Vision and Mission

Department Vision

Build Professionals in the field of Production Engineering

Department Mission

M1: To impart Quality technical Education in Production and Industrial Engineering.

M2: To inculcate Sustainable Managerial Skills, Research and Learning Attitudes, and Social Responsibilities.

M3: To be committed to fulfill the needs of society in manufacturing and service sector.

Program Educational Objectives (PEOs)

PEO1: Classify, analyze, evaluate, design and develop engineered system and processes using appropriate engineering tools and approaches.
PEO2: Demonstrate in-depth knowledge of manufacturing systems and work effectively in diverse environments.
PEO3: Build successful careers as per the need of Indian and multinational industries/companies.

Program Outcomes

1) Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization to the solution of complex engineering problems.

2) Problem analysis: Identify, formulate, review research literature and analyze complex engineering problems researching substantiated conclusions using first principals of mathematics, natural science, and engineering sciences.

3)Design / development of solutions: Design solution 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) 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: 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 limitation.

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 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 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, as such, 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 principals and apply these to one's own work, as member and leader in team, to manage projects and in multidisciplinary environment.

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.

Course Outcomes

Class: Second Year of Engineering	
Semester I	
Course: Engineering Mathematics-III (207002)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO 207002.1	Find General solution of higher-order linear differential equation with constant & Variable coefficient using different Methods?
CO207002 .2	Find Laplace transform and Fourier transform of functions using definition & properties & solve Ordinary D.E. using L.T.
CO207002.3	Understand the different techniques of statistical Analysis, Use of probability and probability distribution
CO207002 .4	Recognize nature of vector fields ,use different vector differential operators& able to evaluate Line, surface & Volume integrals& its application
CO207002 .5	Solve boundary value problems for Laplace's equation, heat equation, the wave equation by separation of variables.
Course : Heat and Fluid Engineering (211101)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO211101 .1	Analyze the type fluid flow along with its application, basic principles and laws of fluid mechanics
CO211101 .2	Classify basic pressure measurement devices and its application throughout fluid mechanics.
CO211101 .3	Analyze boiler and energy balance concept, also the properties and behavior of steam and different types of fuels.
CO211101 .4	Analyze performance characteristics and application of Vapour compression cycle, turbines and compressor.
CO211101 .5	Perform individually or in a group to formulate and solve, analyze the engineering problem and to conclude the result of the outcome.
Course : Mechanics of Material (211102)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO211102 .1	Analyze stress and strain at a point as well as the stress-strain relationship for homogeneous, isotropic materials.
CO211102 .2	Analyze and Design the members subjected to tension, compression, torsion, bending and combined stresses using fundamental concepts of stress, strain and elastic behaviour of materials.
CO211102 .3	Determine the stresses and strains in members subjected to combined loading and apply the theories of failure for static loading.
CO211102 .4	Analyze the slender, long columns and determine and illustrate principal

	stresses, maximum shearing stress and stresses acting on a structural member.
Course : Welding and Foundry (211103)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO211103.1	Classify and describe welding processes.
CO211103.2	Predict safety measures, inspection and testing of welding of welding.
CO211103.3	Describe and classify metal casting process and casting defects.
CO211103.4	Justify the pattern material, allowances, and effect of mould ingredients on mould strength.
CO211103.5	Design the gating system design and risers.
Course : Course: Material Science (211104)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO211104. 1	Explain the mechanism of plastic deformation
CO211104. 2	Define the mechanical properties of materials and conduct destructive and non destructive tests to evaluate and test the properties of materials
CO211104. 3	Draw and explain equilibrium diagrams for various alloy systems
CO211104. 4	Explain various strengthening mechanisms and pyrometers.
CO211104. 5	Explain corrosion and suggest various means to prevent corrosion
CO211104. 6	Explain various aspects of powder metallurgy
Semester II	
Course : Electrical Technology (203050)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO203050.1	Develop the capability to identify and select suitable DC motor and its speed control method for given industrial application.
CO203050 .2	Develop the capability to identify and select suitable Induction motor and its speed control method for given industrial application.
CO203050 .3	Select and Design appropriate Transformers for available load.
CO203050.4	Develop the capability to identify and select suitable Special Purpose motor and its speed control method for given industrial application.
CO203050 .5	Select Power Electronics devices for various power Conversion Applications
CO203050 .6	Implement the knowledge of Power Electronics in Electrical Drives
Course : Theory of Machines (211110)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO211107.1	carry out velocity and acceleration analysis applying the basic knowledge of mechanism, their inversions, applications.
CO211107.2	use mechanical elements like belt drives, brakes, dynamometer in machine tools appropriately.
CO211107.3	apply theories of wear and friction, their effects, measurement and

