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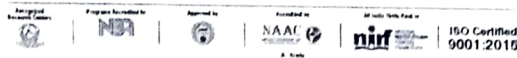
**DEPARTMENT OF MECHANICAL
ENGINEERING**

**PROGRAM: PRODUCTION ENGINEERING
COURSE OUTCOMES**



CHAITANYA BHARATHI
INSTITUTE OF TECHNOLOGY (A)

Kokapet(Village), Gandipet, Hyderabad, Telangana-500075. www.cbti.ac.in



COMMITTED TO
RESEARCH,
INNOVATION AND
EDUCATION

44
years

B.E (Production Engineering) Program

B.E. Program Outcomes (PO's)

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization for the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, research literature, and analyse 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 public health and safety, and 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 modelling to complex engineering activities, with an understanding of the limitations.

PO6: 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.

PO7: 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.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and teamwork: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write

order calligraphy
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effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: 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.

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.

R-18

B.E – Production Engineering Department Vision

To be a pace setter in the field of Mechanical Engineering by providing conducive environment for understanding and applying its principles and to cater to the needs of society

Department Mission

To impart quality and innovative technical education to the students of Mechanical Engineering for their professional achievements in consultancy, R & D and to become successful entrepreneurs enabling them to serve the society, in general, and the industry in particular.

B.E – Production Engineering Program Educational Objectives (PEO's):

1. The graduating students from Production Engineering will have a widespread knowledge in basic sciences and fundamentals of Production engineering and will be able to solve application level problems pertaining to society.
2. The graduating students from mechanical engineering will have knowledge in core areas in Production Engineering like Design Engineering, Industrial Engineering, Manufacturing Engineering, and Thermal Engineering.
3. The programme prepares the graduates to acquire competency for research in core areas and also in interdisciplinary research activities like environment & sustainability.
4. The graduating students from Production Engineering will inculcate professional & ethical values, team work, leadership skills, moral responsibility, industrial relations and communication skills.
5. The graduating students from Production Engineering will be enriched in project, finance management and technical knowhow skills.

B.E – Production Engineering Program Specific Outcomes (PSO's):

1. Fundamental knowledge of the theoretical background for the applied technologies and methods applied in Production Engineering, including conventional and CAD/CAM areas

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2. Ability to think and work in a problem oriented, project oriented and in an inter-disciplinary way
3. Ability to work independently as well as in teams and get the opportunity to learn leadership and entrepreneurship qualities.

R-16

B.E – Production Engineering Department Vision

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B.E – Production Engineering Program Specific Outcomes (PSO's):

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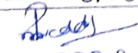
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Department of Mechanical Engineering

Program: Production Engineering Course Outcomes

Statements for B.E (Prod) – R18

S.no.	Course		Course Outcomes Statements
	Code	Name	
1	18MT C01	MATHEMATICS– I	Solve system of linear equations and identify the Eigen values and Eigen vectors in engineering problems.
			Check the series convergence.
			Find the evolutes of the given curves.
			Expand and find extreme values of functions of two variables.
			Understanding the significance of gradient, divergence and curl.
			An ability to solve the problems and interpret in geometrical approach.
2	18PY C03	INTRODUCTION TO MECHANICS AND ELECTROMAGNETIC THEORY	Describe the types of oscillations and analyze them.
			Develop the concepts of dynamics and apply them to solve the related problems.
			Analyze the role of different laws in electrostatics.
			Discuss the significance of magnetostatics.
			Develop the concepts related to electromagnetic behavior.
3	18CS C01	PROGRAMMING FOR PROBLEM SOLVING	Identify the computing environments.
			Formulate solutions to problems and represent them using algorithms/ Flowcharts.
			Choose proper control statements and data structures to implement the algorithms.
			Trace the programs with test the program solution.
			Decompose a problem into modules and use functions to implement the modules.
			Develop applications using file I/O
4	18EG C01	ENGLISH	The students will understand the nature, process and types of communication and will communicate effectively without barriers.
			The students will write correct sentences and coherent paragraphs
			The students will know how to condense passages by writing précis and write essays by using accurate grammar and appropriate vocabulary
			The students will demonstrate advanced writing skills by drafting formal reports.
			The students will apply their reading techniques and analyze reading comprehension passages.
			The students will become effective communicators and will display their advanced skills of reading and writing and use correct grammar and appropriate vocabulary in all contexts.
5	18PY C06	MECHANICS AND ELECTROMAGNETIC LABORATORY	Understand the concept of errors and find the ways to minimize the errors
			Demonstrate the various kinds of oscillations.
			Determine the loss of energy of a ferromagnetic material and its uses in electrical engineering .
			Understand the suitability of dielectric materials in engineering applications.
			Use LCR circuits in different applications
6	18CS C02	PROGRAMMING FOR PROBLEM SOLVING (PROGRAMMING LAB – I)	Identify and setup program development environment.
			Implement the algorithms using C programming language constructs.
			Identify and rectify the syntax errors and debug program for semantic errors.


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			Analyze the results to evaluate the solutions of the problems.
			Solve problems in a modular approach using functions.
			Implement file operations with simple text data.
7	18ME C02	WORKSHOP/ MANUFACTURING PRACTICE	Fabricate components with their own hands.
			Get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
			Assembling different components, student will be able to produce small mechanisms/devices of their interest.
			Gain practical skills of carpentry, tin smithy, fitting, house wiring.
			Gain knowledge of different Engineering Materials and Manufacturing Methods.
			Understand trades and techniques used in Workshop and chooses the best material/ manufacturing process for the application.
8	18EG C02	ENGLISH LAB	The students will differentiate the speech sounds in English.
			The students will interact with the software and understand the nuances of pronunciation in English.
			The students will speak with the proper tone, intonation and rhythm and apply stress correctly.
			The students will demonstrate their listening skills by analyzing the IELTS and TOEFL listening comprehension texts.
			The students will speak with clarity and confidence.
			The students will work in teams and discuss various topics and demonstrate their presentation skills through posters
9	18MT C03	MATHEMATICS– II	Find the areas, volumes and surface of solids revolution
			Use Greens, Gauss and Stoke's theorems to find the surface and volume integrals.
			Able to solve solutions of differential equations with initial and boundary value problems.
			Solve the problems on analytic functions, Cauchy's theorem and Cauchy's integral formula.
			Real and complex integrals by using Cauchy's theorems.
			Solve physical and engineering problems
10	18CY C01	CHEMISTRY	Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
			Rationalize bulk properties and processes using thermodynamic considerations & Ionic Equilibria.
			List major chemical reactions that are used in the synthesis of molecules.
			Apply the various methods used in treatment of water for domestic and industrial use.
			Discuss the various Engineering materials & Drug synthesis & their applications
11	18CE C01	ENGINEERING MECHANICS	Solve problems dealing with forces in plane and space force systems, draw free body diagrams to analyze various problems in equilibrium, for smooth and frictional surface.
			Determine centroid and moment of inertia for elementary, composite areas and bodies.
			Analyze simple trusses for forces in various members of a truss.
			Solve problem in kinematics and kinetics of particles and rigid bodies.
			Analyze body motion using work energy principles, impulse and momentum approach and able to apply the concepts of simple harmonic motion and free vibrations in dynamics.
12	18ME C01	ENGINEERING GRAPHICS AND DESIGN	Introduction to engineering design and its place in society.
			Exposure to the visual aspects of engineering design.
			To become familiar with engineering graphics standards.
			Exposure to solid modelling.

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			Exposure to computer-aided geometric design.
			Exposure to creating working drawings.
			Exposure to engineering communication
13	18EE C01	BASIC ELECTRICAL ENGINEERING	Acquire the concepts of Kirchhoff's laws and network theorems and able to get the solution of simple dc circuits.
			Obtain the steady state response of RLC circuits and also determine the different powers in AC circuits.
			Acquire the concepts of principle of operation of Transformers and DC machines.
			Acquire the concepts of principle of operation of DC machines and AC machines.
			Acquire the knowledge of electrical wiring and cables and electrical safety precautions.
			Recognize importance of earthing and methods of earthing and electrical installations
14	18EE C02	BASIC ELECTRICAL ENGINEERING LAB	Get an exposure to common electrical components and their ratings.
			Make electrical connections by wires of appropriate ratings.
			Understand the circuit analysis techniques.
			Determine the parameters of the given coil.
			Understand the basic characteristics of transformer.
			Understand the basic characteristics of dc and ac machines
15	18CY C02	CHEMISTRY LAB	Estimate rate constants of reactions from concentration of reactants/products as a function of time.
			Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
			Synthesize a small drug molecule and Identify the organic compounds.
			understand importance of analytical instrumentation for different chemical analysis.
			Perform interdisciplinary research such that the findings benefit the common man
16	18MT C05	MATHEMATICS-III	Solve Linear and Non-Linear PDE's.
			Solve One-Dimension Wave and Heat equations and Two Dimension Laplace equation.
			Find Laplace transform and inverse Laplace transform and can solve Linear Differential equations.
			Find the solutions of various Transforms.
			Find moments of discrete and continuous random variables as well as familiar with distribution
17	18MB C01	ENGINEERING ECONOMICS AND ACCOUNTANCY	Apply fundamental knowledge of Managerial economics concepts and tools.
			Understand various aspects of demand analysis and forecasting.
			Analyze production and cost relationships to make best use of resources available.
			Analyze different opportunities and come out with best feasible capital investment decisions.
			Apply accountancy concepts and conventions and preparation of final accounts
18	18ME C03	MATERIAL SCIENCE AND METALLURGY	Understand the imperfections of crystals.
			Understand crack propagation by fatigue, creep deformation and diffusion theory.
			Understand the importance of steel in engineering applications.
			Understand to the methods of improvement of mechanical properties by various heat treatment operations
			Understand the methods of production of various metals by extractive metallurgy
19	18ME C04	MECHANICS OF	Determine stresses and strains in members subjected to axial loads and

