



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

Kokapet(Village), Gandipet, Hyderabad, Telangana-500075. [www.cbbit.ac.in](http://www.cbbit.ac.in)



COMMITTED TO  
RESEARCH,  
INNOVATION AND  
EDUCATION

**44**  
years

## **B.E (Mechanical 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

  
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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 – Mechanical Engineering Department Vision**

To be a Pace Setter in the field of Mechanical Engineering by providing conducive environment for understanding and applying its principles to cater the needs of Society.

### **Department Mission**

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

### **B.E – Mechanical Engineering Program Educational Objectives (PEO's):**

1. The graduating students from mechanical engineering will have a widespread knowledge in basic sciences and fundamentals of mechanical engineering to be able to solve application-level problems pertaining to society.
2. The graduating students from mechanical engineering will have knowledge in core areas in mechanical 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 in interdisciplinary research activities like environment & sustainability.
4. The graduating students from Mechanical Engineering will inculcate professional & ethical values, teamwork, leadership skills, moral responsibility, industrial relations and communication skills.
5. The graduating students from mechanical engineering will be enriched in project, finance management and technical knowhow skills.

### **B.E – Mechanical Engineering Program Specific Outcomes (PSO's):**

1. The graduates will be able to apply specific program principles to the specification, fabrication, test, operation, or documentation of basic mechanical systems or processes
2. The student will be able to apply his knowledge in Analysis, design, development, implementation, or oversight of more advanced mechanical systems or processes and able to do research with this basic knowledge in engineering.
3. The student will be able to inculcate leadership qualities and grow as a successful entrepreneur and gain understanding of global and contemporary issues related to engineering.

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## **R-20**

### **B.E – Mechanical Engineering Department Vision**

To be the destination for aspiring young minds to become globally competitive, enlightened, innovative, immediate contributors to the industry and successful in higher studies in the field of mechanical engineering.

### **Department Mission**

1. To impart quality and innovative education in mechanical engineering with basic and specialised training, internships to meet the current and emerging needs of the industry.
2. To prepare the students for successful professional career by inculcating ethical, entrepreneurial and leadership qualities.
3. To foster Research and Development environment by disseminating knowledge and technology by involving the students in publications, sponsored projects, and consultancy.

### **B.E – Mechanical Engineering Program Educational Objectives (PEO's):**

After Four years of graduation graduates will have

1. Ample technical knowledge and skills for a successful career in Mechanical Engineering and product development, design, development and implementation of engineering systems, services, and processes.
2. Capability to develop competitive technologies and find solutions to industry, societal challenges, and engineering problems with ethical and professional standards.
3. Ability to be entrepreneurial, innovative in the context of global scenarios of technological challenges and environmental issues.
4. To pursue life-long learning and to adapt to the changing industry requirements.
5. To be a team player, lead and engage diverse teams through effective communication, inter-personal and project management skills.

### **B.E – Mechanical Engineering Program Specific Outcomes (PSO's):**

The graduates will be able to

1. Apply their learning to design and develop basic mechanical systems and processes.
2. Select manufacturing processes and their appropriate parameters for the production of typical engineering components.
3. Apply the concepts of mechanical engineering in power generation, aerospace, environmental, bio-medical, automotive, sustainable energy systems and with suitable safety precautions.

  
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## **R-22**

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(Autonomous)

Gandipet, Hyderabad -75

Department of Mechanical Course Outcomes

Statements for B.E (Mech) – 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 –	Identify and setup program development environment.
			Implement the algorithms using C programming language constructs.

  
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		I)	Identify and rectify the syntax errors and debug program for semantic errors. 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.
			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