	methods to minimize their effects in various mechanisms and machine tools.
CO211107.4	carry out static and dynamic force analysis of mechanisms.
CO211107.5	carry out the experiments to find the mass moment of inertia, radius of gyration by compound pendulum, bifilar and trifilar suspension methods
Course : Machine Tool Operations (211111)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO211111.1	Classify the basic machining processes.
CO211111.2	Understand the various mechanism and operations performed on different types of machine tools.
CO211111.3	Calculate the machining time on different types of machine tools.
CO211111.4	Judge the importance of different super-finishing processes and its applications.
Course : Design of Machine Elements (211109)	
COS	Course Outcomes
	At the end of the course, the students will be able to:
CO211112 .1	apply basic design principles to the design of machine elements
CO211112 .2	design shaft for static and dynamic loading conditions
CO211112 .3	design power screw for practical applications
CO211112 .4	design springs for practical applications
CO211112 .5	design spur gears for practical applications
CO211112 .6	design rolling contact bearings for practical applications
Course : Engineering Metallurgy (211113)	
COS	**Course Outcomes**
	At the end of the course, the students will be able to:
CO211113 .1	work with Iron-Iron carbide equilibrium diagram and apply this knowledge for classification of steels from microstructure observations
CO211113.2	select proper Heat Treatment, Surface Hardening technique & Isothermal Treatments for the steels considering properties and service requirements
CO211113.3	evaluate hardenability of steel using Jominy hardenability test
CO211113.4	distinguish different Alloy Steels and Cast Irons based on chemical compositions and microstructures
CO211113.5	Familiarize with different types of non-ferrous alloys and Composites with their need, scope and applications
Course : Production Practice-I (211116)	
COS	**Course Outcomes**
	At the end of the course, the students will be able to:
CO211111.1	Operate various machines like lathe, drilling, milling etc.
CO211111.2	Perform plain turning, taper turning etc. on lathe machine
CO211111.3	Calculate the machining time on different types of machine tools.
CO211111.4	Understand the various mechanisms of machine tools.
CO211111.5	Perform the forging operation for knife edge and Vee shape tool
Course : Soft Skills (211112)	

COS	Course Outcomes
	At the end of the course, the students will be able to:
CO211112 .1	Carryout SWOT analysis and list down and define short term and long term goals.
CO211112 .2	Develop presentation, public speaking and listening skills.
CO211112 .3	Acquire technical report writing, letter writing, story writing and resume writing.
CO211112 .4	Built-up confidence and participate effectively through stress management

Class: Third Year of Engineering	
Semester I	
Course : Metrology and Quality Assurance (311081)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO311081.1	able to describe and work with various linear and angular measuring devices
CO311081.2	able to design limit gauges and also work with measuring devices for gear, screw thread, measurements of surface finish, use profile projector and comparators
CO311081.3	be able to distinguish various comparators and use profile projector be able to distinguish various comparators and use profile projector
CO311081.4	able to use various control charts and various quality assurance tools with the knowledge of various quality standards
CO311081.5	able to implement TQM and TPM concepts in practice
Course : Industrial Engineering Management (311082)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO311082.1	Summarize the contribution of peoples to management
CO311082.2	Differentiate between two employees on the basis of productivity
CO311082.3	Prepare time schedule to complete the task.
Course : Material Forming (311083)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO311083.1	classify and compare the forming processes and describe the yield criteria
CO311083.2	analyze various forming processes
CO311083.3	identify and evaluate the forming problems and generate solutions to these problems
CO311083.4	classify and describe special forming processes
Course : Kinematics of Manufacturing Machines (311084)	
COs	**Course Outcomes**