		MATERIALS	<p>temperature changes.</p> <p>Draw shear force, bending moment diagrams for different types of beams and calculate stresses and strains due to simple bending.</p> <p>Determine slope and deflection for various configurations of beams using different methods. analyze stress, strain and deflection due to torsion in circular members.</p> <p>Analyze shear stress distribution in different sections of beams and find out principal stresses and strains.</p> <p>Find out stresses and strains in thin, thick cylindrical shells and also able to calculate critical buckling loads in columns and struts.</p>
20	18ME C10	FLUID PRINCIPLES AND HYDRAULIC MACHINES	<p>Determine the various properties of fluid and their applications</p> <p>Understand the methodology in calculation of impact force exerted by the jet on the vanes</p> <p>Acquire the knowledge of the functionality and performance of Reciprocating pumps.</p> <p>Understand the working, estimate the performance and testing of Centrifugal pumps.</p> <p>Acquire knowledge in the functionality, performance and testing of hydraulic turbines.</p>
21	18EG M01	INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES	<p>Understand the making of the Indian Constitution and its features.</p> <p>Have an insight into various Organs of Governance - composition and functions.</p> <p>Understand powers and functions of Municipalities, Panchayats and Co-operative Societies.</p> <p>Be aware of the Emergency Provisions in India.</p> <p>Understand the Right To equality, the Right To freedom and the Right To Liberty.</p>
22	18EE A01	INDIAN TRADITIONAL KNOWLEDGE	<p>Understand philosophy of Indian culture.</p> <p>Distinguish the Indian languages and literature.</p> <p>Learn the philosophy of ancient, medieval and modern India.</p> <p>Acquire the information about the fine arts in India.</p> <p>Know the contribution of scientists of different eras</p>
23	18ME C05	MATERIAL SCIENCE AND METALLURGY LAB	<p>Identify crystal structure of various metals.</p> <p>Measure hardness and can correlate with microstructure.</p> <p>Perform a suitable heat treatment operation based on desired properties.</p> <p>Underlines the importance of grain size in evaluating the desired mechanical properties.</p> <p>Correlate the heat treatment methods and the mechanical properties obtained</p>
24	18ME C06	MECHANICS OF MATERIALS LAB	<p>Draw stress-strain curve for an isotropic material and understand the salient features of it.</p> <p>Determine the Young's modulus of various beam materials by conducting load-deflection test and. rigidity modulus of a given shaft specimen by torsion test.</p> <p>Able to find out Young's modulus and shear modulus for mechanical components like leaf spring and closely coiled helical spring through load-deflection test respectively.</p> <p>Evaluate hardness of different materials using different scales</p> <p>Find the compressive and crushing strengths of concrete cubes and bricks.</p>
25	18ME C11	FLUID PRINCIPLES AND HYDRAULIC MACHINES LAB	<p>Carry out discharge measurements</p> <p>Determine the energy loss in conduits.</p> <p>Calculate forces and work done by a jet on fixed or moving, flat and curved blades.</p> <p>Evaluate the performance characteristics of pumps.</p> <p>Demonstrate the characteristics curves of turbines.</p>
26	18CS C05	BASICS OF DATA STRUCTURES	<p>Understand the basic concepts of data structures.</p> <p>Understand the notations used to analyze the performance of algorithms.</p>


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
			Choose and apply an appropriate data structure for a specified application.
			Understand the concepts of recursion and its applications in problemsolving.
			Demonstrate a thorough understanding of searching and sorting algorithms
27	18ME C07	KINEMATICS OF MACHINES	Basic elements of mechanisms and their motion characteristics.
			Designing a suitable mechanism depending on application.
			Principles involved in functioning of brakes and dynamometer
			Drawing displacement diagrams and cam profile diagram for followers executing different types of motions and various configurations of followers.
			Selecting gear and gear train depending on application.
28	18ME C08	THERMO DYNAMICS	Estimate the temperature of different scales of thermometers.
			Apply the first law of thermodynamics to various thermodynamic processes.
			Understand the meaning of perpetual motion of machine of secondkind and its significance.
			Read data from steam tables, Mollier diagram and its applications.
			Distinguish working principles of various air standard cycles, vapourpower cycles and determine air–fuel ratios required for combustionof fuels
29	18ME C09	PRINCIPLES OF MANAGEMENT	Identify and evaluate the principles of management
			Demonstrate the ability to have an effective and realistic planning
			Identify the nature and the type of organization
			Apply the tools and techniques of directing
			Explain and evaluate the necessity for controlling and further refinement of an organization
30	18PE C03	METAL CASTING AND WELDING	Design the pattern, gating system and riser for a simple casting.
			Understand various properties of molding sand, furnaces used in foundry, and defects in casting
			Describe various special casting processes
			Describe various arc welding processes.
			Compare various arc, resistance, solid state and other welding processes.
31	18CE M01	ENVIRONMENTAL SCIENCE	To define environment, identify the natural resources and ecosystemsand contribute for the conservation of bio-diversity.
			To suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
			To relate the social issues and the environment and contribute for the sustainable development.
			To follow the environmental ethics.
			To contribute for the mitigation and management of environmentaldisasters
32	18CS C08	BASICS OF DATA STRUCTURES LAB	Implement the abstract data type.
			Implement linear data structures such as stacks, queues using arrayand linked list.
			Understand and implement non-linear data structures such as trees,graphs.
			Implement various kinds of searching, sorting and traversal techniques.
			Identify the suitable data structure for real world problem.
33	18EG C03	SOFT SKILLS LAB	Be assertive and set short term and long term goals. Also learn tomanage time effectively and deal with stress.
			Win in professional communication situations and participate in group discussions with confidence. Write abstracts.
			Write effective resumes. Plan, prepare and face interviews confidently.
			Adapt to corporate culture by being sensitive - personally and sensible-professionally. Draft an SOP.
			Apply the soft skills learnt in the mini-live project, by collecting andanalyzing data and making oral and written presentations on the same.


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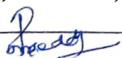
34	18PE C04	METAL CASTING AND WELDING LAB	Prepare the mould for a single piece and split patterns.
			Test the moulding sand and analyze the same.
			Test the bead geometry and correlate the results to the input parameters.
			Distinguish the type of the flame and recommend for different materials.
35	18ME C12	DYNAMICS OF MACHINES	Use TIG, MIG and Spot welding machines and experiment with them.
			Determine the fluctuation of energy and decide the cross section of flywheel.(BL-3)
			Understand the gyroscopic effects in ships, aero planes and road vehicles.(BL-2)
			Analyze the characteristics of various centrifugal governors. (BL-4)
36	18ME C13	APPLIED THERMODYNAMICS AND HEAT TRANSFER	Analyze balancing problems in rotating and reciprocating machinery. (BL-4)
			Understand free and forced vibrations of single degree freedom systems and two-degree freedom linear systems.
			Estimate the power required for reciprocating air compressor using the basic principles of thermodynamics for many engineering applications. (BL-4)
			Evaluate the performance of C.I. and S.I. engines with appropriate consideration for public health and safety. (BL-5)
37	18ME C14	DESIGN OF MACHINE ELEMENTS	Understand the standards, codes, various design considerations and failure criteria of members (BL-2)
			Analyze and evaluate machine members subjected to static and dynamic loads(BL-4)
			Recommend suitable shafts, couplings and belt drives for a given application(BL-5)
			Design permanent joints for a given application(BL-6)
38	18PE C05	METAL FORMING TECHNOLOGY	Design bolted joints, power screws and screw jack(BL-6)
			Apply theory of plasticity to analyze metal forming processes.
			Understand the basic principles and practical aspects of metal forming operations.
			Understand various process parameters that affect product quality in various processes under different conditions
39	18ME E01	REFRIGERATION AND AIR CONDITIONING	Determine load, energy and power required for various processes and machines.
			Propose suitable metal forming processes for making different products.
			Evaluate COP of various air craft refrigeration systems using principles of thermodynamics along with necessity of eco-friendly refrigerants for public health and safety (BL-4)
			Analyze COP of vapor compression refrigeration system with the appropriate concern for environment.(BL-4)
40	18ME E02	VALUES, ETHICS AND SOCIETY	Understand the Vapour absorption, steam jet refrigeration and non-conventional refrigeration in order to provide valid conclusions over simple vapor compression refrigeration system. (BL-2)
			Understand the working principle of air conditioning system including human comfort and its importance over environment, society with balance of ecological system. (BL-2)
40	18ME E02	VALUES, ETHICS AND SOCIETY	Apply the principles of engineering which are complex in nature, having lifelong learning to design air conditioning system for various environments. (BL-3)
			State basic values and the need for value education.(BL -2)
			Differentiate between values and skills, happiness and

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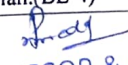
			<p>accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual.(BL-2)</p> <p>Demonstrate the knowledge of ethics at their work place and apply different theoretical approaches to solve ethical dilemmas.(BL-3)</p> <p>Apply risk and safety measures in the engineering practice.(BL-3)</p> <p>Understand the role of a human being in ensuring harmony in society and nature.(BL-2)</p>
41	18PE E01	PLASTICS, CERAMICS AND COMPOSITE MATERIALS	<p>Recall the types of plastics, properties and applications.(BL-1)</p> <p>Select the suitable method of manufacturing a plastic component. (BL-5)</p> <p>Describe refractories, their manufacturing methods and applications.(BL-2)</p> <p>Describe the properties, uses and Manufacturing methods of white wares, ceramic coatings and glass.(BL-2)</p> <p>Understand the concept of composites, properties in engineering applications.(BL-2)</p>
42	18PE E02	PRODUCT DESIGN AND PROCESS PLANNING	<p>Define the needs of the customer while designing a new product or modifying existing product in the competitive environment.(BL-1)</p> <p>Understand creativity, brainstorming and ergonomic concepts.(BL-2)</p> <p>Apply the concept of design for manufacture, assembly, maintenance, reliability and product life cycle in developing a product.(BL-3)</p> <p>Implement the Intellectual Property Rights to a new product or a process.(BL-3)</p> <p>Evaluate and recommend an effective Process Plan and principles of value engineering to new product development.(BL-5)</p>
43	18PE E03	POWDER PROCESSING	<p>Characterize the Powders in different techniques.</p> <p>Suggest appropriate compaction technique for a particular powder.</p> <p>Suggest appropriate sintering technique for a particular powder.</p> <p>Choose correct post sintering processes.</p> <p>Have ability to choose the appropriate testing for sintered parts.</p>
44	18ME E04	AUTOMOBILE ENGINEERING	<p>Understand the basic layout of automobiles (BL-2)</p> <p>Understand the various systems in an automobile like engine cooling, lubrication, ignition, electrical and air conditioning systems with the principles of thermodynamics.(BL-2)</p> <p>Describe the principles of suspension and steering system using modern tool usage (BL-2)</p> <p>Explore the recent systems in Braking and Transmission. (BL-3)</p> <p>Evaluate the effect of automobile pollution on environment and necessity of pollution norms along with trouble shooting (BL-5)</p>
45	18ME E05	NANO SCIENCE AND TECHNOLOGY	<p>Understand the basic concepts, developments and challenges in Nano technology. (BL-2)</p> <p>Describe the methods of evaluating magnetic and electronic properties, microstructure by SPM, atomic force microscopy, friction force microscopy.(BL-2)</p> <p>Apply homogenous & heterogeneous methods and characterization techniques of Zero & One dimensional Nano structures.(BL-3)</p> <p>Evaluate various Nano Material Fabrication Techniques. (BL-5)</p> <p>Analyze Nano materials and Nano bio materials for obtaining solutions to societal problems. (BL-4)</p>
46	18ME E06	RIGHTS, DUTIES AND LEGISLATION	<p>Recall the human rights in the global and national context.(BL-1)</p> <p>Understand the overall view on working of Indian constitution.(BL-2)</p> <p>Analyse the societal problems in the context of human rights.(BL-4)</p> <p>Evaluate implementation of right to development and right to information.(BL-5)</p> <p>Application of human rights for human safety and clean environment.(BL-3)</p>