  
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19	18ME C04	MECHANICS OF MATERIALS	Determine stresses and strains in members subjected to axial loads and temperature changes.
			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. analyze stress, strain and deflection due to torsion in circular members.
			Analyze shear stress distribution in different sections of beams and find out principal stresses and strains.
			Find out stresses and strains in thin, thick cylindrical shells and also able to calculate critical buckling loads in columns and struts.
20	18PE C01	MANUFACTURING PROCESSES	Students should able to define various terms related to manufacturing processes (Level-1)
			Demonstrate the understanding of various manufacturing processes(Level 2)
			Solve simple problems such as riser design and sheet metal calculations (Level 3)
			Compare various Manufacturing processes (Level 4)
21	18EG M01	INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES	Understand the making of the Indian Constitution and its features.
			Have an insight into various Organs of Governance - composition and functions.
			Understand powers and functions of Municipalities, Panchayats and Co-operative Societies.
			Be aware of the Emergency Provisions in India.
			Understand the Right To equality, the Right To freedom and the Right To Liberty.
22	18EE A01	INDIAN TRADITIONAL KNOWLEDGE	Understand philosophy of Indian culture.
			Distinguish the Indian languages and literature.
			Learn the philosophy of ancient, medieval and modern India.
			Acquire the information about the fine arts in India.
23	18ME C05	MATERIAL SCIENCE AND METALLURGY LAB	Know the contribution of scientists of different eras
			Identify crystal structure of various metals.
			Measure hardness and can correlate with microstructure.
			Perform a suitable heat treatment operation based on desired properties.
			Underlines the importance of grain size in evaluating the desired mechanical properties.
24	18ME C06	MECHANICS OF MATERIALS LAB	Correlate the heat treatment methods and the mechanical properties obtained
			Draw stress-strain curve for an isotropic material and understand the salient features of it.
			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.
			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.
			Evaluate hardness of different materials using different scales
25	18CS C05	BASICS OF DATA STRUCTURES	Find the compressive and crushing strengths of concrete cubes and bricks.
			Understand the basic concepts of data structures.
			Understand the notations used to analyze the performance of algorithms.
			Choose and apply an appropriate data structure for a specified application.
			Understand the concepts of recursion and its applications in problemsolving.
26	18ME C07	KINEMATICS OF	Demonstrate a thorough understanding of searching and sorting algorithms.
			Basic elements of mechanisms and their motion characteristics.




		MACHINES	<p>Designing a suitable mechanism depending on application.</p> <p>Principles involved in functioning of brakes and dynamometer</p> <p>Drawing displacement diagrams and cam profile diagram for followers executing different types of motions and various configurations of followers.</p> <p>Selecting gear and gear train depending on application.</p>
27	18ME C08	THERMODYNAMICS	<p>Estimate the temperature of different scales of thermometers.</p> <p>Apply the first law of thermodynamics to various thermodynamic processes.</p> <p>Understand the meaning of perpetual motion of machine of second kind and its significance.</p> <p>Read data from steam tables, Mollier diagram and its applications.</p> <p>Distinguish working principles of various air standard cycles, vapour power cycles and determine air-fuel ratios required for combustion of fuels</p>
28	18ME C09	PRINCIPLES OF MANAGEMENT	<p>Identify and evaluate the principles of management</p> <p>Demonstrate the ability to have an effective and realistic planning</p> <p>Identify the nature and the type of organization</p> <p>Apply the tools and techniques of directing</p> <p>Explain and evaluate the necessity for controlling and further refinement of an organization</p>
29	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>
30	18CE M01	ENVIRONMENTAL SCIENCE	<p>To define environment, identify the natural resources and ecosystems and contribute for the conservation of bio-diversity.</p> <p>To suggest suitable remedial measure for 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 follow the environmental ethics.</p> <p>To contribute for the mitigation and management of environmental disasters</p>
31	18CS C08	BASICS OF DATA STRUCTURES LAB	<p>Implement the abstract data type.</p> <p>Implement linear data structures such as stacks, queues using array and linked list.</p> <p>Understand and implement non-linear data structures such as trees, graphs.</p> <p>Implement various kinds of searching, sorting and traversal techniques.</p> <p>Identify the suitable data structure for real world problem.</p>
32	18EG C03	SOFT SKILLS LAB	<p>Be assertive and set short term and long term goals. Also learn to manage time effectively and deal with stress.</p> <p>Win in professional communication situations and participate in group discussions with confidence. Write abstracts.</p> <p>Write effective resumes. Plan, prepare and face interviews confidently.</p> <p>Adapt to corporate culture by being sensitive - personally and sensible-professionally. Draft an SOP.</p> <p>Apply the soft skills learnt in the mini-live project, by collecting and analyzing data and making oral and written presentations on the same.</p>
33	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>