	At the end of the course, the students will be able to:
CO311084.1	carry out kinematic analysis and synthesis of mechanisms
CO311084.2	apply knowledge of the elements of machines like gears, cams, flywheels for engineering applications.
CO311084.3	design and analyze the elements of machines like gears, cams, flywheels.
CO311084.4	balance the rotating and the reciprocating masses in different machine tools.
CO311084.5	evaluate the effects of vibrations and the remedial actions needed to reduce the effect of vibrations.
Course : Cutting Tool Engineering (311085)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO311085.1	Identify the different cutting tool geometry and evaluate economics of machining
CO311085.2	Calculate the cutting force components in orthogonal cutting and Merchants force circle
CO311085.3	Draw geometry of cutting tools, design and draw the different cutting tools.
CO311085.4	Design and draw the Jigs and fixtures for various machining processes and to know environmental issues, decide manufacturing policies, various responsibilities of engineering professional etc.
Course : Production Practice/Employable Skill Development (311086)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO311086.1	Learn and practice safety rules while working on various machine tools.
CO311086.2	Analyze need of using concept of indexing, necessary calculations and do setting for gear teeth cutting on milling machine.
CO311086.3	Independently perform different operations on lathe to produce composite job.
CO311086.4	Carry out the machining of spur, bevel and helical gears on milling machine.
CO311086.5	Analyze given work piece drawing and develop CNC program code for turning and/or milling operations.
Semester II	
Course : Production Management (311091)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO 311091.1	Use the knowledge of strategies for the Production and Operations management for the sustainability of an enterprise.
CO 311091.2	Apply knowledge and analyze Production Systems for Production Planning and Control.
CO 311091.3	Design facility layouts and study their structure during implement in their In-Plant training project work.
CO 311091.4	Implement principles of just-in-time systems.
CO 311091.5	Use forecasting techniques and demonstrate the ability to apply some

	mathematical forecasting techniques.
CO 311091.6	Prepare operations scheduling for manufacturing industries.
CO 311091.7	Apply concepts of inventory management.
Course : Numerical Techniques and Optimization Methods (311092)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO311092.1	Make use of numerical & iterative methods for solving complex algebraic & transcendental equation, simultaneous equations, curve fitting, interpolation , optimization , integration & differentiation
CO311092.2	Able to establish the co-relation between input factors and performance measure using regression analysis and interpolation methods
CO311092.3	Develop mathematical model of physical problem and subsequent solution by appropriate optimization method
CO311092.4	select & apply appropriate solution methodology to solve production engineering problems involving complex mathematical formulations
CO311092.5	Design the database using ER model & work with relational algebra & relational calculus
Course: Machine Tool Engineering (311093)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO311093 .1	Classify and describe with a neat sketch the construction and working of various automats
CO311093 .2	Compare and contrast NC/CNC and conventional machine tools
CO311093 .3	Explain various material handling equipments along with the objectives, principles and selection criteria of Material Handling Systems
CO311093 .4	Classify, compare and explain with neat sketches various non-conventional machining processes
CO311093 .5	Describe special processes used for manufacturing of gears and threads with a neat sketch
CO311093 .6	Explain meaning, considerations, types, and significance, as applicable, of installation, control, maintenance and reliability of machine tools
Course : Tool Design (311094)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO311094.1	describe Press working, Forging, Die casting and Plastic processing operations.
CO311094.2	design and construct Press tools
CO311094.3	design and construct Forging dies
CO311094.4	apply knowledge to design Injection molds
Course : Process Planning and Tool Selection (311095)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO311095.1	To provide details of the aspects Process engineering, Product design and role of product designer

