid Mechanics-II	Civil Engineering Graduates will be able to: 1. Analyze fluid flow around submerged objects and unsteady flow

		2. explain open channel flow, depth-energy relationships in open channel flow, uniform flow in open channels and hydraulic jump
		3. Assess impact of jets, work done by impellers in centrifugal pumps, hydropower generation and performance of hydraulic turbines
		4. Explain and analyze gradually varied flow in open channels
301006	Employability Skills Development	Civil Engineering Graduates will be able to: 1. Interpret Employable Skills and interpersonal skills 2. Recognize presentation skills. 3. Use various communication skills 4. Illustrate commercial awareness and personal skills.
Fourth Year- Civil Engineering		
401001	Environmental Engineering-II	Civil Engineering Graduates will be able to: 1. Explain sewage quantity and characteristics of sewage 2. Design of sewage treatment unit 3. Choose low cost treatment methods for rural areas 4. Categorize on site sanitation treatment system & industrial waste water treatment
401002	Transportation Engineering	Civil Engineering Graduates will be able to: 1. Explain highway development and planning in India 2. Design of horizontal and vertical alignment ,cross section and sight distance for highways 3. Categories traffic characteristics ,signals and pavement materials in Highway Engineering 4. Design of pavement and discuss about pavement construction methods
401003	Structural Design-III	Civil Engineering Graduates will be able to: 1. Discuss pre-stress concrete analysis & design Pre-stress concrete. 2. Design of flat slab. 3. Analyze earth retaining & liquid retaining structures. 4. Categorize vibrations &analyze& examine earthquake forces.
401004	Elective-I (Architectural Town Planning)	Civil Engineering Graduates will be able to: 1. Classify qualities of architecture & role of urban planning and architect. 2. Assess various levels of town planning and determine corresponding planning agencies. 3. Justify legislative mechanism preparation of development plan. 4. Apply GIS, GPS, remote sensing in planning.
401004	Elective-I (Earthquake Engineering)	Civil Engineering Graduates will be able to: 1. Basic knowledge of engineering seismology 2. In-depth knowledge and critical understanding of the theory and principles of seismic design. 3. To involve the application of scientific and technological principles of planning, analysis, design of buildings according to earthquake design philosophy

| 401005 | Elective-II (Total Quality Management) | Civil Engineering Graduates will be able to:
1. Able to understand concept of quality in construction by considering quality assurance, quality control & total quality management.
2. Able to apply the basics of Six sigma, ISO & quality Manual in constructional projects
3. Able to understand awards and modern techniques is used for quality certifications in construction projects.
4. Able to understand the basics of Management Information System used in constriction field. |

SEMESTER II

Subject Code	Subject	Course Outcomes (COs) statement
Second Year- Civil Engineering		
201004	Fluid Mechanics I	Civil Engineering Graduates will be able to: 1. Describe properties of Fluids and perform the dimensional analysis. 2. Interpret and solve fluid static problems. 3. Understand and apply the knowledge of fluid kinematics. 4. Identify, analyze and apply the principles of fluid dynamics.
201005	Architectural Planning and Design of Buildings	Civil Engineering Graduates will be able to: 1. Illustrate Town Planning and legal aspect. 2. Apply architectural planning ,building byelaws and develop architectural drawings 3. Classify building services such as acoustics, ventilation, lighting, plumbing and other services 4. Plan for residential buildings and public buildings
201008	Structural Analysis I	Civil Engineering Graduates will be able to: 1. Understand the basic concept of static and kinematic indeterminacy, slope and deflection of determinate beams, frames & trusses for analysis of structures 2. Analyze indeterminate beams, frames & trusses 3. Apply influence line diagrams for the analysis of structures under moving load 4. Analyze two and three hinged arches and its application. 5. Apply plastic analysis for indeterminate steel structures by limits state method
207009	Engineering Geology	Civil Engineering Graduates will be able to: 1. Illustrate Mineralogy, Petrology and general Geology. 2. Identify Plate Tectonics, Structural Geology and Geomorphology. 3. Illustrate Preliminary Geological studies and Remote Sensing with a role of Engineering Geology in Reservoirs, Dams and Tunneling 4. Categorize Geological Hazards, Groundwater and Building Stones.

201007	Concrete Technology	Civil Engineering Graduates will be able to:
		1. Check type & quality of cement, mineral additive & which chemical admixture to be used to improve the overall quality of concrete.
		2. Check the produced concrete for homogeneity, consistency & durability.
		3. Design concrete mix for a particular placing condition and to check quality control on site
		4. Perform post-graduation in the subject and to use the knowledge in competitive examination.
201010	Soft Skill	Civil Engineering Graduates will be able to:
		1. Explain self-awareness and self-development.
		2. Apply communication skill for communication, speaking, listening group discussion presentation and written skills.
		3. Develop personality and interpersonal relationship.
		4. List out the leadership qualities, other skills like and management and stress management.
	Audit Course 2 Road Safety Management	Civil Engineering Graduates will be able to:
		1. Identify existing road transport scenario, accident causes and remedies.
		2. Classify investigation methods of road, accidents and summarize vehicle technology.
		3. Articulate regulatory legislative provisions for improving road safety.
		4. Relate behavioral training for drivers and road engineering measures for improving road safety.
Third Year- Civil Engineering	
301007	Advanced Surveying	Civil Engineering Graduates will be able to:
		5. Classify Triangulation system in Geodetic Surveying and distinguish different errors in triangulation surveying.
		6. Experiment with hydrographic Surveying.
		7. Explain Remote Sensing, GIS with Aerial Photogrammetry.
		8. Surveying by Trigonometric leveling and Setting out works
301008	Project Management and Engineering Economics	Civil Engineering Graduates will be able to:
		1. Illustrate project management, project planning and scheduling.
		2. Interpret project monitoring and control.
		3. Analyze and relate project economics in project management.
		4. Use project resource and safety aspects with project appraisal in project management.
301009	Foundation Engineering	Civil Engineering Graduates will be able to:
		1. The ability to plan, supervise and implement a site investigation
		2. Ability to calculate the, settlement, consolidation and Safe bearing capacity of shallow as well as deep foundation.
		3. Ability to calculate the, settlement, consolidation and Safe bearing capacity of shallow as well as deep foundation.
		4. Ability to evaluation of liquefaction potential and suggest the preventive measures and also includes brief discussion on geo-synthetics and its application.