  
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			Evaluate the performance characteristics of pumps.
			Demonstrate the characteristics curves of turbines.
34	18ME C12	DYNAMICS OF MACHINES	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)
			Analyze balancing problems in rotating and reciprocating machinery. (BL-4)
			Understand free and forced vibrations of single degree freedom systems and two-degreeof freedom linear systems.
35	18ME C13	APPLIED THERMODYNAMICS AND HEAT TRANSFER	Estimate the power required for reciprocating air compressor using the basic principles of thermodynamicsfor 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)
			Understand the functioning of components of I.C. engines and the concept of abnormal combustion with remedial measures. (BL-2)
			Derive the expressions for the heat transfer in conduction and convection with the basic principles of thermodynamics. (BL-3)
			Understand the basic principles of heat exchangers, boiling and condensation.(BL-2)
36	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)
			Design bolted joints, power screws and screw jack(BL-6)
37	18PE C07	METAL CUTTING AND MACHINE TOOL ENGINEERING	Describe tool geometry, select tool material for machining of various materials and identify the types of chips.
			Calculate cutting forces, MRR, power consumption under different cutting conditions.(BL-3)
			Classify the mechanisms of tool wear, estimate tool life using Taylor's equation under various cutting conditions. (BL-4)
			Identify the basic parts, specifications, operations of various machine tools and understand jigs & fixtures. (BL-2)
			Classify methods of unconventional machining and identify suitable method for a given component. (BL-3)
38	18ME E01	REFRIGERATION AND AIR CONDITIONING	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)
			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)
			Apply the principles of engineering which are complex in nature, having lifelong learning to design air conditioning system for various environments. (BL-3)
39	18ME E02	VALUES, ETHICS AND SOCIETY	State basic values and the need for value education.(BL -2)
			Differentiate between values and skills, happiness and accumulation of physical facilities, the Self and the Body, Intention and Competence of an individual.(BL-2)

			Demonstrate the knowledge of ethics at their work place and apply different theoretical approaches to solve ethical dilemmas.(BL-3)
			Apply risk and safety measures in the engineering practice.(BL-3)
			Understand the role of a human being in ensuring harmony in society and nature.(BL-2)
40	18PE E01	PLASTICS, CERAMICS AND COMPOSITE MATERIALS	Recall the types of plastics, properties and applications.(BL-1)
			Select the suitable method of manufacturing a plastic component. (BL-5)
			Describe refractories, their manufacturing methods and applications.(BL-2)
			Describe the properties, uses and Manufacturing methods of white wares, ceramic coatings and glass.(BL-2)
			Understand the concept of composites, properties in engineering applications.(BL-2)
41	18PE E02	PRODUCT DESIGN AND PROCESS PLANNING	Define the needs of the customer while designing a new product or modifying existing product in the competitive environment.(BL-1)
			Understand creativity, brainstorming and ergonomic concepts.(BL-2)
			Apply the concept of design for manufacture, assembly, maintenance, reliability and product life cycle in developing a product.(BL-3)
			Implement the Intellectual Property Rights to a new product or a process.(BL-3)
			Evaluate and recommend an effective Process Plan and principles of value engineering to new product development.(BL-5)
42	18ME E03	MECHANICAL VIBRATIONS	Apply Newton's law of motion and energy method to get governing differential equations of vibrating systems.(BL-3)
			Analyze response of machine members in forced vibration with different excitation frequencies. (BL-4)
			Recommend suitable Vibration parameters for isolation and compute critical speeds.(BL-5)
			Predict natural frequency and mode shape for all continuous systems.(BL-3)
			Understand working principles of vibration measuring instruments. (BL-2)
43	18ME E04	AUTOMOBILE ENGINEERING	Understand the basic layout of automobiles (BL-2)
			Understand the various systems in an automobile like engine cooling, lubrication, ignition, electrical and air conditioning systems with the principles of thermodynamics.(BL-2)
			Describe the principles of suspension and steering system using modern tool usage (BL-2)
			Explore the recent systems in Braking and Transmission. (BL-3)
			Evaluate the effect of automobile pollution on environment and necessity of pollution norms along with trouble shooting (BL-5)
44	18ME E05	NANO SCIENCE AND TECHNOLOGY	Understand the basic concepts, developments and challenges in Nano technology. (BL-2)
			Describe the methods of evaluating magnetic and electronic properties, microstructure by SPM, atomic force microscopy, friction force microscopy.(BL-2)
			Apply homogenous & heterogeneous methods and characterization techniques of Zero & One dimensional Nano structures.(BL-3)
			Evaluate various Nano Material Fabrication Techniques. (BL-5)
			Analyze Nano materials and Nano bio materials for obtaining solutions to societal problems. (BL-4)
45	18ME E06	RIGHTS, DUTIES AND LEGISLATION	Recall the human rights in the global and national context.(BL-1)
			Understand the overall view on working of Indian constitution.(BL-2)
			Analyse the societal problems in the context of human rights.(BL-4)
			Evaluate implementation of right to development and right to information.(BL-5)