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47	18PE E04	NON DESTRUCTIVE TESTING AND EVALUATION	Understand Non Destructive Testing techniques of Dye penetrant inspection and Magnetic particle inspection.(BL-2)
			Compare eddy current testing with other NDT methods.(BL-2)
			Identify different types of defects using ultra sonic testing.(BL-2)
			Analyze the radiograph to detect the defects by using principles of radiography.(BL-4)
			Interpret latest techniques of NDT with other methods.(BL-3)
48	18PE E05	SURFACE ENGINEERING	Demonstrate basic understanding of friction, and be familiar with adhesion theories and the effect of adhesion on friction.
			Demonstrate basic understanding of wear processes, and able to describe wear mechanisms on engineering components
			Demonstrate basic understanding of corrosion and know the methods to reduce the corrosion on engineering components
			Design a tribological system for optimal performance, and Justify, critical analysis on surface engineering techniques and surface design for relevant applications
			Apply surface engineering principles and methods to modify and improve the properties of surfaces for structural and functional applications
49	18ME C15	DYNAMICS AND VIBRATIONS LAB	Demonstrate the dynamic behavior of mechanical systems.(BL-3)
			Analyze the cam profile for different motion characteristics.(BL-4)
			Examine the performance of governors and the gyroscopic effect on vehicles.(BL-3)
			Evaluate the static and dynamic balancing masses in a rotating mass system.(BL-5)
			Determine the natural frequency of different single degree freedom vibrating systems.(BL-3)
50	18ME C16	APPLIED THERMODYNAMICS AND HEAT TRANSFER LAB	Evaluate the performance of petrol and diesel engines. (BL-5)
			Evaluate the heat losses in heat balance sheet of IC engine. (BL-5)
			Determine the performance of multi stage reciprocating air compressor and its importance over single stage air compressor.(BL-3)
			Estimate the effect of insulation on conduction heat transfer and also estimate the value of convection heat transfer coefficients under different scenario. (BL-5)
			Determine Stefan - Boltzmann constant, emissivity of grey plate and LMTD of heat exchanger (BL-3)
51	18PE C06	METAL FORMING TECHNOLOGY LAB	Understand the practical aspects of metal forming operations.
			Understand various process parameters that affect product quality under different conditions.
			Determine load, energy and power required for various processes and machines.
			Propose suitable metal forming processes for making different products.
			Design and fabricate various types of dies for sheets metal operations.
52	18ME C17	CAD/CAM	Understand the applications of computer in design, manufacturing, and geometric transformation techniques(BL-2)
			Apply Wireframe, surface, and solid modeling techniques for the generating various parts.(BL-3)
			Distinguish various NC systems and develop the CNC program.(BL-4)
			Demonstrate the fundamentals knowledge of robotics(BL-2)
			Understand automated manufacturing environment.(BL-2)
53	18ME C18	MACHINE DESIGN	Understand the stresses in helical, leaf springs under static and fluctuating loads.(BL-2)
			Design the spur, helical and bevel gears.(BL-6)
			Demonstrate the ability in designing sliding contact bearings.(BL-3)
			Selection of rolling contact bearings and roller chains.(BL-4)
			Design of IC engine piston, connecting rod, crank shaft, C-clamp and crane hooks.(BL-6)


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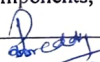
54	18PE C09	MACHINE TOOL ENGINEERING	Select tool geometry for various materials.
			Estimate the tool wear
			Identify the machine tools for manufacturing various components.
			Select grinding wheel and Automats.
55	18ME E08	OBJECT ORIENTED PROGRAMMING WITH C++	Work on shaper, planner and grinding machines
			Identify fundamental object oriented concepts of C++ programming Language.(BL-1)
			Distinguish between object oriented program and structured programming(BL-2)
			Use operator overloading to give comfort in the programming.(BL-3)
			Illustrate Exception handling and templates(BL-4)
56	18ME E09	MECHANICS OF COMPOSITE MATERIALS	Solve basic mechanical engineering problems by developing programs using object oriented features (BL-5)
			Differentiate between composite materials and conventional materials using basic concepts.(BL-2)
			Analyze macro and micro mechanical behaviour of a lamina.(BL-4)
			Determine role of constituent materials in defining the average properties and response of compositematerials on macroscopic level.(BL-3)
			Analyze the laminates for stresses and strains using Classical lamination theory(BL-4)
57	18ME E10	ROBOTIC ENGINEERING	Summarize the various fabrication methods of composite materials and measurements of propertiesthrough tests.(BL-2)
			Understand the basic components and specifications of the Robots (BL-2)
			Solve the problems of transformations, direct and inverse kinematics of robots (BL-3)
			Analyze forces in links and joints of a robot and find the singularities, Jacobian and trajectory planning of a robot for various tasks(BL-4)
			Recommend sensors and controllers for finding position and orientation to take corrective action basedon feedback(BL-5)
58	18PE E06	PRODUCTION AND OPERATIONS MANAGEMENT	Design an intelligent robot using machine vision and sensors (BL-6)
			Understand the role of production system and its design in Production and Operations Management.(BL-2)
			Apply forecasting techniques for predicting demand.(BL-3)
			Use Aggregate Planning, Master Scheduling and Materials Requirement Planning in a production system.(BL-3)
			Compare various inventory control techniques used in production system.(BL-4)
59	18PE E07	PRINCIPLES OF INDUSTRIAL ENGINEERING	Apply the quality control tools to improve performance of production system.(BL-3)
			Conceptualize the essence of industrial engineering techniques.
			Plan, execute and control production related issues.
			Analyze and choose right inventory control techniques.
			Plot control charts and apply quality control tools.
60	18ME E12	COMPUTATIONAL FLUID DYNAMICS	Apply productivity improvement techniques.
			Describe and develop mathematical models for flow phenomena.(BL-1)
			Classify PDE for fluid flow and heat transfer applications.(BL-2)
			Apply Finite Difference Method for fluid flow and heat transfer problems(BL-3)
			Test the discretized equations for stability and solve the system of linear equations(BL-4)
61	18ME E13	PRINCIPLES OF ENTREPRENEURSHIP	Formulate numerical equations by Finite Volume Method for fluid flow and heat transfer problems (BL-6)
			Understand the concept and essence of entrepreneurship.(BL-2)
			Identify business opportunities and nature of enterprise.(BL-3)
			Analyze the feasibility of new business plan.(BL-4)


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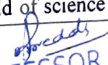
			Apply project management techniques like PERT and CPM for effective planning and execution of projects.(BL-3)
			Use behavioral, leadership and time management aspects in entrepreneurial journey.(BL-3)
62	18PE E08	MODERN MACHINING AND FORMING METHODS	Compare the Traditional and Non Traditional Machining process and recognize the need for Non traditional Machining process.(BL-2)
			Illustrate constructional features, performance parameters, process characteristics, applications, advantages and limitations of Non Traditional Machining process.(BL-3)
			Classify mechanisms of material removal of various non traditional machining processes.(BL-4)
			Describe the principles, characteristics, advantages, limitations and applications of various unconventional methods of forming, HERF. (BL-1)
			Compare the principles, constructional features and applications among explosive forming, EHF and EMF. (BL-4)
63	18ME E15	BLOCKCHAIN TECHNOLOGY	Outline the concepts of blockchain technology.(BL-2)
			Understand the bit coin, working with consensus in Bitcoin.(BL-2)
			Develop knowledge about designing and building Permissioned block chains.(BL-3)
			Explain the concepts of supply chain management and internet enabled supply chains.(BL-2)
			Make use of blockchain applications involved in various sectors.(BL-3)
64	18ME E16	FINITE ELEMENT METHODS	Apply FE method for solving field problems using Virtual work and Potential energy formulations
			Analyze linear problems like axial, trusses and beam problems
			Analyze 2D structural problems using CST element and analyze plane stress, plane strain and axi-symmetric problems with triangular elements
			Write shape functions for 4 node quadrilateral isoparametric elements, apply numerical integration, Gaussian quadrature and to estimate natural frequencies for stepped bar
			Check for convergence requirements, Solve linear 1D and 2D heat conduction and convection heat transfer problems, formulate 3D elements, apply finite element analysis software for engineering solutions
65	18ME E17	RENEWABLE ENERGY SOURCES	Understand the need for renewable energy sources in the context of environmental issues.(BL-2)
			Apply the principles of solar energy for domestic and industrial usages.(BL-3)
			Understand the working principle of wind power plants along with merits and demerits.(BL-2)
			Describe the concepts of geothermal energy sources and biomass as a source of energy.(BL-2)
			Explain the principles and impact of wave, tidal and OTEC plants on the environment.(BL-2)
66	18ME E18	CONTROL SYSTEMS THEORY	Understand control system, modeling and transfer functions of different systems.(BL-3)
			Apply the concept of block diagram and signal flow graphs to different systems.(BL-3)
			Differentiate between time domain and frequency domain techniques.(BL-2)
			Examine the stability of a system using different approaches.(BL-3)
			Analyze the system in state space and to find out the controllability and observability.(BL-4)
67	18ME E19	ARTIFICIAL INTELLIGENCE	Differentiate between a rudimentary Problem and an AI problem, its Characteristics and
			Compare and contrast the various knowledge representation schemes of AI.(BL-4)
			Analyze various reasoning and planning techniques involved in solving AI problems.(BL-4)