301010	Structural Design II	Civil Engineering Graduates will be able to: 1. Apply the fundamental concepts of various design philosophies, classify Limit states and analyze the Reinforced Concrete sections 2. Design slabs and staircases. 3. Design flexural members and continuous beam with moment redistribution concept. 4. Classify and design the columns and column footing.
301011	Environmental Engineering I	Civil Engineering Graduates will be able to: 1. Analyze noise pollution, air pollution & municipal solid waste 2. Estimate water consumption rate for domestic ,Industrial and commercial etc 3. Design water treatment operations such as aeration, sedimentation & Filtration 4. Explain disinfection , water softening ,water distribution and rain water harvesting systems
	Fourth Year- Civil Engineering	
401007	Dams and Hydraulic Structures	Civil Engineering Graduates will be able to: 1. Classification of various types of dam and dam instrumentation. 2. Analyze stability for gravity dam, earthen dam and spillways. 3. Explain various types of diversion head works. 4. Explain various types of canals and CD works with river training structures.
401008	Quantity Surveying, Contracts and Tenders	Civil Engineering Graduates will be able to: 1. Assess quantities with cost by using Center line and PWD method for load bearing, R.C.C. framed buildings. 2. Estimate quantities for any civil engineering structure like factory shade, water tank, pipe culvert, road, railway track, and runway. 3. Classify detailed specifications for building items and analyze rates for items. 4. Explain Tender documents with Tender notice
401009	Elective III (Airport and Bridge Engineering)	Civil Engineering Graduates will be able to: 1. Illustrate Airport Engineering, planning and Layout 2. Design of Runways and Taxiways, Planning of heliports 3. Describe Bridge Engineering and Explain various components of Bridge, different loads 4. Differentiate various types of Bridges
	Elective III (Air Pollution and Control)	Civil Engineering Graduates will be able to: 1. Understand the effects of various meteorological aspects on air pollution 2. Identify the sampling methods of air pollution and its control of air pollution 3. Understand the indoor air pollution and its control 4. Understand the legislative systems and environmental impact assessment plans to control air pollution

	Elective III (Hydropower Engineering)	Civil Engineering Graduates will be able to: 1. Illustrate Energy Resources, its planning and potential 2. Categorize Hydro Power Plants and their component parts, load assessment. 3. Explain water conductor system, typical layout and component parts of powerhouse. 4. Classify turbines and examine economics of Hydroelectric Power.
401010	Elective IV (Construction Management)	Civil Engineering Graduates will be able to: 1. Apply construction management technique with construction scheduling & artificial intelligence technique 2. Assess financial aspects of construction projects 3. Distinguish elements of risk management & value engineering 4. Decide materials management and human resource management for construction projects

Imperial College of Engineering and Research, Wagholi, Pune
(Approved by AICTE,Delhi & Govt. of Maharashtra, affiliated to SPPU)
Gat.No.720, Pune-Nagar Road, Wagholi, Pune, 412207
Department of Computer Engineering

Vision

" To be a leading educational center grooming computer engineers to serve the society "

Mission

To develop professionals by providing conducive educational environment. To develop ability amongst students for innovation, entrepreneurship and higher studies through well designed curriculum.

Program Educational Objective (PEO)

PEO1. Graduate shall have abilities to pursue professional career.
PEO2. Graduate shall have an ability to work in core and diversified areas demonstrating teamwork and leadership.
PEO3. Graduate shall have an ability to pursue higher studies and develop enterprise yielding eco-friendly solutions.

1) **Program outcomes**

PO	Description
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
PO2	**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.
PO3	**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.
PO4	**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.
PO5	**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.
PO7	**To accomplish the goal:** An ability to function effectively as an individual or as a team member to accomplish the goal.
PO8	**Environmental Issues:** An ability to understand the environmental issues and provide the sustainable System, understand environmental issues and

provide contemporary solutions

PO9 **Social Issues:** An ability to understand professional, financial, ethical, legal, security, and social issues and responsibilities.

PO11 **Engineering Approach:** An ability to communicate effectively with engineering community at different levels verbal communication and non-verbal communication.

PO12 **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.

2) <mark>PSO: Program specific outcomes addressed by the Course:</mark>

PSO	Description
PSO1 :	The ability to apply, analyze and develop computer programs related to system software, networking, web design, big data analytics for efficient design of computer-based systems.
PSO2 :	The ability to adopt the technological changes in computing and develop their skills to deliver a quality product for business success, real world problems and meet the automation need of society and industry.
PSO3 :	The ability to apply standard practices and strategies in computer field for lifelong learning, creating innovative career paths to be an entrepreneur and enthusiasm for higher studies.

BE SEM-I

Class : BE
Course : High Performance Computing (410241)
After the completion of the course, students will be able to....

CO	Statement
410241.01	To study parallel computing hardware and programming models.
410241.02	To be conversant with performance analyze and modeling of parallel programs
410241.03	To understand the options available to parallelize the programs .
410241.04	know the operating system requirements to qualify in handling the parallelization

Class : BE
Course : Artificial Intelligence & Robotics (410242)
After the completion of the course, students will be able to....

CO	Statement
410242.01	Describe fundamental concepts of Artificial Intelligence with problem decomposition and Planning.
410242.02	Develop a basic understanding of the building blocks of AI in terms of Logic & Reasoning and use Natural Language processing and ANN.
410242.03	To acquaint with the fundamentals of robotics.
410242.04	Select and use robotics to solve real world problems.

Class : BE
Course : Data Analytics (410243)
After the completion of the course, students will be able to....

CO	Statement
410243.01	To study data analytics lifecycle
410243.02	To develop statistical methods for evaluation
410243.03	To implement various classification techniques
410243.04	To study big data visualization and analytic tools.

Class: BE

Course: Elective I Data Mining and Warehousing (410244)
After the completion of the course, students will be able to....

CO	Statement
410244.01	Apply basic, intermediate and advanced techniques to mine the data
410244.02	Analyze the output generated by the process of data mining
410244.03	Explore the hidden patterns in the data
410244.04	Optimize the mining process by choosing best data mining technique

Class : BE
Course : Elective II Business Intelligence (410245)
After the completion of the course, students will be able to....

CO	Statement
410245.01	Apply basic, intermediate and advanced techniques to analysis the data
410245.02	Analyze the output generated by the process of Business Intelligence
410245.03	Explore the hidden patterns in the data
410245.04	Evaluate the role of BI in real world application.

BE SEM-II

Class : BE
Course : Machine Learning (410250)
After the completion of the course, students will be able to....