  
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			Application of human rights for human safety and clean environment.(BL-3)
46	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)
47	18ME E07	FUELS AND COMBUSTION	Analyse quality of fuels based on its properties with a special emphasis on environment with merits and demerits.(BL-4)
			Understand the refining methods of various liquid fuels using the principles of engineering with a special focus on public health and safety and environmental considerations.(BL-2)
			Estimate the theoretical air fuel ratio for different types of combustion processes using basic laws of thermodynamics in the context of environment.(BL-5)
			Identify various techniques of utilizing fuels with different combustion appliances for cleaner environment and safety.(BL-3)
			Understand the impact of pollutants on environment and to demonstrate the knowledge for sustainable development.(BL-2)
48	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)
49	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)
50	18PE C08	METAL CUTTING AND MACHINE TOOL ENGINEERING LAB	Identify tool geometry and grind to a given tool signature.(BL-2)
			Perform various machining operations to produce components of different shapes and also using jigs & fixtures. (BL-3)
			Determine the shear angle at various cutting conditions (BL-4)
			Evaluate cutting forces using dynamometer, estimate MRR & power consumption under different cutting conditions.(BL-5)
			Plan and create components of utility using various manufacturing facilities in the laboratory (BL-6)
51	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)
52	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)
53	18ME C19	THERMAL TURBO MACHINES	Design various configurations of nozzles and diffusers with the principles of Thermodynamics, Fluidmechanics and Heat transfer to meet specified needs.(BL-6)
			Predict the compressible flow properties behavior with friction, heat transfer and shock waves for complex engineering problems(BL-3)
			Estimate the power required for various types of rotary compressors using the principles of gasdynamics for engineering problems.(BL-5)
			Understand the working principle of steam turbines, velocity triangles and performance parameters using principles of turbo machinery.(BL-2)
			Discuss the working principle of gas turbine, jets and rocket propulsions incorporating methods for efficiency improvement in gas turbine cycles.(BL-2)
54	18ME E08	OBJECT ORIENTED PROGRAMMING WITH C++	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)
			Solve basic mechanical engineering problems by developing programs using object oriented features (BL-5)
55	18ME E09	MECHANICS OF COMPOSITE MATERIALS	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 composite materials on macroscopic level.(BL-3)
			Analyze the laminates for stresses and strains using Classical lamination theory(BL-4)
			Summarize the various fabrication methods of composite materials and measurements of properties through tests.(BL-2)
56	18ME E10	ROBOTIC ENGINEERING	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 based on feedback(BL-5)
			Design an intelligent robot using machine vision and sensors (BL-6)
57	18PE E06	PRODUCTION AND OPERATIONS MANAGEMENT	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)
			Apply the quality control tools to improve performance of production system.(BL-3)
58	18ME E11	ADVANCED IC ENGINES	Evaluate the performance of SI/ CI engines with emphasis on environment(BL-5)
			Understand the combustion phenomenon in IC engines with remedial methods for controlling abnormal combustion.(BL-2)
			Discuss the need and control of I.C Engine emissions in the context of human health and environment.(BL-2)
			Understand the need for professional and engineering practices required for identifying alternative fuels in the context of fossil fuels depletion to

  
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			address health, safety and societal issues.(BL-2)
			Choose appropriate technologies to improve engine performance with alternative power sources for automobiles.(BL-5)
59	18ME E12	COMPUTATIONAL FLUID DYNAMICS	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)
			Formulate numerical equations by Finite Volume Method for fluid flow and heat transfer problems (BL-6)
60	18ME E13	PRINCIPLES OF ENTREPRENEURSHIP	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)
			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)
61	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)
62	18ME E14	HEAT AND MASS TRANSFER	Apply various laws pertaining to conduction heat transfer using basic principles of thermodynamics.(BL-3)
			Determine heat transfer coefficient for free and forced convection phenomena along with boundary layer for various complex engineering problems.(BL-5)
			Understand the concept of radiation phenomena of heat transfer.(BL-2)
			Design of heat exchangers using the principles of engineering sciences.(BL-6)
			Understand the concept of mass transfer and co-relate with heat transfer and provide valid conclusions.(BL-2)
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 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)