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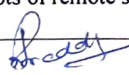
			Understand the different learning techniques.(BL-2)
			Apply the AI techniques in the field of mechanical engineering.(BL-3)
68	18ME E20	INDUSTRIAL ADMINISTRATION AND FINANCIAL MANAGEMENT	Understand different types of business organizations, functions of management and importance of various types of plant layouts.(BL-2)
			Apply techniques of method study and work measurement in organizations to enhance productivity (BL-3)
			Use quality control charts and tools in industries.(BL-3)
			Apply various optimization and project management techniques for solving real time problems.(BL-3)
			Understand basic concepts of Cost accounting and financial management (BL-2)
69	18PE E10	TOTAL QUALITY MANAGEMENT	Apply TQM techniques in engineering applications
			Use various theories and principles related to TQM
			Use statistical techniques in TQM
			Have awareness and use quality information system and innovative systems
			Deal with customer grievances and satisfying the customers
70	18ME E20	CAD/CAM LAB	Model components using CAD software. Select appropriate commands to generate 3D model (BL-3)
			Select constraints to assemble the components(BL-3)
			Develop manufacturing drawings from 3D models(BL-3)
			Analyze the concept CNC part program to generate tool path for different machining operations(BL-4)
			Develop a product using CAD/CAM technology(BL-6)
71	18PE C10	MACHINE TOOL ENGINEERING LAB	Grind single point cutting tool with various angles.
			Perform various machines on lathe.
			To manufacture a gear using milling machine.
			Do operation on shaper.
			Get exposure to various unconventional processes.
72	18ME C22	METROLOGY AND INSTRUMENTATION	Understand the need, accuracy and associated concepts of measurements.(BL-2)
			Select appropriate gauges for inspection and design.(BL-3)
			Calculate surface roughness by using appropriate instruments.(BL-3)
			Analyze and interpret the types of errors, strain measurement and instrument characteristics.(BL-4)
			Evaluate measuring methods and devices for displacement, pressure & temperature.(BL-5)
73	18ME C23	OPERATIONS RESEARCH	Understand the concepts of linear programming problems.(BL-2)
			Solve the given transportation problem.(BL-3)
			Develop optimum pair of operations and resources by using Assignment technique.(BL-3)
			Analyze project management techniques like CPM and PERT to plan and execute projects successfully.(BL-4)
			Apply sequencing and queuing theory concepts for industry applications.(BL-3)
74	18PE C11	ADDITIVE MANUFACTURING TECHNOLOGIES	Explain the process chain of Additive manufacturing and their classification, advantages and disadvantages
			Critically explore and compare the technologies used for additive manufacturing in terms of their material, parameters, applications and limitations
			Analyse various software issues for rapid prototyping and related operations for STL file and features of various slicing softwares
			Identify different post processing techniques involved in enhancing the properties of the 3d printed components, understand rapid tooling


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			Understand applications of Additive Manufacturing in various fields
75	18ME E21	POWER PLANT ENGINEERING	Select the suitability of site for a power plant in the context of environment.(BL-4)
			Discuss ash handling and coal handling methods in thermal power plants.(BL-2)
			Understand the importance of site selection for a hydro-power plant in the context of societal and environment.(BL-2)
			Explain the safety aspects of nuclear waste disposal.(BL-2)
			Estimate the economic factors and pollutant formation from power plants.(BL-3)
76	18ME E22	ENGINEERING RESEARCH METHODOLOGY	Define research problem.(BL-1)
			Review and assess the quality of literature from various sources.(BL-2)
			Understand and develop various research designs.(BL-2)
			Analyze problem by statistical techniques: ANOVA, F-test, Chi-square.(BL-4)
			Improve the style and format of writing a report for technical paper/ Journal report.(BL-4)
77	18ME E23	DATA ANALYTICS	Solve the problems using statistics, regression analysis and ANOVA. (BL-3)
			Understand the concept of machine learning.(BL-2)
			Apply various supervised learning techniques to a given problem.(BL-3)
			Understand unsupervised learning and problems in big data analysis.(BL-2)
			Demonstrate prescriptive analytics methods to the given data. (BL-2)
78	18ME E24	INNOVATION AND INTELLECTUAL PROPERTY RIGHTS	Understand the evolution of Intellectual property, working of organization's at global level to protect and promote intellectual property.(BL-2)
			Apply the patent filing process at national and international level.(BL-3)
			Derive logical conclusion of research, innovation and patent filing.(BL-4)
			Compare different kinds of Intellectual property and their patenting system.(BL-2)
			Understand the techno-legal-business angle of Intellectual property, infringement and enforcement Mechanisms for protection.(BL-2)
79	18PE E12	SUPPLY CHAIN MANAGEMENT	Understand fundamentals of supply chain and its key concepts.(BL-2)
			Design an effective supply chain network.(BL-4)
			Understand the essence of demand and supply and associated gaps.(BL-2)
			Apply inventory management techniques.(BL-3)
			Evaluate pricing and revenue management systems.(BL-5)
80	18IT O01	OBJECT ORIENTED PROGRAMMING USING JAVA	Understand Object-Oriented concepts.
			Create Java applications using sound OOP practices e.g. Inheritance, Interfaces, Packages, and InnerClasses.
			Implement Exception Handling and Multithreading concepts in java programs.
			Develop programs using the Java Collection API and Stream classes.
			Design and Develop GUI applications with the integration of event handling, JDBC.
81	18PY O01	HISTORY OF SCIENCE AND TECHNOLOGY	Demonstrate the process of beginning of science and civilization, knowledge acquisition and philosophical approach of science and its advancements in the Stone Ages and Antiquity period.
			Illustrate the advancements in science and technology in the medieval period across Asia and Arab countries and decline and revival of science in Europe.
			Explain the scientific approach and its advances of the Europeans and how the role of engineer during the industrial revolution and the major advancements.
			Make use of the advancements in the field of science and


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			<p>technology by adopting new philosophies of 19th and first half of 20th century in finding ethical solutions to the societal problems.</p> <p>Interpret the changes in specializations of science and the technology and build the relation between information and society from second half of 20th century onwards.</p>
82	18EG 002	GENDER SENSITIZATION	<p>Understand the difference between -Sex I and -Gender I and be able to explain socially constructed theories of identity.</p> <p>Recognize shifting definitions of -Man I and -Women I in relation to evolving notions of -Masculinity I and -Femininity I.</p> <p>Appreciate women's contributions to society historically, culturally and politically.</p> <p>Analyze the contemporary system of privilege and oppressions, with special attention to the ways gender intersects with race, class, sexuality, ethnicity, ability, religion, and nationality.</p> <p>Demonstrate an understanding of personal life, the workplace, the community and active civic engagement through classroom learning</p>
83	18IT 003	PRINCIPLES OF INTERNET OF THINGS	<p>Comprehend the terminology, protocols and communication models of IoT.</p> <p>Define the various IoT enabling technologies and differentiate between M2M and IoT.</p> <p>Acquire the basics of Python Scripting Language used in developing IoT applications.</p> <p>Describe the steps involved in IoT system design methodology.</p> <p>Design simple IoT systems using Raspberry Pi board and interfacing sensors with Raspberry Pi.</p>
84	18CS 009	BASICS OF ARTIFICIAL INTELLIGENCE	<p>Identify various search strategies to solve problems.</p> <p>Compare and contrast knowledge representation schemes.</p> <p>Apply Bayesian Networks and Dempster Shafer theory for reasoning</p> <p>Explain the role of agents and interaction with the environment</p> <p>Determine different learning paradigms.</p> <p>Explain robotic architectures and expert systems.</p>
85	18ME C25	METROLOGY AND INSTRUMENTATION LAB	<p>Measure the linear dimension by using appropriate method & device.(BL-3)</p> <p>Demonstrate the knowledge of angular measurements and use measuring instruments as per requirements.(BL-2)</p> <p>Determine the gear and screw thread parameters using profile projector and tool makers' microscope. (BL-3)</p> <p>Design and test plain limit gauges for a given specimen.(BL-3)</p> <p>Evaluate and estimate the measurement of flatness, roundness and surface roughness.(BL-5)</p>
86	18PE C12	ADDITIVE MANUFACTURING LAB	<p>Generate tool path data for any component using slicing software</p> <p>Compare different Additive manufacturing processes and select a subtractive or an AM process for a particular application for product development of engineering components</p> <p>Use different post processing techniques to enhance the component after fabrication</p> <p>Generate STL file from digital data input</p> <p>Operate themselves the 3d printing machine</p>
87	18ME C27	PROJECT: PART -1	<p>Identify a topic in advanced areas of Mechanical / Allied fields of Engineering.(BL-1)</p> <p>Review literature to identify the gaps, define the objectives and scope of the work.(BL-2)</p> <p>Generate innovative ideas for societal benefit and Nation building.(BL-6)</p> <p>Develop prototypes/models, experimental setup and software systems necessary to meet the objectives.</p> <p>Prepare a technical report and present before the departmental committee(BL-5)</p>
88	18EC 001	REMOTE SENSING AND GIS	<p>Demonstrate the understanding of basic concepts of remote sensing and interpret energy interactions.</p>


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			Choose an appropriate technique for a given scenario by appreciating the types of remote sensing.
			Distinguish the principle behind the working of microwave and LiDAR sensing.
			Apply an appropriate data model from the acquired knowledge of the basics of GIS.
			Explain the procedure for encoding data and geospatial data analysis.
89	18MT 001	APPLIED OPERATIONS RESEARCH	Define and formulate LPP and appreciate their limitations.
			Solve the problem using different optimization techniques.
			Solve the problem of transporting the products from origins to destination with least cost.
			Convert and solve the practical situations into Dynamic programming problem.
			Identifying the resources required for a project and generate a plan and work schedule.
90	18EE 003	ENERGY AUDITING	Know the current energy scenario and importance of energy auditing.
			Understand the concepts of energy auditing.
			Evaluate the performance of existing engineering
			Systems Explore the methods of improving energy efficiency in different engineering
			Systems Design different energy efficient devices.
91	18CS 004	BASICS OF CYBER SECURITY	List the different types of cybercrimes and analyze legal frameworks to handle cybercrimes.
			Identify the Tools and Methods used in cybercrimes.
			Analyze and resolve cyber security issues and laws governing Cyberspace.
			Describe the need of Digital Forensics and the importance of digital evidence in prosecution.
			Interpret the commercial activities in the event of significant information security incidents in the Organization.
			Discuss the vulnerabilities in networking protocols and their mitigation techniques.
92	18EC 005	MEMS AND ITS APPLICATIONS	Understand various materials used for MEMS.
			Design the micro devices and systems using the MEMS fabrication process.
			Analyze the operation of different Sensors and Actuators.
			Interpret the micro devices and systems using Polymer MEMs.
			Apply different MEMS devices in various disciplines.
93	18EG 001	TECHNICAL WRITING SKILLS	Understand the channels of communication and define nature and aspects of Technical communication
			Compare and contrast technical communication to that of general communication while constructing errorfree sentences applying features of technical writing.
			Analyze data, draw inferences to write Journal articles and conference papers and to compose businessletters.
			Evaluate data to draft technical reports and technical proposals.
			Design a technical presentation by understanding the nuances of presentation skills and also transfer datafrom verbal to graphic and vice versa.
94	18BT 001	BASICS OF BIOLOGY	Explain the theories of origin and evolution of life.
			Describe the anatomical structure and physiological functions of the human organ systems.
			Outline the principle and applications of medical devises.
			Discuss the technology advancements in improving human health and environment
			Explain the biological information, sequencing and evolutionary relationship among organisms.
95	18CE 002	DISASTER MITIGATION AND MANAGEMENT (M)	Identify and understand the fundamental terminologies in disaster management.