CO	Statement
410250.01	Relate different human learning aspects with machine learning concepts & select suitable preprocessing technique for datasets.
410250.02	Understand nature of problem & apply machine learning algorithms.
410250.03	Implement decision trees for classification of datasets.
410250.04	Describe deep networks & evaluate appropriate clustering technique for real time applications

Class : BE
Course : Information and Cyber Security (410251)
After the completion of the course, students will be able to....

CO	Statement
410251.01	Describe various basic encryption technique and implement block cipher
410251.02	Apply various public key cryptography technique and demonstratr IP security concepts
410251.03	Analyze different security system for internet security
410251.04	Identify various cyber laws for cinfedentility and information protection

Class : BE
Course : Elective –III Compilers(410253)
After the completion of the course, students will be able to....

CO	Statement
410253.01	Design and implement a lexical analyzer and a syntax analyzer
410253.02	Specify appropriate translations to generate intermediate code for the given programming language construct
410253.03	Compare and contrast different storage management schemes
410253.04	Identify sources for code optimization

Class : BE
Course : Elective –IV Business Intelligence (410254)
After the completion of the course, students will be able to....

CO	Statement
410254.01	Apply basic, intermediate and advanced techniques to analysis the data
410254.02	Analyze the output generated by the process of Business Intelligence
410254.03	Explore the hidden patterns in the data
410254.04	Evaluate the role of BI in real world application.

Class : TE
Course : Theory of Computation (310241)
After the completion of the course, students will be able to....

CO	Statement
310241.01	Design, manipulate, and reasoning about formal computational models such as automata and Turing machines.
310241.02	Identify relations between classes of computational problems, formal languages, and computational models.
310241.03	Apply mathematical knowledge and logic in solving problems of grammer.
310241.04	Illustrate various Turing machine and related hypotheses and try to solve undecidable problem.
310241.05	Analyze deeper and broader concepts of parsing and push down automata.
310241.06	Apply NP-completeness concepts to create proofs regarding the computational complexity of novel problems.

Class : TE
Course : Database Management System (310242)
After the completion of the course, students will be able to....

CO	Statement
310242.01	Identify structure of database system using data models
310242.02	Demonstrate an understanding & Implementation of SQl Queries
310242.03	Demonstrate an understanding of normalization theory and apply such knowledge to the normalization of a database.
310242.04	Define and discuss transaction management, query optimization and performance tuning.

Class : TE
Course : Software Engineering & Project Management (310243)
After the completion of the course, students will be able to....

CO	Statement
310243.01	Explain the different process models, software requirement process and compare traditional and recent models in software engineering.
310243.01	Design software system using appropriate methods and apply Scheduling & Cost Estimation techniques.
310243.01	Apply appropriate Testing Technique for fault/defect finding & handle risk management.
310243.01	Explain the different process models, software requirement process and compare traditional and recent models in software engineering.

Class : TE

Course : Information Systems & Engineering Economics (310244)

After the completion of the course, students will be able to....

CO	Statement
310244.01	To Understand the need, usage and importance of Information and the activities that are undertaken while managing, designing, planning, implementation, and deployment of computerized information system in an organization.
310244.02	To implement various Information System solutions like ERP, CRM, Data warehouses in any organizations
310244.03	To Outline the past history, present position and expected performance of a company engaged in engineering practice or in the computer industry.
310244.04	To Perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.

Class : TE
Course : Computer Network (310245)
After the completion of the course, students will be able to....

CO	Statement
310245.01	Analyze the requirements for a given organizational structure to select the most appropriate networking architecture and technologies.
310245.02	Demonstrate LAN and WAN protocol behavior using Modern Tools and Analyze data flow between peer to peer in an IP network using Application, Transport and Network Layer Protocols.
310245.03	Illustrate applications of Computer Network capabilities, selection and usage for various sectors of user community.
310245.04	Develop Client-Server architectures and prototypes by the means of correct standards and technology.

Class : TE
Course : Design & Analysis of Algorithm (310250)
After the completion of the course, students will be able to....

CO	Statement
310250.01	Describe the fundamentals of algorithms & techinques of model and design
310250.02	Apply algorithmic strategies for given problem andAnalyze the asymptotic performance of algorithms
310250.03	Analyze and find the amortized solutions for searching & sorting types of algorithms.
310250.04	Explain and solve the advanced algorithms

Class : TE
Course : Systems Programming & Operating System (SP& OS) (310251)
After the completion of the course, students will be able to....

CO	Statement
310251.01	Design & Analysis of different System Softwares.
310251.02	Understand the basic concepts of compiler design and apply the knowledge of LEX and YACC to develop scanner and parser.
310251.03	Apply different algorithms for process, memory and resource management.
310251.04	Grasp the concepts of operating Systems functions.

Class : TE
Course : Embedded Systems & Internet of Things (ES & IoT) (310252)
After the completion of the course, students will be able to....

CO	Statement
310252.01	State fundamentals of embedded system and IoT including essence and basic design strategy.
310252.02	Solve the given societal challenges using the various interaction techniques in software, hardware in IoT.
310252.03	Work on different IoT platforms with different cloud architectures.
310252.04	Designate suitable solution among available technologies and devices for stated IoT challenge.

Class : TE
Course : Software Modeling and Design (SMD) (310253)
After the completion of the course, students will be able to....

CO	Statement
310253.01	To design and analyze an application using UML modeling as fundamental tool.
310253.02	To describe and illustrate the different architectural designs for an application.
310253.03	To explain different design patterns used in software modeling and design.
310253.04	To discuss the different types of testing and develop test case for an application.

Class : TE
Course : Web Technology (310254)
After the completion of the course, students will be able to....

CO	Statement
310254.01	Describe various techniques to develop web application.
310254.02	Develop web based application using suitable server side technologies.
310254.03	Apply suitable frameworks to improve the website effectiveness.
310254.04	Implement appropriate web services for web applications

SE SEM-I

Class : SE
Course : Discrete Mathematics(210241)
After the completion of the course, students will be able to....

CO	Statement
210241.01	Illustrate concept of set theory, proposition & mathematical induction.
210241.02	Discuss the basic concepts associated with relation, functions and their applications.
210241.03	Explaining possible outcomes of elementary combinatorial processes such as permutation and combination.
210241.04	Explain concept in graph theory & apply algorithm to solve various mathematical problems.
210241.05	Illustrate basic terminology in trees & apply algorithms to find minimum spanning tree.
210241.06	To identify and prove the properties of algebraic structures-groups, rings and integral domain.

Class : SE
Course : Digital Electronics and Logic & Design(210242)
After the completion of the course, students will be able to....