CO311095.2	To demonstrate application of geometric dimensioning and tolerance analysis.
CO311095.3	To analyze and differentiate between Work-piece control and selection of operations.
CO311095.4	To analyze factors affecting Selection of Equipment & Tooling.
CO311095.5	To demonstrate process Selection, capacity Planning and approaches for CAPP
Course : Seminar and Technical Communication (311096)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO311096.1	Gain knowledge of fast and rapidly changing technology by self learning.
CO311096.2	Develop articles and presentation materials on latest Technology.
CO311096.3	Develop the interpersonal skills, presenting skills, soft skills and creativity.
CO311096.4	Learn to review and assess scientific literature critically.

Class: Fourth Year of Engineering	
Semester I	
Course : Machine Tool Design (411081)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO 411081.1	Design gear box used in machine tools.
CO 411081.2	Design of Machine Tool Structures.
CO 411081.3	Design of Guide ways.
CO 411081.4	Design of Spindles, Spindle Supports and Power Screws.
CO 411081.5	Determine Dynamics of machine tools.
CO 411081.6	Develop Automation system in Machines.
Course : Automation and Control Engineering (411082)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO411082 .1	Apply basic principles of fluid power for automation of industrial systems
CO411082 .2	Select the proper hydraulic and pneumatic component for an application
CO411082 .3	Design basic fluid power components and circuits.
CO411082 .4	Apply the concept of programmable automation and control systems
CO411082 .5	Analyze and select appropriate mechanical systems for factory automation
Course: Operations Research (411083)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO411083 .1	Formulate and solve linear programming problem using graphical method and other techniques like simplex, dual simplex and revised simplex.
CO411083 .2	Formulate and solve transportation and assignment problems using

	appropriate techniques.
CO411083 .3	Apply advanced linear programming techniques to solve related problems
CO411083 .4	Apply network techniques to solve PERT and CPM problems
CO411083 .5	Find optimum solution to replacement and game problems
CO411083 .6	Solve queuing problem in various queuing situations
Course: Elective I: Product Design and Development (411084 A)	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO411084 .A1	Carry out the basic engineering design process and also various techniques used for a product.
CO411084 .A2	Construct the product development process and customer requirements, QFD.
CO411084 .A3	Check the performance measure of design and DFM of a product.
CO411084 .A4	Perform the case study of product life cycle management of a product
Course : Elective I -Financial Management and Costing 411084B	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO411084-B.1	Use Financial Statements to evaluate performance of a firm
CO411084-B.2	Calculate time value of money and Cost of Capital.
CO411084-B.3	Demonstrate how materials, labor and overhead costs are added to a product at each stage of the production cycle
CO411084-B.4	Apply cost accounting techniques and evaluate their limitations
CO411084-B.5	Use and evaluate appropriate costing and decision making techniques to make short term decisions
CO411084-B.6	Use standard costing systems to undertake a performance review and interpret the results
Course : Elective I - Data Analytics 411084-C	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO411084-C.1	Effectively visualize and interpret the data
CO411084-C.2	Apply predictive and prescriptive techniques for production engineering applications
CO411084-C.3	Use data analysis for engineering applications through the powerful tools of data application
Course : Elective I: Advanced Thermal Engineering 411084-D	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO411084-D .1	Apply laws of thermodynamics to devices viz. engines, refrigerators etc.
CO411084-D .2	Analyze and compare air standard cycles, steam power cycles