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			Distinguish between the Hydro-meteorological disasters and apply the concepts of structural and non- structural mitigation measures.
			Categorize different Geographical Disasters and apply the knowledge in utilizing the early warning systems.
			Analyze various mechanisms and consequences of human induced disasters.
			Develop an awareness of disaster management phases and formulating effective disaster management plans, ability to understand various participatory roles of stakeholders- Central and State Government bodies at different levels.
96	18EE 005	WASTE MANAGEMENT	Understand the various processes involved in allied disciplines of engineering
			Infer the regulations of governance in managing the waste
			Distinguish the nature of waste materials concerned to the particular branch of engineering
			Explore the ways and means of disposal of waste material
			Identify the remedies for the disposal of a selected hazardous waste material
97	18EC 007	SYSTEM AUTOMATION AND CONTROL	Understand the features of various automatic and process control systems.
			Define and analyze various measuring parameters in the industry.
			Compare performance of various controllers (P, PD, PI, and PID).
			Illustrate the role of digital computers in automation.
			Develop various robot structures for different applications.
98	18PE C15	PROJECT: PART -2	Summarize the literature review for the identified problem
			Identify methods and materials to carry out experiments/ develop code/simulation
			Integrate the methodology and engineering tools adopted for solving the problem
			Analyze and discuss the results to draw valid conclusions
			Exhibit knowledge, skill, attitude and technical knowhow in preparing report as per format and presenting as a professional engineer


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**CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY
(Autonomous)**


Gandipet, Hyderabad -75

**Department of Mechanical Engineering
Program: Production Engineering Course Outcomes
Statements for B.E (Prod) – R16**


SNo	Course		Course Outcomes Statements
	Code	Name	
1.	16MT C01	ENGINEERING MATHEMATICS – I	Solve system of linear equations and identify the Eigen values and Eigen vector in engineering problems
			Expand and find extreme values of functions of two variables
			Trace and interpret curve behavior in physical systems
			Find the areas, volumes and surface of solids revolution
			Use-differential equations to model engineering phenomena such as circuit theory, networks
			An ability to solve the problems and interpret it in geometrical approach
2.	16CY C01	ENGINEERING CHEMISTRY	This syllabus gives necessary theoretical aspects required for understanding intricacies of the subject and also gives sufficient exposure to the chemistry aspects in different disciplines of engineering
			The above knowledge also helps students to carry out inter disciplinary research such that the findings benefit the common man.
			This syllabus imparts a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.
3.	16PY C02	APPLIED PHYSICS	Understand the advances in laser physics, holography, optical fibers and apply them in engineering & technology
			Explain the importance of wave mechanics and band theory of solids
			Analyze and apply distributions of statistical mechanics for problem solving
			Identify the materials with semiconducting and superconducting properties for engineering applications
			Understand the role of novel materials and their characterization techniques in engineering and technology
4.	16CS C01	PROGRAMMING AND PROBLEM SOLVING	Develop algorithms for scientific problems.
			Explore algorithmic approaches to problem solving.
			Understand the components of computing systems.
			Choose data types and structure to solve mathematical problem.
			Develop modular programs using control structure, arrays and structures.
			Write programs to solve real world problems using structured features
5.	16ME C01	ELEMENTS OF MECHANICAL ENGINEERING	Select the material depending upon requirement.
			Evaluate performance of Petrol & Diesel engines.
			Demonstrate his/her knowledge in preparing process chart for various machining operations.
			Estimate the power required for various power transmitting devices like belt and gear trains.
			Become a successful entrepreneur after studying principles of management.
			Apply various quality control techniques after studying principles of industrial engineering
6.	16EC C01	ELEMENTS OF ELECTRONICS AND COMMUNICATION	Familiar with the basic electronic devices and simple circuits
			Work with Boolean algebra principles, build the simple combinational and sequential circuits
			Appreciate the need for modulation, filtering and multiplexing

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		ENGINEERING	Understand the working principles of a few communication systems Familiar to the selected applications
7.	16CE C03	PROFESSIONAL ETHICS AND HUMAN VALUES	Students develop the capability of shaping themselves into outstanding personalities, through a value based life. Students turn themselves into champions of their lives. Students take things positively, convert everything into happiness and contribute for the happiness of others. Students become potential sources for contributing to the development of the society around them and institutions/ organisations they work in. Students shape themselves into valuable professionals, follow professional ethics and are able to solve their ethical dilemmas.
8.	16CS C02	PROGRAMMING LABORATORY	Identify the computing environments. Formulate solutions to problems and represent them using algorithms/ Flowcharts. Choose proper control statements and data structures to implement the algorithms. Trace the programs with test the program solution. Decompose a problem into modules and use functions to implement the modules. Develop applications using file I/O.
9.	16ME C03	MECHANICAL AND IT WORKSHOP	Fabricate components with their own hands. Get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes. Assembling different components, student will be able to produce small mechanisms/devices of their interest. Gain practical skills of carpentry, tinsmithy, fitting, house wiring. Gain knowledge of different Engineering Materials and Manufacturing Methods. Understand trades and techniques used in Workshop and chooses the best material/ manufacturing process for the application.
10.	16PY C04	APPLIED PHYSICS LABORATORY	Understand the various applications of semiconductor devices and their suitability in engineering Demonstrate the working of lasers and optical fibers and their applications in the field of communication. Analyze the electrical properties of a given solid based on its energy band gap. Verify the resistance and thermoelectric given power properties with temperature variation. Demonstrate the concept of electron and its chare experimentally.
11.	16CY C03	ENGINEERING CHEMISTRYLABORATORY	This syllabus helps the student to understand importance of analytical instrumentation for different chemical analysis. The above knowledge also helps students to carry out interdisciplinary research such that the findings benefit the common man.
12.	16MT C02	ENGINEERING MATHEMATICS – II	Solve the solutions of Differential Equations which arise in electrical circuits, vibrations and other linear systems. Able to solve solutions of differential equations with initial and boundary value problems. Evaluating definite integrals using Beta, Gamma functions. Understating the significance of gradient, divergent and Curl. Use Greens, Gauss and Stoke"s theorems to find the surface and volume integrals. Able to solve and analyse the Engineering problems.
13.	16PY C01	ENGINEERING PHYSICS	Describe the types of oscillations and analyze them Demonstrate the wave nature of the light Develop the concepts related to electromagnetic behavior


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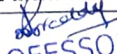
14	16CY C02	APPLIED CHEMISTRY	<p>Identify the various crystal systems and defects</p> <p>Explain the origin of magnetism and dielectric polarization and applications of these materials in the field of engineering & technology</p> <p>At the end of the course, the students will be familiar with the fundamentals of water technology, corrosion and its control, applications of polymers in domestic and engineering areas, nano materials and their applications</p> <p>The engineer who has the above background can effectively manage the materials in his designing applications and for discovering & improving the systems for various uses in industry, agriculture, health care, technology, telecommunications and electronics</p> <p>The above knowledge also helps students to carry out inter disciplinary research such that the findings benefit the common man</p> <p>Study of nano related materials helps to update the knowledge necessary to launch into the demands of the world</p> <p>Acquire the knowledge of basic concepts of electrical circuits such as Ohm's law, Kirchhoff's laws etc</p> <p>Acquire the knowledge of basic Faraday's laws of electromagnetic induction</p>
15	16EE C01	ELEMENTS OF ELECTRICAL ENGINEERING	<p>Acquire the knowledge to solve the problem of AC circuits</p> <p>Acquire the knowledge of specifications of batteries, types of cells and sources of renewable energy</p> <p>Acquire the knowledge of electrical wiring and cables and their types and electrical equipment and their specification.</p> <p>Acquire the knowledge of safety precautions in handling electrical appliances, importance of grounding and methods of earthing.</p>
16	16CE C01	ENGINEERING MECHANICS	<p>Solve problems dealing with forces in planar force systems</p> <p>Draw free body diagrams to analyze the forces in the given structure</p> <p>Understand the concept of moments and couples in plane systems.</p> <p>Understand the mechanism of friction and can solve friction problems</p> <p>Determine the centroid of plane areas and centers of gravity of bodies using integration methods</p> <p>Determine moments of inertia, product of inertia for all areas and mass moments of inertia for bodies,</p>
17	16EG C01	PROFESSIONAL COMMUNICATION IN ENGLISH	<p>Understand the nature, process and types of communication and will communicate effectively without barriers.</p> <p>Understand the nuances of listening and will learn to make notes</p> <p>Read different texts, comprehend and draw inferences and conclusions.</p> <p>Write effective paragraphs, letters and reports</p> <p>Critically analyze texts and write book reviews</p>
18	16CE C02	ENVIRONMENTAL STUDIES	<p>To understand the scope and importance of environmental studies, identify the natural resources and ecosystems and contribute for their conservation.</p> <p>To understand the ecological services of biodiversity and contribute for their conservation.</p> <p>To develop skills to solve the problems of environmental pollution and contribute for the framing of legislation for protection of environment.</p> <p>To relate the social issues and the environment and contribute for the sustainable development.</p> <p>To understand the essence of the ethical values of the environment for conserving depletable resources and pollution control.</p>
19	16ME C02	ENGINEERING GRAPHICS	<p>To understand theory of projections</p> <p>Ability to improve visualization skills</p> <p>Ability to sketch Engineering Objects</p>
20	16PY C03	ENGINEERING PHYSICS LABORATORY	<p>Understand the concept of errors and find the ways to minimize the errors</p> <p>Demonstrate interference and diffraction phenomena experimentally</p> <p>Distinguish between polarized and unpolarized light</p>


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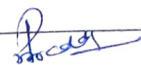
			Determine the loss of energy of a ferromagnetic material and its uses in electrical engineering
			Understand the suitability of dielectric materials in engineering applications
21.	16CY C04	APPLIED CHEMISTRY LABORATORY	This syllabus helps the student to understand importance of analytical instrumentation for different chemical analysis. The above knowledge also helps students to carry out inter disciplinary research such that the findings benefit the common man.
22.	16EG C02	PROFESSIONAL COMMUNICATION LABORATORY	The students will understand the speech sounds in English and the nuances of pronunciation. The students will understand tone, intonation and rhythm and apply stress correctly. The students will be able to participate in group discussions with clarity and confidence. The students will speak confidently on stage with appropriate body language. The students will debate on various issues and learn to work in teams.
23.	16MT C05	ENGINEERING MATHEMATICS-III	Expand functions in the given intervals. Solve linear and non linear PDEs. Solve one-dimension, two-dimension, Heat steady state equations and also one-dimension wave equation. Solve problems on Analytic functions, Cauchy's theorem and Cauchy's integral formula. Expand functions by using Taylor's and Laurent's series. Solve Real and Complex integrals by using Cauchy Theorems.
24.	16ME C04	MATERIAL SCIENCE AND METALLURGY	Know the fundamental science and engineering principles relevant to material. Suggest appropriate physical metallurgical methods (phase diagrams). The type of heat treatment operation to be given to any metal in order to improve desired Mechanical properties. Basic ability to plan an extraction process for given ore. Suggest the appropriate methods for prevention of failures. Analyze the applications of conventional metals and alloys.
25.	16ME C05	MECHANICS OF MATERIALS	Classify the materials, stresses, strains and understand engineering constants, poissons ratio along with relation between them. Also analyze axially loaded members. Draw shear force, bending moment diagrams for different types of beams and calculate stresses and strains due to simple bending. Determine slope and deflection for various configurations of beams using different methods and stress, strain and deflection due to torsion of circular members. Analyze shear stress distribution in different sections of beams. Understand compound stresses, calculation of principal stresses analytically and graphically using Mohr's circle. Estimate stresses in thin and thick cylinders. Also estimate critical load in buckling for various columns and struts.
26.	16ME C06	FLUID DYNAMICS	Differentiate different types of fluids. Calculate centre of buoyancy and metacentric height. Differentiate rotational and irrotational flows. Determine forces exerted on fluid body. Differentiate laminar over turbulent flows. Determine various losses incurred in fluid flows.
27.	16ME C07	MACHINE DRAWING	Draw conventional representation of different materials and mechanical components. Read the working drawings in the machine shop.