CO	Statement
210242.01	Design, Analyze and Implement Combinational circuits. Describe various variable reduction techniques of digital Logic Circuit.
210242.02	Design Analyze and construct Sequential circuits
210242.03	Design an ASM and Analyze behaviour of digital components by using VHDL
210242.04	Describe different types of Programmable logic devices.

Class : SE
Course : Data Structure & Algorithms(210243)
After the completion of the course, students will be able to....

CO	Statement
210243 .01	Define basic static and dynamic data structures and relevant standard algorithms for them: stack, queue, dynamically linked lists, heap, priority queue, hash tables, sorting algorithms, min-max algorithm
210243.02	Demonstrate advantages and disadvantages of specific algorithms and data structures
210243.03	Select basic data structures and algorithms for autonomous realization of simple programs or program parts

210243.04	Determine and demonstrate bugs in program, recognize needed basic operations with data structures
210243.05	Formulate new solutions for programming problems or improve existing code using learned algorithms and data structures
210243.06	Evaluate algorithms and data structures in terms of time and memory complexity of basic operations.

Class : SE
Course : Computer Organization and Architecture (210244)
After the completion of the course, students will be able to....

CO	Statement
210244 .01	Able to design optimally functional units of ALU by analyzing Structure, function and storage representation and performance of computer system.
210244.02	Able to design cache memory and analyze performance characteristics of memory hierarchy.
210244.03	Able to evaluate I/O interfacing techniques to microprocessor and to create assembly language program for microprocessor system
210244.04	Able to evaluate various design alternatives of processor organization and control unit.

Class : SE
Course : Object oriented Programming language (210245)
After the completion of the course, students will be able to....

CO	Statement
210245 .01	To understand the concept of object oriented programming language.
210245.02	Develop programming application using object oriented programming language C++.
210245.03	Evaluate the strengths of object oriented programming language.
210245.04	Design and develop object-oriented computer program.

Class : SE
Course : Engineering Mathematics-III
After the completion of the course, students will be able to....

CO	Statement
207003.01	Linear differential equations of higher order applicable to Control systems, Computer vision and Robotics.
207003.02	Transform techniques such as Fourier transform, Z-transform and applications to Image processing.
207003.03	Statistical methods such as correlation, regression analysis and probability theory to analyze data and to make predictions applicable to machine intelligence.
207003.04	Vector calculus necessary to analyze and design complex electrical and electronic devices as appropriate to Computer engineering.
207003.05	Complex functions, conformal mappings and contour integration applicable to Image· processing, Digital filters and Computer graphics.
207003.06	Linear differential equations of higher order applicable to Control systems, Computer vision and Robotics.

Class : SE
Course : Computer Graphics   (210251)
After the completion of the course, students will be able to....

CO	Statement
210251.01	Describe and implement various computer graphic techniques and algorithms for primitive graphic operations.
210251.02	Apply the mathematical concepts related to image transformation, segmentation & animation.
210251.03	Understand the concepts related to illumination models, hidden surfaces and shading algorithms.
210251.04	To use advanced animation and gaming techniques by using modern graphics tools.

Class : SE
Course : Advanced data structure (210252)
After the completion of the course, students will be able to....

CO	Statement
210252 .01	Explain different concepts related to nonlinear data structures.
210252.02	Apply different types of data organization techniques for data storage.
210252.03	Select appropriate retrieval mechanism using search tree.
210252 .04	Apply appropriate file organization strategies to retrieve data efficiently.

Class : SE
Course : Microprocessor (210253)
After the completion of the course, students will be able to....

CO	Statement
210253 .01	Understand the Architecture of advanced processors and its features.
210253.02	Able to use different techniques of multitasking, protection ad Interrupt handling for better resource utilization.
210253.03	Able to test the switching mechanism between different operating modes of 80386 DX.
210253 .04	4Able to use math Co-processor to speed up mathematical operations.

Class : SE
Course : Principles of Programming Language (210254)
After the completion of the course, students will be able to....

CO	Statement
210254 .01	To explain the concept of syntax and semantics and classify the different data types with the structure of computation.
210254.02	To apply syntax, semantics & structure of different programming languages.
210254.03	To demonstrate the principles of Object Oriented Programming using java.
210254 .04	To explain the concept of exception handling and develop a program using applet.

Vision

To develop engineers addressing emerging challenges of industry and society.

Mission

To develop competent engineers through effective teaching learning process. To provide platform for coping with rapidly changing industrial and societal needs through collaborative add-on courses.

Program Educational Objective(PEO)

PEO 1:To provide sound theoretical & practical knowledge in Electronics & Telecommunication Engineering managerial & entrepreneurial skills.
PEO 2:To develop the graduates with solid foundation in Mathematical, Scientific, Electronics& Telecommunication engineering fundamentals to solve real life problems.
PEO 3:To prepare graduates to demonstrate their multidisciplinary expertise to meet contemporary requirements.
PEO4:Graduates shall be equipped with skills like communication, team work ethics & leadership in preparation for their successful career.

Program Specific Outcome(PSO)

PSO1: Understand concepts of E&TC Engineering in various areas such as Electronics, Communication, Signal processing, VLSI, Embedded Systems for the design & implementation of complex Systems.
PSO2: Solve complex E&TC Engineering problems with latest hardware, software tools to arrive at cost& appropriate solutions.
PSO3: Design a system which will meet the desired needs with realistic constraints such as economic, social & ethical.

Class: SE

Course: Signals & Systems [204181]

After the completion of the course, students will be able to….

CO	Statement
204181.1	Representation of signals in time and frequency domain mathematically.
204181.2	Analysis of probability models and random variable
204181.3	Explain time domain representation of linear time invariant systems
204181.4	Analyze linear time invariant systems in time & transform domain as Fourier & Laplace Transform
204181.5	Evaluate role of correlation in communication systems

Course: Electronic Devices & Circuits [204182]

After the completion of the course, students will be able to….

CO	Statement
204182.1	Study semiconductor devices like FET & MOSFET, their characteristics, parameters.
204182.2	Analyze & simulate FET and MOSFET for small signal analysis and study their applications.
204182.3	Discriminate types of feedback used in amplifier and study of oscillator.
204182.4	To study and design different types of voltage regulators.

Course: Electrical Circuits & Machines [204183]

After the completion of the course, students will be able to….