65	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)
66	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)
			Understand the different learning techniques.(BL-2)
			Apply the AI techniques in the field of mechanical engineering.(BL-3)
67	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)
68	18PE E11	PRINCIPLES AND APPLICATIONS OF ADDITIVE MANUFACTURING	Understand the fundamental concepts of Additive manufacturing, its advantages and Disadvantages(BL-2)
			Select suitable process and materials used in Additive Manufacturing(BL-5)
			Analyze pre-processing issues for Additive Manufacturing and related operations for STL file generation.(BL-4)
			Identify different post processing techniques for enhancing the properties of the 3D printed components(BL-3)
			Infer the prospects of additive manufacturing in various industrial sectors.(BL-2)
69	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)
70	18ME C21	THERMAL ENGINEERING LAB	Determine thermal conductivity of a metal rod and critical heat flux of a copper wire(BL-3)
			Estimate the convective heat transfer coefficients for phase change heat transfer and effectiveness of cross flow heat exchanger.(BL-3)
			Evaluate the performance of rotary compressors, refrigeration and air conditioned tutors.(BL-5)
			Evaluate drag and lift coefficients for different profiles of automobiles.(BL-5)
			Determine the pressure distribution in a nozzle and around symmetrical bodies.(BL-3)
71	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)



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			Evaluate measuring methods and devices for displacement, pressure & temperature.(BL-5)
72	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)
73	18ME C24	FINITE ELEMENT ANALYSIS	Understand FE method for solving field problems using energy formulations.(BL-2)
			Analyze bars, trusses, beams and circular shafts for static and dynamic analysis.(BL-4)
			Formulate 2D structural components using triangular element for plane stress, plane strain and axi-symmetric problems.(BL-4)
			Derive stiffness matrix for 4 node quadrilateral isoparametric element for static analysis and 3 D elements.(BL-6)
			Solve heat transfer problems and apply finite element analysis software for engineering solutions.(BL-3)
74	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)
75	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)
76	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)
77	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)
78	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)
79	18IT O01	OBJECT ORIENTED	Understand Object-Oriented concepts.



		PROGRAMMING USING JAVA	<p>Create Java applications using sound OOP practices e.g. Inheritance, Interfaces, Packages, and InnerClasses.</p> <p>Implement Exception Handling and Multithreading concepts in java programs.</p> <p>Develop programs using the Java Collection API and Stream classes.</p> <p>Design and Develop GUI applications with the integration of event handling, JDBC.</p>
80	18PY 001	HISTORY OF SCIENCE AND TECHNOLOGY	<p>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.</p> <p>Illustrate the advancements in science and technology in the medieval period across Asia and Arab countries and decline and revival of science in Europe.</p> <p>Explain the scientific approach and its advances of the Europeans and how the role of engineer during the industrial revolution and the major advancements.</p> <p>Make use of the advancements in the field of science and technology by adopting new philosophies of 19<sup>th</sup> and first half of 20<sup>th</sup> 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 20<sup>th</sup> century onwards.</p>
81	18EG 002	GENDER SENSITIZATION	<p>Understand the difference between -Sex   and -Gender   and be able to explain socially constructed theories of identity.</p> <p>Recognize shifting definitions of -Man   and -Women   in relation to evolving notions of -Masculinity   and -Femininity  .</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>
82	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>
83	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>
84	18ME C25	METROLOGY AND INSTRUMENTATION LAB	<p>Measure the linear dimension by using appropriate method &amp; 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>
85	18ME C26	COMPUTER AIDED	<p>Apply basics of Theory of Elasticity to continuum problems.(BL- 3)</p>

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		ENGINEERING LAB	Analyze finite elements like 1D, 2D and 3D structures for linear static analysis.(BL-4)
			Solve heat transfer problems.(BL- 3)
			Examine problems of limited complexity in buckling and dynamic analysis.(BL-4)
			Evaluate solutions to practical problems by finite element software.(BL-5)
86	18ME C27	PROJECT: PART –1	Identify a topic in advanced areas of Mechanical / Allied fields of Engineering.(BL-1)
			Review literature to identify the gaps, define the objectives and scope of the work.(BL-2)
			Generate innovative ideas for societal benefit and Nation building.(BL-6)
			Develop prototypes/models, experimental setup and software systems necessary to meet the objectives.
			Prepare a technical report and present before the departmental committee(BL-5)
87	18EC 001	REMOTE SENSING AND GIS	Demonstrate the understanding of basic concepts of remote sensing and interpret energy interactions.
			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.
88	18MT 001	DECISION THEORY	Calculate the optimum values for given objective function by LPP
			Solve the solution for maximize the profit with minimum cost by Transportation problem.
			Determine the optimum feasible solution for sequencing the Jobs
			Arrange the jobs for different Machines to get optimum values
			Measure the solution of dynamical system problems
89	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.
90	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.
91	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.
92	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 error free sentences