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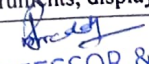
			<p>Draw the orthographic projections and sectional views of machine parts.</p> <p>Draw missing views as well as to analyze and interpret drawings of machine components.</p> <p>Understand the shape and structure of different types of screws, keys, couplings, and rivets.</p> <p>Draw assembly drawings of certain Machine Tools, Engine parts and Valves etc.</p>
28.	16MB C01	ENGINEERING ECONOMICS AND ACCOUNTANCY	<p>Apply fundamental knowledge of Managerial economics concepts and tools.</p> <p>Understand various aspects of demand analysis and forecasting.</p> <p>Understand price determination for different markets.</p> <p>Study production theory and analyze various costs and benefits involved in it so as to make best use of resources available.</p> <p>Analyze different opportunities and come out with best feasible capital investment decisions.</p> <p>Apply accountancy concepts and conventions, Final accounts and financial analysis.</p>
29.	16ME C08	MATERIAL SCIENCE AND METALLURGY LAB	<p>Identify crystal structure of various metals.</p> <p>Measure hardness and can correlate with microstructure.</p> <p>Perform a suitable heat treatment operation based on desired properties.</p> <p>Underlines the importance of grain size in evaluating the desired mechanical properties.</p> <p>Understand the process of heating and cooling for various heat treatment methods.</p> <p>Correlate the heat treatment methods and the mechanical properties obtained.</p>
30.	16ME C09	MECHANICS OF MATERIALS LAB	<p>Draw stress-strain curve for an isotropic material and understand the salient features of it.</p> <p>Demonstrate in determining the Young's modulus of various beam materials by conducting load-deflection test.</p> <p>Evaluate rigidity modulus of a given shaft specimen by torsion test.</p> <p>Able to find out Young's modulus and shear modulus for mechanical components like leaf spring and closely coiled helical spring through load-deflection test respectively.</p> <p>Evaluate hardness of different materials using different scales and also estimate the impact resistance of a material by conducting impact tests.</p> <p>Find the compressive and crushing strengths of concrete cubes and bricks.</p>
31.	16ME C10	COMPUTER DRAFTING LAB	<p>Demonstrates Graphics and design competencies.</p> <p>Apply CAD techniques for 2D modeling.</p> <p>Develops an ability to think 3D and interpret data from blue prints and sketches, layers concepts.</p> <p>Apply and draw orthographic projections with the knowledge of correct graphics communication (drawings).</p> <p>Draw 2D drawings and sectional views of part models.</p> <p>Draw 2D drawings and sectional views of assembly models.</p>
32.	16ME C14	KINEMATICS OF MACHINES	<p>Understanding basic elements of machinery and their motion characteristics.</p> <p>Designing a suitable mechanism depending on application.</p> <p>Drawing displacement diagrams and cam profile diagram for followers executing different types of motions and various configurations of followers.</p> <p>Drawing velocity and acceleration diagrams for different mechanisms.</p> <p>Selecting gear and gear train depending on application.</p> <p>Selection of suitable clutch, brake.</p>
33.	16ME C15	THERMODYNAMICS	<p>Estimate the temperature of different scales of the thermometers.</p>


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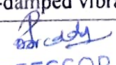
			<p>Apply the first law of thermodynamics process to various thermodynamics processes.</p> <p>Understand the meaning of perpetual motion of machine of second kind and its significance.</p> <p>Read data from the chart of Mollier diagram and its applications.</p> <p>Distinguish working principles of various IC engines like diesel engine, petrol engine.</p> <p>Calculate theoretical air-fuel ratios required for combustion of fuels and also convert from gravimetric analysis to volumetric analysis and vice versa.</p>
34.	16PE C01	METAL CASTING AND WELDING	<p>Select the suitable manufacturing process for a given component.</p> <p>Design the pattern, gating system and risers for a simple casting.</p> <p>Identify the defect and suggest remedy for the same.</p> <p>Describe various welding processes.</p> <p>Illustrate the terminology of welding, the characteristics of power sources used for welding and the consumables required.</p> <p>Compare various arc, resistance, solid state and other welding processes.</p>
35.	16PE C02	METAL FORMING TECHNOLOGY	<p>Define what is meant by metal forming and its specific advantages over other manufacturing processes.</p> <p>Apply theory of plasticity to analyze metal forming processes.</p> <p>Understand the basic principles and practical aspects of metal forming operations.</p> <p>Understand various process parameters that affect product quality in various processes under different conditions.</p> <p>Determine load, energy and power required for various processes and machines.</p> <p>Propose suitable metal forming processes for making different products.</p>
36.	16EE C14	ELECTRICAL MACHINES AND MICROCONTROLLER APPLICATIONS	<p>Identify the compatibility of DC machines for a given application.</p> <p>Identify the applications of 3-phase induction motor.</p> <p>Know the calculation of Efficiency and regulation of transformer.</p> <p>Program using 8051 microcontrollers.</p> <p>Use 8051 microcontrollers for basic applications.</p>
37.	16PE C03	METAL CASTING AND WELDING LAB	<p>Prepare the mould for a single piece and split patterns.</p> <p>Test the moulding sand and analyse the same.</p> <p>Test the bead geometry and correlate the results to the input parameters.</p> <p>Construct the cooling curves and analyse the same.</p> <p>Distinguish the type of the flame and recommend for different materials</p> <p>Use TIG, MIG and Spot welding machines and experiment with them</p>
38.	16PE C04	METAL FORMING TECHNOLOGY LAB	<p>Understand the practical aspects of metal forming operations.</p> <p>Understand various process parameters that affect product quality under different conditions</p> <p>Work independently with various presses and dies to produce different components</p> <p>Determine load, energy and power required for various processes and machines</p> <p>Propose suitable metal forming processes for making different products</p> <p>Design and Fabricate various types of dies for sheets metal operations</p>
39.	16EG C03	SOFT SKILLS AND EMPLOYABILITY ENHANCEMENT LAB	<p>Be effective communicators and participate in group discussions and case studies with confidence. Also be able to make presentations in a professional context.</p> <p>Write resumes, prepare and face interviews confidently.</p> <p>Be assertive and set short term and long term goals. Also learn to manage time effectively and deal with stress.</p>


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
			<p>Make the transition smoothly from Campus to Corporate. Also use media with etiquette and know what academic ethics are.</p> <p>To do a live, mini project by collecting and analyzing data and making oral and written presentation of the same</p>
40	16ME C20	DYNAMICS OF MACHINES	<p>Graduates are expected to demonstrate the ability of the analysis of forces in mechanism which provide them the required inputs to design the systems which withstand operating conditions</p> <p>Graduates are expected to understand the turning moment diagram, cyclic fluctuation in speed, fluctuation in energy and get the ability of designing flywheel.</p> <p>Graduates are expected to understand gyroscopic and centrifugal actions of vehicles and will be able to reckon additional bearings reactions due to gyroscopic and centrifugal effects</p> <p>Graduates will have ability to control speed using governors</p> <p>Graduates will have ability to identify the unbalance in rotor and engines and will get the knowledge of balancing.</p> <p>Graduates will understand the concepts of vibration thereby they are able to design the systems free from ill effects of vibration.</p>
41	16ME C21	APPLIED THERMODYNAMICS & HEAT TRANSFER	<p>Estimate power required for reciprocating air compressor, used for many engineering applications.</p> <p>Evaluate the performance of diesel and petrol engines and suggest some suitable methods for remedy of abnormal combustion</p> <p>Understand the importance of accessories of IC engines</p> <p>Apply appropriate equations depending on mode of heat transfer</p> <p>Distinguish the radiation heat transfer from other modes of heat transfer</p> <p>Design heat exchangers with the basic knowledge acquired in heat exchangers</p>
42	16ME C22	DESIGN OF MACHINE ELEMENTS	<p>Select material based on type of load and manufacturing considerations.</p> <p>Design the components subjected to static loads.</p> <p>Design the components subjected to fluctuating loads.</p> <p>Become familiar with mechanical elements like shafts, keys, couplings and pulleys.</p> <p>Become familiar with permanent types of joints and their design concepts.</p> <p>Become familiar with detachable joints and power screws.</p>
43	16ME E01	REFRIGERATION AND AIR CONDITIONING	<p>Differentiate refrigeration from air conditioning</p> <p>Understand merits and demerits of vapor compression refrigeration system over air refrigeration system</p> <p>Know the importance of absorption refrigeration system over vapor refrigeration system</p> <p>Apply a suitable psychrometric process depending on requirement or application</p> <p>Know the condition necessary for comfort condition</p> <p>Estimate the load required for AC system depending on application</p>
44	16ME E02	MECHANICAL VIBRATIONS	<p>Ability to construct a Free Body Diagram, formulates the equations of motion, analytically solves the equations of motion for arbitrary linear single-degree-of- freedom systems in undamped, damped cases.</p> <p>Ability to analyze the basic principles of vibration isolation and absorption and ability to apply them to the design of mechanical systems such as automotive suspensions.</p> <p>Ability to formulate the equations of motion analytically solves the equations of motion for arbitrary linear two -degree-of-freedom systems in undamped, damped, free and forced cases,</p> <p>Ability to analyze normal mode vibration, coordinate coupling and orthogonal property of modeshape.</p> <p>Ability to differentiate discrete and continuous systems, formulate equation of motion and solve for string, bar and beams in continuous systems.</p> <p>Ability to understand vibration measuring instruments, display and</p>