CO	Statement
204183.1	Student should be able to apply network simplification techniques for electrical circuits.
204183.2	Student should be able to determine iron loss and copper loss components.
204183.3	Student should be able to identify and select transformer for particular application.
204183.4	Student should be able to explain constructional details, characteristics, features and application areas of various types of AC and DC motors
204183.5	Student should be able to select electrical motor as per specific application.

Course: Data Structures & Algorithms [204184]

After the completion of the course, students will be able to….

CO	Statement
204184.1	Understand fundamental concepts of C language and define asymptotic notations to analyze the performance of algorithms.
204184.2	Illustrate and compare various techniques for searching & sorting.
204184.3	Use appropriate data structures like arrays, linked list, stack & queue to solve

	real world problem efficiently.
204184.4	Represent & manipulate data using nonlinear data structures like Tree & Graph to design algorithms for various applications.

Course: Digital Electronics [204185]

After the completion of the course, students will be able to….

CO	Statement
204185.1	Use the basic logic gates and various reduction techniques of digital logic circuit in detail.
204185.2	Understand the design of combinational and sequential circuits.
204185.3	Design and implement hardware circuit to test performance and application.
204185.4	Understand various cascading methods for different combinational and sequential ICs.
204185.5	Analyze digital system design using PLD.
204185.6	Understand the architecture and use of microcontrollers for basic operations and simulate using simulation softwares.

Course: Electronic Measuring Instruments & Tools [204186]

After the completion of the course, students will be able to….

CO	Statement
204186.1	Understand fundamental of various electrical measurements.
204186.2	Understand and describe specifications, features and capabilities of electronic instruments.
204186.3	Finalize the specifications of instrument and select an appropriate instrument for given measurement.
204186.4	Select appropriate instrument for the measurement of electrical parameter professionally.

Course: Integrated Circuits [204187]

After the completion of the course, students will be able to….

CO	Statement
204187.1	Explain basic building blocks of op-am and identify closed loop configurations of op amp.
204187.2	Design and analyse linear and nonlinear application of op amp.
204187.3	Design and Compare various convertors using op amp.
204187.4	Apply functionalities of PLL to various applications.

Course: Control Systems [204188]

After the completion of the course, students will be able to....

CO	Statement
204188.1	Model a physical and electrical system and express its input-output relationships by means of block diagrams and Signal flow graph.
204188.2	Analyze a linear control system in time and frequency domain using graphical methods for stability.
204188.3	Model and analyze the control system using state space analysis.
204188.4	Introduce the concept of PLC and PID controllers and analyze digital control system using transfer function.

Course: Analog Communication [204189]

After the completion of the course, students will be able to....

CO	Statement
204189.1	Understand and identify the fundamental concepts and various elements of analog communication systems.
204189.2	Understand and analyze noise performance of analog communication systems.
204189.3	Describe various pulse analog modulation schemes.
204189.4	Develop the ability to compare various analog communication systems.

Course: Object Oriented Programming [204190]

After the completion of the course, students will be able to....

CO	Statement
204190.1	Interpret various OS functions used in Linux / Ubuntu
204190.2	Design a class in C++ and develop codes using basic constructs of C++, constructors and destructors.
204190.3	Illustrate the concept of inheritance in C++ and it's types.
204190.4	Describe object oriented concepts that constitutes JAVA language.
204190.5	Develop simple C++ and JAVA programs using associated class libraries.
204190.6	Use/Setup JAVA SDK environment and Integrated Development environment like Eclipse to create debug and run simple Java
204190.7	Apply object oriented concepts of C++ and JAVA for engineering solutions

Class: TE

Course: Digital Communication [304181]

After the completion of the course, students will be able to....

CO	Statement
304181.1	Understand working of waveform coding techniques and analyze their performance.
304181.2	Analyse the performance of baseband and passband digital communication system in terms of error rate and spectral efficiency.

| 304181.3 | Perform the time and frequency domain analysis of the signals in a digital communication system. |
| 304181.4 | Understand working of spread spectrum communication system and analyze its performance. |

Course: Digital Signal Processing [304182]

After the completion of the course, students will be able to….

CO	Statement
304182.1	Understand and explain the basics of DSP and concepts of sampling and aliasing.
304182.2	Analyse the discrete time signals and systems using different transform domain techniques like DFT, FFT, ZT.
304182.3	Design and implement analog and digital filters [LTI system]
304182.4	Explain different DSP Applications and develop them using DSP Processor.

Course: Electromagnetics [304183]

After the completion of the course, students will be able to….

CO	Statement
304183.1	Understand the basic mathematical concept related to electromagnetic vector fields.
304183.2	Apply the principles of electrostatics to the solutions of problems relating to electric field and electric potential, boundary conditions and electric energy density.
304183.3	Apply the principles of Magnetostatics to the solutions of problems relating to magnetic field and magnetic potential, boundary conditions and magnetic energy density.
304183.4	Understand the concepts related to Faraday's law, induced emf and Maxwell's equations.
304183.5	Apply Maxwell's equations to solutions of problems relating to transmission lines and uniform plane wave propagation.

Course: Microcontrollers [304184]

After the completion of the course, students will be able to….

CO	Statement
304184.1	Understand the importance of microcontroller in designing embedded application
304184.2	Understand the use of hardware and software tools to design embedded system
304184.3	Implement interfacing with real world devices
304184.4	Design the Microcontroller based embedded system

Course: Mechatronics [304185]

After the completion of the course, students will be able to….

CO	Statement
304185.1	Identify key elements of mechatronics system and its representation in terms of block diagram
304185.2	Perceive basic principles of Sensors and Transducers
304185.3	Discuss hydraulic system and its engineering application
304185.4	Demonstrate pneumatic system and its engineering application
304185.5	Interpret the use of electro-mechanical actuators
304185.6	implement case study of the system given

Course: Electronics System Design [304193]

After the completion of the course, students will be able to….

CO	Statement
304193.1	Apply the fundamental concepts and working principles of electronics devices to design electronics systems
304193.2	Shall be able to interpret datasheets and thus select appropriate components and devices
304193.3	Select appropriate transducer and signal conditioning circuit to design prototype of Data Acquisition system
304193.4	Design an electronic system/sub-system and validate its performance by simulating the same

Course: Power Electronics [304186]

After the completion of the course, students will be able to….

CO	Statement
304186.1	To understand the working principle of power devices with their characteristics & ratings.
304186.2	To Illustrate, analyze & perform types of controlled power converters.
304186.3	To describe different types of resonant converter & study protection circuits
304186.4	To explain various engineering applications of power electronics.

Course: Information Theory Coding & Communication Networks [304187]

After the completion of the course, students will be able to….