CO411084-D .3	Understand the principle of power generation system and devices used in steam power plant
CO411084-D .4	Understand and analyze basic modes of heat transfer
CO411084-D .5	Explain the design, performance analysis and practical applications of heat exchangers
Course : Elective I: Mechatronics 411084-E	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO411084-D .1	Understand the control system basics and the types of control systems
CO411084-D .2	Apply knowledge of response specifications of control system.
CO411084-D .3	Use controller principles for composite modes of control
CO411084-D .4	Be Able to do PLC programming, programming with counters and timers, real time PLC programming examples
CO411084-D .5	Apply the Mechatronics system, actuators, sensors and transducers used digital signal processing in real life problems
Course : Elective II: Nano Manufacturing 411085-A	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO411085-A.01	Distinguish between micro and nano manufacturing and identify the various finishing approaches.
CO411085-A.02	Identify the applications of conventional and non-conventional manufacturing processes.
CO411085-A.03	Distinguish various nano finishing processes
CO411085-A.04	Measure the micro and nano scales
CO411085-A.05	
Course : Elective II: Simulation and Modeling 411085-B	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO411085-B1	Solve the problems based on simulation principal
CO411085-B2	Differentiate the simulation systems.
CO411085-B3	Collect data and generate the random numbers
CO411085-B4	Distinguish simulations with regard to output analysis
CO411085-B5	Apply simulation to manufacturing system.
CO411085-B6	Handle software packages – ARENA/SimFactory/Promodel/ Witness
Course : Elective II: Additive Manufacturing 411085-C	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO411085-C1	Identify the materials for used in additive manufacturing.
CO411085-C2	Identify the software for additive manufacturing and digitization techniques.
CO411085-C3	Identify industrial applications of liquid based additive manufacturing technology
CO411085-C4	Identify industrial applications of solid based additive manufacturing technology

CO411085-C5	Identify the industrial applications of powder based additive manufacturing
CO411085-C6	Find applications of Bio-Additive Manufacturing- Computer Aided Tissue Engineering
Course : Elective II: Reliability Engineering 411085-D	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO411085-D1	Identify and analyze the static and dynamic reliability of complex systems.
CO411085-D2	Identify commonly used reliability techniques using graphical techniques and empirical distributions
CO411085-D3	Utilize common physical models for reliability analysis.
CO411085-D4	Perform reliability analysis of complete data.
CO411085-D5	Acquire ability to root cause, correct, and document system failures
CO411085-D6	Implement accelerated and highly accelerated life testing analyses
Course : Elective II: Advanced Materials 411085-E	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO411085-E1	Understand and possess the knowledge of working on materials.
CO411085-E2	Gain the knowledge of properties and applications of different materials
CO411085-E3	Select the appropriate material and prevent failure.
Semester II	
Course : Computer Integrated Design & Manufacturing 411091	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO411091.1	Analyze and use computer graphics and geometric modeling techniques for Production Engineering applications.
CO411091.2	Apply advanced computational tools such as finite element analysis for engineering design and analysis.
CO411091.3	Demonstrate a basic understanding of machining, tooling and work-holding systems for CNC machines, and develop CNC program for drilling, milling & turning.
CO411091.4	Apply various techniques of cellular manufacturing for machine cell formation.
CO411091.5	Understand modern trends of manufacturing including flexible manufacturing systems, computer integrated manufacturing and rapid prototyping
Course : Industrial Robotics 411092	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO411092.1	Understand the motions of robotic arm and body which generates robot configuration.
CO411092.2	Apply the techniques like Homogeneous transformation to understand