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			recording to elements, frequency analysis.
45	16PE E01	POWDER PROCESSING	<p>Know the fundamentals in powder manufacturing methods</p> <p>Characterize the Powders in different techniques</p> <p>Suggest appropriate compaction technique for a particular powder</p> <p>Suggest appropriate sintering technique for a particular powder</p> <p>Choose correct post sintering processes</p> <p>Have ability to choose the appropriate testing for sintered parts.</p>
46	16PE E02	PRODUCT DESIGN AND PROCESSES PLANNING	<p>Have overall view of Product Design and Process Planning</p> <p>Apply creativity techniques in Product Development</p> <p>Applying ergonomically enabled concepts in developing a new product</p> <p>Have awareness and apply Intellectual Property Rights</p> <p>Integrate various stages of developing a new product</p> <p>Develop and execute an effective Process Plan</p>
47	16ME E04	HYDRAULIC MACHINES	<p>Be able to apply the various fluid laws to different hydraulic machines</p> <p>Be able to understand the methodology of selection of reciprocating pumps</p> <p>Acquire the knowledge the functionality of rotary pumps</p> <p>Understand the selection procedure and estimate the power developed by various hydraulic turbines</p> <p>Compare the performance of hydraulic turbines and pumps based on characteristics curves</p> <p>Acquire knowledge the functionality of various hydraulic systems</p>
48	16PE E03	NON-DESTRUCTIVE TESTING AND EVALUATION	<p>The knowledge of different NDT techniques.</p> <p>Clear understanding of liquid penetrant inspection and magnetic particle inspection.</p> <p>View and interpret radiographs, utilize the various principles of radiography for different components of different shapes.</p> <p>The knowledge of acoustic emission for NDT and the instrumentation used for NDT.</p> <p>The ability to analyze and prepare a technical report.</p> <p>The knowledge of latest research, developments and trends in NDT.</p>
49	16PE E04	PLASTICS, CERAMICS AND COMPOSITE MATERIALS	<p>Describe about types of plastics, their properties and uses</p> <p>Suggest the suitable method of manufacturing a plastic component.</p> <p>Describe about types of ceramics, refractoriness, their uses.</p> <p>Express the details about white wares ceramic coatings and glass.</p> <p>Suggest the suitable method of manufacturing processes of ceramics.</p> <p>Describe about types composites and their uses</p>
50	16MT EO4	PROBABILITY AND NUMERICAL METHODS	<p>Analyse the statistical averages and different properties for probability function.</p> <p>Fit the probability distribution for the random data.</p> <p>Solve the non-linear equations for finding the roots.</p> <p>Solving the Differentiation & Integration for numerical data.</p> <p>Solving the ordinary differential equations using single & multi-step methods</p>
51	16ME C23	DYNAMICS AND VIBRATIONS LAB	<p>Evaluate the effect of gyroscopic couple</p> <p>Evaluate the effect of CAM Follower Motions in machines</p> <p>Estimate the performance of governors</p> <p>Evaluate the static and dynamic balancing of rotating masses</p> <p>Estimate the natural frequency of different un-damped vibrating systems</p>


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			Estimate the natural frequency of different damped vibrating systems
52	16ME C24	APPLIED THERMODYNAMICS & HEAT TRANSFER LAB	To demonstrate basic knowledge and exposure to determine valve and port diagram and also to evaluate the performance of the petrol engine and diesel engine
			Student will determine the importance of heat balance sheet of IC engine n
			Students will acquire knowledge in evaluating the performance of multi-stage reciprocating compressor
			To demonstrate knowledge in evaluating thermal conductivity and heat transfer coefficient under natural convection phenomena and forced convection phenomena
			Students will understand the basic concepts of radiation heat transfer
			Student will understand the effectiveness of parallel and counter flow heat exchanger
53	16EE C22	ELECTRICAL MACHINES AND MICROCONTROLLER APPLICATIONS LAB	Test the 1-phase transformer.
			Know the right instrument and its usage for the given circuit.
			Identify the suitable machine for required application.
			Process the data using 8051 microcontroller
			Interface the given device with 8051 microcontroller
54	16PE C05	INDUSTRY VISIT	A minimum of two industrial visits will be arranged by department and students have to attend the visits and prepare a data report of their visits to the industries and submit to the department. Students are required to present a seminar based on their report which is evaluated by Head of the Department and two senior faculty to award the grade and these grades are categorized as follows. Excellent / Very Good / Good / Satisfactory / Unsatisfactory.
55	16ME C26	CAD AND CAM	Apply design concepts in design , analysis and modeling of entities and curves
			Apply surface and solid modeling techniques for the generating various parts and implement transformations on various geometric models for manipulation.
			Visualize the models through the graphics standards and implement NC,CNC systems and programming
			Implement and practice the DNC and AC controls , analyze the manipulator motions, configurations including end effectors, actuators, drives and sensors and programming
			Learn and Implement GT and Coding methods and CAPP.
			Understand and implement FMS, CIMS, RPT ,QC- methods & controls and Turnkey CAD/CAM systems.
56	16PE C06	MACHINE TOOL ENGINEERING	Select tool geometry for various materials
			Calculate forces in turning, drilling and milling processes
			Identify the machine tools for manufacturing various components
			Understand thread cutting and gear cutting operations
			Select grinding wheel and Automats
			Work on shaper, planner and grinding machines
57	16PE C07	ADDITIVE MANUFACTURING	Explain the process chain of Additive manufacturing and other rapid manufacturing Processes and their classification, advantages and disadvantages
			Critically explore technologies used for Additive manufacturing in terms of their parameters,application, limitations, materials, equipment, outcomes and implications and their comparison
			Compare different Additive manufacturing processes and select a subtractive or an AM process for a particular application for product development of engineering components
			Describe various CAD issues for rapid prototyping and related operations for STL model manipulation, formulate and solve typical problems on reverse engineering


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			Identify different post processing techniques involved after rapid prototyping
			Explore the applications of Additive manufacturing in different industries
58	16ME C29	MACHINE DESIGN	<p>Graduates demonstrate the ability to design helical, leaf springs for static and fluctuating loads.</p> <p>Graduates expected to have an ability to design gears for power transmission considering beam strength, dynamic factors and wear life.</p> <p>Graduates demonstrate the ability in designing sliding contact bearings, considering power lost in friction, heat dissipation.</p> <p>Graduates are expected to have the ability of selection of rolling contact bearings based on load-life relationship.</p> <p>Graduates demonstrate the ability of designing IC engine parts such as piston, connecting rod and crank shaft considering gaseous impulse and thermal aspects.</p> <p>Graduate demonstrate the ability of designing curved beams like C-clamp, crane hooks etc.</p>
59	16ME E05	COMPUTATIONAL FLUID DYNAMICS	<p>Classify basic equations of fluid flow</p> <p>Choose appropriate boundary conditions</p> <p>Choose proper numerical technique to solve equations.</p> <p>Critically analyze different mathematical models and computational methods for flow simulations</p> <p>Interpret computational results.</p> <p>Acquire the required knowledge to take advanced courses in C.F.D.</p>
60	16ME E06	AUTOMOBILE ENGINEERING	<p>Identify the different parts of the automobile</p> <p>Explain the working of various parts like engine, transmission, clutch, brakes</p> <p>Describe how the steering and the suspension systems operate.</p> <p>Understand the environmental implications of automobile emissions</p> <p>Develop a strong base for understanding future developments in the automobile industry</p> <p>Formation of pollutants in I.C Engines & Their remedial methods to control them</p>
61	16PE E06	WORK SYSTEM DESIGN	<p>Use work study techniques to improve productivity</p> <p>Apply method study recording techniques</p> <p>Implement work measurement and time study tools</p> <p>Execute job evaluation and merit rating techniques</p> <p>Apply ergonomical principles in product design</p> <p>Use concepts of production planning & control in industry</p>
62	16PEE07	QUALITY AND RELIABILITY ENGINEERING	<p>Apply quality improvement techniques</p> <p>Use control charts for variables and attributes</p> <p>Implement designing for quality</p> <p>Apply experimental design and Taguchi methods</p> <p>Use techniques of reliability engineering</p> <p>Implement reliability & maintainability in industry</p>
63	16ME E08	OBJECT ORIENTED PROGRAMMING WITH C++	<p>The difference between object oriented programming and Structured programming and data types in C++.</p> <p>To program using C++ features such as classes and objects.</p> <p>The write C++ programs for simple applications in mechanical engineering.</p> <p>The overload operators</p> <p>The use inheritance and polymorphism</p> <p>Capability to use effectively templates and exception handling.</p>

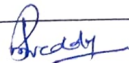

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64	16ME E10	TURBO MACHINES	<p>The principle of turbo machinery</p> <p>Apply gas dynamics equations depending upon applications</p> <p>Estimate the power developed by steam turbines</p> <p>Find efficiency, pressure rise and degree of reaction of axial flow compressor</p> <p>Analyze the slip factor and performance of centrifugal compressor</p> <p>Understand cycles and improve the cycle efficiency in gas turbines</p>
65	16PE E06	MODERN MACHINING AND FORMING METHODS	<p>Select the non-conventional machining process for a particular application</p> <p>Demonstrate the capability of comparison of various non-conventional machining methods</p> <p>Describe the various non-conventional machining processes</p> <p>Exhibit the proficiency of selecting working media for various non-conventional machining processes</p> <p>Exhibit the basic understanding of non-conventional forming processes</p> <p>Compare various non-conventional forming processes based on their merits, limitations and applicability</p>
66	16PE E07	SURFACE ENGINEERING	<p>Demonstrate basic understanding of friction, and be familiar with adhesion theories and the effect of adhesion on friction.</p> <p>Demonstrate basic understanding of wear processes, and able to describe wear mechanisms on engineering components.</p> <p>Demonstrate basic understanding of corrosion and know the methods to reduce the corrosion on engineering components.</p> <p>Design a tribological system for optimal performance, and Justify, critical analysis on surface engineering techniques and surface design for relevant applications.</p> <p>Apply surface engineering principles and methods to modify and improve the properties of surfaces for structural and functional applications.</p> <p>Identify suitable surface processing method from various methods to create surface engineering solutions for specific materials, specific environments and specific applications in modern engineering practice.</p>
67	16ME C30	CAD AND CAM LAB	<p>Draw complex geometries of parts in sketcher mode.</p> <p>Generate freeform shapes in part mode to visualize parts.</p> <p>Create complex engineering assemblies using appropriate assembly constraints.</p> <p>Develop various machine components and generate their orthographic view modeling software</p> <p>Have a fundamental knowledge of Computer Numerical Control machines.</p> <p>Write part programs using G and M codes for lathe and milling operations</p>
68	16PE C08	MACHINE TOOL ENGINEERING LAB	<p>Grind single point cutting tool with various angles</p> <p>Perform taper turning and knurling on lathe</p> <p>Perform drilling and thread cutting operations</p> <p>To manufacture a gear using milling machine</p> <p>Do operation on shaper</p> <p>Exposed to various unconventional processes</p>
69	16PE C09	ADDITIVE MANUFACTURING LAB	<p>Select and use correct CAD formats in the manufacture of a 3D printed part.</p> <p>Set up and fabricate a 3D part using an additive manufacturing machine.</p> <p>Ability to understand and use modern rapid prototyping systems;</p> <p>Capacity to select the processing parameters best suited to the production of prototype quality</p> <p>Identify, characterize and select the ideal materials for a given Rapid Prototyping system.</p> <p>Gain confidence to operate the 3d printing machine</p>