CO	Statement
304187.1	Understand and Perform information analysis of communication System.
304187.2	Design and Develop compression scheme using suitable Source coding.
304187.3	Design a channel coding scheme for a communication system.
304187.4	Understand and apply Fundamental principles of data communication and networking.

Course: Business Management [304188]

After the completion of the course, students will be able to….

CO	Statement
304188.1	Demonstrate Management Science aspects useful in business
304188.2	Perceive Quality Aspects for Systematically Running the Business
304188.3	Develop Project Management aspect and Entrepreneurship Skills

Course: Advanced Processors [304189]

After the completion of the course, students will be able to….

CO	Statement
304189.1	To understand need and application of ARM Microprocessors & TIVA Launch boards in embedded system
304189.2	To describe architecture and features of typical ARM Processor
304189.3	To interface real world input and output devices
304189.4	To understand architecture and features of typical DSP Processor

Course: System Programming & Operating Systems [304190]

After the completion of the course, students will be able to….

CO	Statement
304190.1	Demonstrate the knowledge of Systems Programming and Operating Systems
304190.2	Formulate the Problem and develop the solution for same.
304190.3	Compare and analyze the different implementation approach of system programming operating system abstractions.
304190.4	Interpret various OS functions used in Linux / Ubuntu.

Class: BE

Course: VLSI Design & Technology [404181]

After the completion of the course, students will be able to….

CO	Statement
404181.1	Write effective HDL coding for digital design.
404181.2	Apply knowledge of real time issues in digital design.
404181.3	Model digital circuit with HDL, simulate, synthesis and prototype in PLDs.
404181.4	Design CMOS circuits for specified applications.
404181.5	Analyze various issues and constraints in design of an ASIC
404181.6	Apply knowledge of testability in design and build self-test circuit.

Course: Computer Networks & Security [404182]

After the completion of the course, students will be able to....

CO	Statement
404182.1	Understand fundamental underlying principles of computer networking.
404182.2	Describe and analyze the hardware,software,components of network and their interrelations.
404182.3	Specify and identify deficiencies in existing protocols and then go onto new and better protocols.
404182.4	Have a basic knowledge of the use of cryptography and network security .

Course: Radiation & Microwave Techniques [404183]

After the completion of the course, students will be able to....

CO	Statement
404183.1	Differentiate various performance parameters of radiating elements.
404183.2	Analyze various radiating elements and arrays.
404183.3	Apply the knowledge of waveguide fundamentals in design of transmission lines.
404183.4	Design and set up a system consisting of various passive microwave components.
404183.5	Analyze tube based and solid state active devices along with their applications.
404183.6	Measure various performance parameters of microwave components.

Course: Digital Image & Video Processing [404184]

After the completion of the course, students will be able to....

CO	Statement
404184.1	Develop and implement algorithms for digital image processing.
404184.2	Apply image processing algorithms for image enhancement and image restoration problems.
404184.3	Understand and Apply different image compression techniques.
404184.4	Focus and design image processing techniques for object segmentation and recognition.
404184.5	Represent objects and region
404184.6	Analysis of video signal representation and various algorithms for video processing.

Course: Embedded Systems & RTOS [404184]

After the completion of the course, students will be able to....

CO	Statement
404184.1	To Understand fundamental concepts of database management system.
404184.2	To understand a powerful, flexible & scalable general purpose database for handling of Big data.

404184.3	To Understand fundamental concepts of Big data technology with its data analytic lifecycle.
404184.4	To apply appropriate analytic techniques & tools for analyzing & communicating insights of Big data analysis.
404184.5	To apply appropriate analytic techniques & tools for analyzing & communicating insights of Big data analysis.

Course: Internet of Things [404184]

After the completion of the course, students will be able to….

CO	Statement
404184.1	Understand the various concepts ,terminologies and architecture of IOT systems and use sensors and actuators for design of IOT.
404184.2	Understand and apply various protocols for design of IOT
404184.3	Understand and apply various protocols for design of IOT systems
404184.4	Use various techniques of data storage and analytics in IOT and understand various applications of IOT

Course: Electronic Product Design [404185]

After the completion of the course, students will be able to….

CO	Statement
404185.1	Understand the stages of electronic product designing.
404185.2	Learning about formulating and designing specifications of product
404185.3	Aware about types of software tools ,Software bugs and testing.
404185.4	Knowledge of PCB designing
404185.5	Understanding steps of debugging
404185.6	Learning about special considerations and importance of documentation

Course: Artificial Intelligence [404185]

After the completion of the course, students will be able to….

CO	Statement
404185.1	Design and implement key components of intelligent agents and expert systems
404185.2	Distinguish various search strategies and real time decision making rules
404185.3	Describe knowledge representation techniques
404185.4	Analyze the various leaning methodologies and algorithm
404185.5	Understand basics of pattern recognition and feature extraction techniques for object recognition, speech recognition and pattern mining
404185.6	Describe Natural language processing and modelling

Course: Mobile Communication [404189]

After the completion of the course, students will be able to….

CO	Statement
404189.1	Understand switching techniques for voice and data traffic.
404189.2	Study and analyze telecommunication traffic models and signaling.
404189.3	Understand basics of cellular telephone systems.
404189.4	Study GSM fundamentals ,channels and services.
404189.5	Understand concepts of 4G LTE & 5G Technologies.

Course: Broadband Communication Systems [404190]

After the completion of the course, students will be able to….

CO	Statement
404190.1	Identify & analyze components used for optical fiber system.
404190.2	Carry out link power & rise time budget analysis by proper selection of components & check its viability.
404190.3	Understand & analyze various subsystems & orbital mechanism of satellite.
404190.4	Carry out link budget analysis for satellite communication link.

Course: Audio Video Engineering [404191]

After the completion of the course, students will be able to….

CO	Statement
404191.1	Interpret the concept of colour Television along with different standards and Fault finding equipments
404191.2	Describe the digital TV, Digital Video compression techniques and various display devices
404191.3	Analyze advanced television systems like HDTV ,IPTV, mobile TV, Wi-Fi TV,3D TV and Digital broadcasting
404191.4	Describe audio recording systems such CD/DVD recording, Audio Standards, and Acoustics principles

Course: Data Science & Analytics [404192]

After the completion of the course, students will be able to….

CO	Statement
404192.1	To Understand fundamental concepts of database management system.
404192.2	To understand a powerful, flexible & scalable general purpose database for handling of Big data.
404192.3	To Understand fundamental concepts of Big data technology with its data analytic lifecycle.
404192.4	To apply appropriate analytic techniques & tools for analyzing & communicating insights of Big data analysis.