	direct and inverse kinematics
CO411092.3	Use design procedure for mechanical grippers depending upon their types and mechanism
CO411092.4	Understand different types of sensors and will be able to convert blank and white image from the given grayscale pattern.
CO411092.5	Use different programming languages used to operate robot.
CO411092.6	Identify application of robots in different areas where they will work in future.
Course : Elective III: Sustainability Engineering 411093 A	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO411093.A1	Explain the design concepts, methods, tools, the key technologies and the operation of sustainable manufacturing.
CO411093.A2	Apply the principles, techniques and methods to customize the learned generic concepts to meet the needs of a particular industry/enterprise
CO411093.A3	Identify the strategies for the purpose of satisfying a set of given sustainable manufacturing requirements
CO411093.A4	Design the rules and processes to meet the market need and the Sustainable manufacturing requirements by selecting and evaluating suitable technical, managerial / project management and supply chain management schemes
Course : Elective III: Supply Chain Management 411093-B	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO 411093.B1	Build and manage a competitive supply chain using strategies, models, techniques and information technology.
CO 411093.B2	Optimize supply chain network
CO 411093.B3	Plan the demand, inventory and supply
Course : Elective III: Automobile Engineering 411093 C	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO 411093.C1	Understand Vehicle specifications, Chassis and safety.
CO 411093.C2	Study of Fuel Supply System & Cooling System.
CO 411093.C3	Understand Lubrication System and Ignition System.
CO 411093.C4	. Study of Clutches and Gear Boxes.
CO 411093.C5	Understand Suspension and Steering System.
CO 411093.C6	Understand Breaking Systems and Automobile Maintenance techniques
Course : Elective III: Entrepreneurship 411093 D	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO 411093.D1	Understand the meaning and importance of entrepreneurship
CO 411093.D2	Acquire entrepreneurial skills
CO 411093.D3	Understand financial statements of business organization

CO 411093.D4	Understand managerial skills required for successful entrepreneurship
CO 411093.D5	Understand various laws governing startups
CO 411093.D6	Prepare a viable small scale business plan
Course : Elective III: Human Resource Management 411093 E	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO 411093.E1	Discuss strategic plan for the human resources needed to meet organizational goals and objectives
CO 411093.E2	Define the process of job analysis and discuss its importance as a foundation for human resource management practice
CO 411093.E3	Compare and contrast methods used for selection and placement of human resources
CO 411093.E4	Describe the steps required to develop and evaluate an employee training program
CO 411093.E5	Identify and explain the issues involved in establishing wage and compensation systems
CO 411093.E6	Summarize the activities involved in evaluating and managing employee performance
Course : Elective IV: Intelligent Manufacturing System 411094 A	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO 411094.A1	Implement statistical methods, evolutionary optimization techniques, soft computing methods, machine learning and knowledge based system for Equipment selection and layout
CO 411094.A2	Implement statistical methods, evolutionary optimization techniques, soft computing methods, machine learning and knowledge based system for Process planning and parametric optimization
CO 411094.A3	Implement statistical methods, evolutionary optimization techniques, soft computing methods, machine learning and knowledge based system for Cellular manufacturing
CO 411094.A4	Implement statistical methods, evolutionary optimization techniques, soft computing methods, machine learning and knowledge based system Robotics systems
Course : Elective IV: Energy Management 411094 B	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO 411094.B1	Identify areas of energy conservation in industries.
CO 411094.B2	Identify role and responsibilities of an energy manager and energy auditor.
CO 411094.B3	Analyze working of the energy utilizing and generating machines.
CO 411094.B4	Practice and utilize the instruments in energy audit process.
CO 411094.B5	Implement proper energy saving techniques in boiler, furnaces, compressors and heavy machineries.
Course : Elective IV: World Class Manufacturing 411094 C	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO 411094.C1	Understanding recent trends in manufacturing
CO 411094.C2	Customization of product for manufacturing
CO 411094.C3	Implementation of new technology

Course : Elective IV Finite Element Analysis 411094-D	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO 411094.D1	Model and Analyze 1-D problem.
CO 411094.D2	Model and Analyze Truss subjected to loading.
CO 411094.D3	Model and Analyze Two-Dimensional Problem Using Constant Strain Triangles
CO 411094.D4	Perform finite element modeling of triangular element and 2-D iso-parametric elements
CO 411094.D5	Analyze steady state heat transfer - 1D and 2D heat conduction and convection
CO 411094.D6	Identify meshing techniques quality aspects of meshing
Course : Elective IV: Environmental Engineering 411094-E	
COs	**Course Outcomes**
	At the end of the course, the students will be able to:
CO411094.E1	Understand importance of environment and different types of pollution
CO411094.E2	Explain causes and preventive measures against air pollution
CO411094.E3	Describe causes and preventive measures against water pollution.
CO411094.E4	Explain causes and preventive measures against noise pollution