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70	16ME C33	METROLOGY AND INSTRUMENTATION	<p>Learn and understand the need for measurement and fundamental concepts of measurement.</p> <p>Demonstrate sound knowledge in gauges design and gauge selection for inspection.</p> <p>Demonstrate an ability to select and use the appropriate measuring instruments to measure surface roughness.</p> <p>Recognize the concepts of errors, strain measurement, classification and instrument characteristics.</p> <p>Apply the skills in measuring various quantities like displacement, pressure & temperature.</p>
71	16ME C34	OPERATIONS RESEARCH	<p>Formulate a managerial decision problem into a mathematical model;</p> <p>Apply transportation problems in manufacturing industries;</p> <p>Build and solve assignment models and travelling salesmen problems.</p> <p>Apply project management techniques like CPM and PERT to plan and execute project successfully</p> <p>Apply sequencing and queuing theory concepts in industry applications</p>
72	16PE C10	PRODUCTION DRAWING	<p>Draw part drawings from given assembly drawings of machine parts.</p> <p>Indicate tolerance values on the parts drawn on sheet as per alpha numeric codes for given assembly drawings</p> <p>Indicate form tolerances and position tolerances on the parts drawn on the sheet as per universally accepted norms for a given assembly drawing</p> <p>Indicate values of surface finish and heat treatment process on the parts drawn for a given assembly drawings.</p> <p>Write process sheet for the part that is drawn from given assembly drawing and interpret production drawing and process sheet.</p>
73	16PE C11	PRODUCTION AND OPERATIONS MANAGEMENT	<p>Identify and evaluate the processes, tools and principles of production and operations management to better understand the logistics and supply chain operations</p> <p>Demonstrate the ability to apply mathematical forecasting techniques</p> <p>Identify future challenges and directions that relate to production and operations management to effectively and efficiently respond to market changes</p> <p>Apply the tasks, tools and underlying principles of operations management in the manufacturing and service sectors to improve organizational performance</p> <p>Explain and evaluate the quality process in manufacturing and service sector to improve the operational performance</p>
74	16PE C12	TOOL ENGINEERING	<p>Understand the importance of cutting tool materials</p> <p>Design simple tools independently like single point cutting tool, milling cutter, form tool and broaching tool</p> <p>Suggest appropriate tool geometry, tool material for manufacturing process like drilling, reaming and tapping</p> <p>Design the tools for various operations like blanking, piercing, drawing and forging, mould design etc</p> <p>Design jigs and fixtures based on requirements</p>
75	16ME E10	RENEWABLE ENERGY SOURCES	<p>Understand the depletion and of environmental impact conventional sources of energy and will suggest suitable renewable energies in place of conventional energies</p> <p>Determine the principles of absorption</p> <p>Understand the problems associated with utilizing the wind energy</p> <p>Describe the physics of geothermal resources and describe how biomass is currently used as a source of energy</p> <p>Explain the physical principles of wave energy, tides and the environmental impact of OTEC plants</p>
76	16ME E11	ENERGY CONSERVATION,	<p>Know energy scenario both India and world</p> <p>Review and asses the various audit tools</p>


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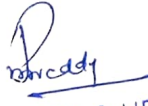
		MANAGEMENT AND AUDIT	Understand energy policy planning and take energy management as a profession Analyze energy security, codes, standards Arrange the financial arrangements for industries
77	16ME E12	ENGINEERING RESEARCH METHODOLOGY	Define research problem Review and assess the quality of literature from various sources. Understand and develop various research designs. Analyze problem by statistical techniques: ANOVA, F-test, Chi-square Improve the style and format of writing a report for technical paper/ Journal report
78	16ME E14	FINITE ELEMENT METHODS	Apply FE method for solving field problems using Virtual work and Potential energy formulations Analyze linear problems like axial, trusses and beam problems Analyze 2D structural problems using CST element and analyze plane stress, plane strain and axis-symmetric problems with triangular elements Write shape functions for 4 node quadrilateral isoparametric elements, apply numerical integration, Gaussian quadrature and to estimate natural frequencies for stepped bar Check for convergence requirements, Solve linear 1D and 2D heat conduction and convection heat transfer problems, formulate 3D elements, apply finite element analysis software for engineering solutions
79	16ME C36	METROLOGY AND INSTRUMENTATION LAB	Identify methods and devices for measurement of length, height and diameter. Acquire the knowledge about angular measurement and various measuring instruments. Recognize & measure the gear and screw thread parameters using profile projector and tool maker microscope. Demonstrate the sound knowledge in gauges selection, design and measurement. Acquire adequate knowledge in the measurement of flatness, roundness and surface roughness.
80	16PE C13	MANUFACTURING ENGINEERING LAB	Apply right manufacturing techniques and choose the right material Operate different machine tools Prepare process sheets and Bill of Material Apply limits, fits and tolerances while manufacturing components Prepare CAD drawings
81	16ME E15	POWER PLANT ENGINEERING	Select the suitability of site for a power plant. Propose ash handling, coal handling method in a thermal power plant Understand the water cycle, flow-sheet of hydro-power plant and types of dams and spillways Explain working principle of different types of nuclear power plant. Know the various factors of plant load and economy and safety aspects of power plants
82	16ME E16	PRINCIPLES OF ENTREPRENEURSHIP	Analyze ideas for new and innovative products or services Identify opportunities and deciding nature of industry Analyze the feasibility of a new business plan and preparation of Business plan Use project management techniques like PERT and CPM Analyze behavioral aspects and use time management matrix
83	16ME E17	INNOVATIONS, PROTECTION AND LEGAL ASPECTS	Will respect intellectual property of others Learn the art of understanding IPR Develop the capability of searching the stage of innovations.


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			Will be capable of filing a patent document independently.
			Completely understand the techno-legal business angle of IPR and converting creativity into IPR and effectively protect it.
84	16PE E11	SUPPLY CHAIN MANAGEMENT	Plan an effective transportation and warehouse management systems
			Design an effective supply chain networks
			Integrate and optimize demand and supply gaps
			Apply inventory management techniques
			Understand and design pricing and revenue management systems
85	16PE E12	TOTAL QUALITY MANAGEMENT	Apply TQM techniques in engineering applications
			Use various theories and principles related to TQM
			Use statistical techniques in TQM
			Have awareness and use quality information system and innovative systems
			Deal with customer grievances and satisfying the customers
86	16CE O02	DISASTER MITIGATION AND MANAGEMENT	Analyze and critically examine existing programs in disaster management regarding vulnerability, risk and capacity at different levels
			Understand and choose the appropriate activities and tools and set up priorities to build a coherent and adapted disaster management plan
			Understand various mechanisms and consequences of human induced disasters for the participatory role of engineers in disaster management
			Understand the impact on various elements affected by the disaster and to suggest and apply appropriate measures for the same
			Develop an awareness of the chronological phases of disaster preparedness, response and relief operations for formulating effective disaster management plans and ability to understand various participatory approaches/strategies and their application in disaster management
87	16IT O02	PRINCIPLES OF INTERNET OF THINGS	Comprehend the terminology, protocols and communication models of IoT.
			Define the various IoT enabling technologies and differentiate between M2M and IoT.
			Acquire the basics of Python Scripting Language used in developing IoT applications.
			Describe the steps involved in IoT system design methodology.
			Design simple IoT systems using Raspberry Pi board and interfacing sensors with Raspberry Pi.
88	16EE O03	ENERGY AUDITING	Know the current energy scenario and importance of energy auditing.
			Understand the concepts of energy auditing.
			Evaluate the performance of existing engineering systems
			Explore the methods of improving energy efficiency in different engineering systems
			Design different energy efficient devices.
89	16EC O07	SYSTEM AUTOMATION AND CONTROL	Understand various process control systems.
			Measure the physical parameters in the industry.
			Design PID controllers
			Understand the role of digital computers in automation
			Understand the applications of Robots.
90	16CS O09	BASICS OF ARTIFICIAL INTELLIGENCE	Differentiate between a rudimentary Problem and an AI problem, it's Characteristics and problem- solving Techniques.
			Compare and contrast the various knowledge representation schemes of AI.
			Understand and analyze the various reasoning and planning techniques involved in solving AI problems.
			Understand the different learning techniques.
			Apply the AI techniques to solve the real-world problems.

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91	16IT 001	OBJECT ORIENTED PROGRAMMING USING JAVA	Understand Object-Oriented concepts.
			Create Java applications using sound OOP practices e.g. Inheritance, Interfaces, Packages, and Inner classes.
			Implement Exception Handling and Multithreading concepts in java programs.
			Develop programs using the Java Collection API and Stream classes.
			Design and Develop GUI applications with the integration of event handling, JDBC.
92	16PY 001	HISTORY OF SCIENCE AND TECHNOLOGY	Demonstrate knowledge of broad concepts in the history of science, technology ranging over time, space and cultures.
			Recognize the values of a wide range of methodologies, conceptual approaches and the impact of competing narratives within the history of science, technology.
			Identify, locate and analyze relevant primary and secondary sources in order to construct evidence-based arguments.
			Think independently and critically, using appropriate methodologies and technologies to engage with problems in the history of science, technology.
93	16EE 005	WASTE MANAGEMENT	Demonstrate academic rigor and sensitivity to cultural and other diversity, and understanding of the ethical implications of historical and scientific enquiry within a global context.
			Understand the various processes involved in allied disciplines of engineering
			Infer the regulations of governance in managing the waste
			Distinguish the nature of waste materials concerned to the particular branch of engineering
			Explore the ways and means of disposal of waste material
94	16EC 005	MEMS AND ITS APPLICATIONS	Identify the remedies for the disposal of a selected hazardous waste material
			Select various materials used for MEMS.
			Design the micro devices and systems using the MEMS fabrication process.
			Understand the operation of different Sensors and Actuators.
			Design the micro devices and systems using Polymer MEMS.
95	16CS 007	BASICS OF CYBER SECURITY	Apply different MEMS devices in various disciplines.
			Discuss different types of cybercrimes and analyze legal frameworks to deal with these cybercrimes.
			Describe Tools used in cybercrimes and laws governing cyberspace.
			Analyze and resolve cyber security issues.
			Recognize the importance of digital evidence in prosecution.
			Analyze the commercial activities in the event of significant information security incidents in the Organization.
			Equipped with the knowledge of Programming methods & drives used in robots
Equipped with the principles of various Sensors and their applications in robots.			


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