Vision

" To Develop Competent engineers for benefit of mankind "

Mission

To Develop Professionals by providing vibrant Academic environment. To provide opportunity to deal with real life problems through industrial and societal interaction.

Program Educational Objective(PEO)

PEO1: Graduate shall have ability to pursue professional career.
PEO2: Graduate shall have an ability of lifelong learning to address incoming interdisciplinary challenges of Industry and society.
PEO3: Graduate shall have an ability to deliver sustainable solutions ethically.

Program Outcome (PO)

PO1: An ability to apply knowledge of computing, mathematics, science and engineering fundamentals appropriate to design, thermal and manufacturing problems.
PO2: Ability to identify the problems and provide solutions by using first principles, of engineering science, mathematics and numerical methods.
PO3: An ability to design solution for thermal, hydraulics and machining systems and design components and processes that meet the specified needs with appropriate consideration for factor of safety, societal and environmental aspects.
PO4: An ability to investigate solutions of complex problems by conducting experiments, simulating, computing and analyzing data provide valid findings and conclusion
PO5: An ability to use modern tools engineering tools and technologies necessary for obtaining quick, economical and accurate solutions of engineering problems.
PO6: An ability to analyse the local and global impact of mechanical system on individuals, organisation and society.
PO7: Ability to understand the environmental issues and provide solutions for sustainable development of the system.
PO8: An ability to understand professional and ethical responsibility through soft skill development.
PO9: An ability to function effectively as an individual or as a team member to accomplish the goal.
PO10: An ability to communicate effectively at technical and management levels using both written and oral communication.
PO11: An ability to apply technical and management skills to develop one's own work as a member and leader in team to manage projects and in multidisciplinary environments.
PO12: An ability to keep up to date with contemporary technologies through lifelong learning

SR NO	YEAR	SUBJECT	CO
			SEMESTER I
1	SE	EM-III	CO1. Solve higher order linear differential equation and apply to modeling and analyzing mass spring systems. CO2. Apply Laplace transform and Fourier transform techniques to solve differential equations involved in Vibration theory, Heat transfer and related engineering applications. CO3 Apply statistical methods like correlation, regression analysis and probability theory for analysis and prediction of a given data. CO4. Perform vector differentiation and integration to analyze the vector fields and apply to fluid flow problems. CO5. Solve various partial differential equations such as wave equation, one and two dimensional heat flow equations.
2		MP-I	CO-01: Able to Illustrate, analyse foundry practices & various forming processes through theory learning and practical demonstrations. CO-02: Able to use knowledge to demonstrate and practice the various plastic processing techniques and metal joining processes. CO-03: Able to explain different sheet metal working processes. CO-04: Able to summarize & dramatize constructional details and working aspects of centre lathe machine and its various accessories by means of theoretical and practical exposure of engineering knowledge.
3		MS	CO1 Identify defects in materials and its effect on material properties by using various destructive and non-destructive testing. CO2 Select appropriate surface modification methods and corrosion prevention methods to prevent corrosion and improve material properties. CO3 Explain different steps in powder metallurgy process for production of typical powder metallurgy components as per specific requirements.
4		THERMO	CO1 To describe laws of thermodynamics, steady flow energy equation and concept of irreversibility. Apply the knowledge of entropy principle, ideal gas processes to evaluate various thermodynamic properties. CO2 To explain thermodynamic cycles and analyze the performance of vapor power and vapor refrigeration cycle using P-h and T-s diagrams. CO3 To elucidate knowledge of boilers and able to analyze psychrometric process, performance of steam generators & natural draught.
5		SOM	CO1 Describe and compute the stresses and strains and their effects on different engineering geometries subjected to various end conditions and loadings. CO2 Evaluate the effect of stresses and deformations on static and rotary structures due to combine effect of torsion, bending and buckling CO3 Calculate principal stresses in machine components under the combination of set of versatile loading using the theories of elastic failure.
6	TE	HT	CO1 Explain various mode of heat transfer & apply the basic heat conduction equation for steady one-Dimensional thermal system.

			CO2 Compute general heat conduction equation to thermal system with or without internal heat generation. CO3 Formulate convection and radiation heat transfer system and carry out heat transfer analysis CO4 Analysis heat transfer equipment with two phase heat transfer phenomena and investigate the performance
7		TOM-II	CO 1 Analyze gear and gear trains by applying basic gear theory. CO2 Choose & design the type, shape of cam based on required follower motions. CO3 Synthesize the four bar mechanism using analytical method. CO4 Interpret the gyroscopic effect and step-less regulation.
8		DME-I	CO1 Demonstrate the fundamental theories of failure and design of machine components based on strength. CO2 Apply theory of S-N curve and Goodman's diagram to design the component for the application of fluctuating loads. CO3 Analyse failure modes of power transmission elements used for motion conversion and design type of joint based on axial or eccentric loading. CO4 Design springs serving for various mechanical applications based on strength and stiffness.
9		MQC	CO-01: Understand the methods of measurement, selection of measuring instruments / standards of measurement, carryout data collection and its analysis; tolerance, limits of size, fits, geometric and position tolerances and gauge design. CO-02: Understand and use the various meteorology tools such as Comparators, Thread and Gear Metrology, Surface Roughness Measurement CO-03: Understand the advances in Metrology such as use of CMM, Laser, Machine Vision System for Metrology etc. CO-04: Develop an ability of problem solving and decision making by identifying and analyzing the cause for variation and recommend suitable corrective actions for quality improvement.
10		TMC	CO1 Classify turbo machines along with its applications and discuss impulse momentum principle to evaluate performance parameters for flat, inclined plate, curved vane and series of vanes. CO2 Analyze & Evaluate the performance parameters and characteristics of water and steam turbine for its use in hydroelectric & thermal power plant. CO3 Classify rotodynamic, centrifugal pump, heads, cavitation, priming, along with multi staging, system resistance curve and evaluate performance with design aspects and selection criteria for household and industrial application. CO4 Distinguish centrifugal and axial flow compressor with flow processes, losses and discuss performance parameter and characteristics.

11		H&P	CO1 Describe the construction & working principles of various components used in hydraulic & pneumatic system. CO2 Implement suitable hydraulic & pneumatic circuits for various industrial applications. CO3 Design & develop hydraulic & pneumatic system by selecting appropriate components required for that system.
13		CCA	CO1 Create geometric model by using transformations and mathematical expressions to describe construction of solid geometry. CO2 Evaluate structural problems involving bars, beams and trusses using finite element analysis. CO3 Summarize advance manufacturing processes in the field of automation.
14	BE	DOM	CO1 Define the fundamentals of vibration and noise with respect to industrial scenario. CO2 Determine natural frequency, damping coefficient and mode shapes of single degree and two degree mechanical system subjected to free and forced vibrations. CO3 Analyze and evaluate the balancing of rotating and reciprocating masses of single cylinder or multiple cylinder engines which are in single or several planes by using knowledge of engineering mechanics. CO4 Explain the measurement, control techniques, methods of vibration and noise for a given mechanical system.
15		FEA	CO1 To remember and understand the fundamentals of FEA pertaining to structural and heat transfer domain. CO2 To formulate and solve 1D/2D element structural, isoparametric and steady state heat transfer problems. CO3 To evaluate appropriate FEA technique to solve dynamic vibration problems.
16		AE	CO1 Describe constructional details of vehicles, working of and transmission system in automobile vehicles and understand the recent trends. CO2 Describe working and constructional details of various Axles, wheels, tyres and steering system. CO3 Describe working principle of suspension system, breaks and its constructional details. CO4 Explain safety system and compute vehicle performance and. CO5 Describe working principle of electrical system and comprehend the overhauling and maintenance of various automotive systems CO6 Explain constructional details, working of EVs, HEVs and solar vehicles and exposure to automobile related Entrepreneurial acumen. .

17		EAM	CO 1 Identify need of renewable energy as per current energy scenario and Apply CO2 various methods of waste energy recovery to get better energy efficiency CO3 Interpret Energy audit methodology and Analyze various financial techniques to know about costing and energy saving opportunities in various energy sources. CO4 Identify and evaluate energy conservation opportunities in Thermal and Electrical Utilities.
18		OR	CO1 Analyse mathematical model and identify transporting the product from origin to destination with least transportation cost CO2 Recognize model strategic situation to predict the decision of the other and to exploit strategic for own decision and provide to use of investment analysis Capability CO3 Identify the type of inventory system available and quantitative metrics of performance for queuing system CO4 Identify the resources required for a project and generate a plan and work schedule and simulation techniques applied to various industries

SEMESTER II			
SR NO	YEAR	SUBJECT	CO
1	SE	ATD	CO1 Understand construction and working principle of I.C Engine under ideal and actual conditions CO2 Analyze the fuel injection process, stages of combustion, combustion chambers and systems of IC engines. CO3 Analyze performance of IC engine, reciprocating air compressor using various methods.

2		TOM-I	CO1 Select the appropriate mechanism and find the forces acting on it. CO2 Solve the numerical based on principle of friction for absorption and transmission type of machine components. CO3 Construct and solve velocity and acceleration of mechanisms having maximum six links by Vector and Graphical methods.
3		EM	CO1 Interpret Iron-Iron carbide phase diagram for various temperatures and carbon percentages. CO2 Identify different microstructures of ferrous and non-ferrous alloys by using electron microscopy and macroscopic techniques. CO3 Explain different heat treatment processes and cooling cycles for different grades of steel.
4		EEE	1. Students should conversant with Electrical and Electronic controls basic 2. It will be prerequisite for Mechatronics. 3. To study Microcontrollers 4. To study Electrical drive system required to drive machines
5		FM	CO1 Determine and Describe various properties of fluid for given operating conditions encountered in fluid flow problems. CO2 Apply laws of fluid dynamics for various flow field parameters and identify nature of fluid flow. CO3 Develop mathematical correlation for complex flow phenomenon in terms of dimensionless parameters. CO4 Interpret various forces and losses on external flow and pipe flow system.
6	TE	NMO	CO1 Select appropriate Numerical Methods to solve mechanical engineering problems. CO2 Apply optimization techniques to solve mechanical engineering problem. CO3 Develop algorithm for solving engineering problem using numerical methods
7		DME-II	CO1 Apply design principles to various gears. CO2 Design sliding contact bearings and Select rolling contact bearings from manufacturer's catalogue. CO3 Design and select belt drives from manufacturer's catalogue for Industrial applications and explain chain and rope drives.
8		MP-II	CO1 Explain various machine tool and machining operations CO2 Analyse and Explain theory of metal cutting using single point cutting tool CO3 Compare the effect of various process parameter on process charectristics of advanced machining process CO4 Write part programming for jobs to machine on CNC CO5 Design Jig and Fixture for component to utilize machine capability for various operations
9		RAC	CO-1 Evaluate the performance of different vapour compression and vapour absorption refrigeration system. CO-2 Identify different types of VCC components used for various applications. CO-3 Estimate the psychrometric properties of air for various air

			conditioning systems. CO-4 Design of duct for air distribution system by using different methods.
10		MTX	CO1 Develop DAQ system using different Sensors and Actuators CO2 Develop block diagrams and PLC program using key elements of Mechatronic system for household and industrial applications. CO3 Design the system with proper controller for its stability analysis based on time and frequency domain methods.
11		MSD	CO.1 Design mechanical components for various mechanical system under given specifications. CO.2 Apply statistical tools to identify number of defective components. CO.3 Apply design principals and optimization techniques for mechanical components.
12		EE	CO1 Describe different power generation methods and energy scenario in India and Analyze thermodynamic cycles for steam Power Plant CO2 Recognize the construction, working and environmental effects of power plants CO3 Emphasis the fundamentals of Non-conventional Power Plant and Describe the instrumentation and Economics in Power Plant.
13	BE	IE	CO1 Apply the Industrial Engineering concepts and tools such as Method Study, Work Study to increase the productivity of system. CO2 Able to Forecast the market demand and to use the available production capacity effectively to fulfil the forecasted demand. CO3 Able to apply HRD functions, engineering economy and industrial safety practices in various industries
14		PDD	CO-01: student will understand modern approach to product design & development and various phases of product design CO-2: Student should perform economic analysis of product and understand the Development of commercial Product CO-3: Student should understand different aspects of reverse engineering and shall learn new techniques of PLM and PDM
15		AMP	CO-1 Classify and analyze special forming processes CO-2 Analyze and identify applicability of advanced joining processes CO-3 Understand and analyze the basic mechanisms of hybrid non-conventional machining techniques CO-4 Select appropriate micro and nano fabrication techniques for engineering applications CO-5 Understand and apply various additive manufacturing technology for product development CO-6 Understand material characterization techniques to analyze effects of chemical composition, composition variation, crystal structure, etc.