			<p>applying features of technical writing.</p> <p>Analyze data, draw inferences to write Journal articles and conference papers and to compose businessletters.</p> <p>Evaluate data to draft technical reports and technical proposals.</p> <p>Design a technical presentation by understanding the nuances of presentation skills and also transfer datafrom verbal to graphic and vice versa.</p>
93	18BT O01	BASICS OF BIOLOGY	<p>Explain the theories of origin and evolution of life.</p> <p>Describe the anatomical structure and physiological functions of the human organ systems.</p> <p>Outline the principle and applications of medical devises.</p> <p>Discuss the technology advancements in improving human health and environment</p> <p>Explain the biological information, sequencing and evolutionary relationship among organisms.</p>
94	18CE O02	DISASTER MITIGATION AND MANAGEMENT (M)	<p>Identify and understand the fundamental terminologies in disaster management.</p> <p>Distinguish between the Hydro-meteorological disasters and apply the concepts of structural and non- structural mitigation measures.</p> <p>Categorize different Geographical Disasters and apply the knowledge in utilizing the early warning systems.</p> <p>Analyze various mechanisms and consequences of human induced disasters.</p> <p>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.</p>
95	18EE O05	WASTE TO ENERGY	<p>Understand the concept of conservation, and Identify the devices for conservation</p> <p>Classify the different forms of wastage</p> <p>Explain the process of Gasification, and Demonstrate the design and operation of Gasifiers</p> <p>Explain the process of Combustion, and Demonstrate the construction and operation of various combustors</p> <p>Describe the process of biomass conversion, and to Differentiate biomass, biogas, biochemical and biodiesel plants</p>
96	18EC O07	SYSTEM AUTOMATION AND CONTROL	<p>Understand the features of various automatic and process control systems.</p> <p>Define and analyze various measuring parameters in the industry.</p> <p>Compare performance of various controllers (P, PD, PI, and PID).</p> <p>Illustrate the role of digital computers in automation.</p> <p>Develop various robot structures for different applications.</p>
97	18ME C28	TECHNICAL SEMINAR	<p>Identify the recent advances in the field of engineering/technology.(BL-1)</p> <p>Develop the skills and expertise in report writing.(BL-6)</p> <p>Compile the content and prepare comprehensive report.(BL-4)</p> <p>Demonstrate skills required for preparation of a technical report.(BL-3)</p> <p>Present technical know-how and professional skills before the committee.(BL-3)</p>
98	18ME C29	PROJECT: PART -2	<p>Summarize the literature review for the identified problem.(BL-2)</p> <p>Identify methods and materials to carry out experiments/ develop code/simulation.(BL-4)</p> <p>Integrate the methodology and engineering tools adopted for solving the problem.(BL-6)</p> <p>Analyze and discuss the results to draw valid conclusions(BL-4)</p> <p>Exhibit knowledge, skill, attitude and technical knowhow in preparing report as per format and presenting as a professional engineer.(BL-3)</p>
99	18ME O01	ROBOTICS	<p>Describe the basic components, specifications and applications of the Robots.(BL-1)</p>

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			Understand transformations, direct and inverse kinematics of robots.(BL-2)
			Calculate forces in links and joints of a robot and find the singularities, Jacobian and trajectory planning of a robot for various tasks. (BL-3)
			Classify drives, sensors and grippers for various applications. (BL-4)
			Program a robot to predict motions for a given task with machine vision and sensors. (BL-5)
100	18ME 002	HUMAN VALUES AND PROFESSIONAL ETHICS	State basic values and the need for value education.(BL-2)
			Analyze the situation and prioritize values for making right decisions in their personal as well as professional life.(BL-4)
			Understand the role of a human being in ensuring harmony in society and nature.(BL-2)
			Demonstrate the knowledge of ethics at their work place and apply different theoretical approaches to solve ethical dilemmas.(BL-3)
			Apply risk and safety measures in the engineering practice. (BL-3)
101	18ME 003	RESEARCH METHODOLOGIES	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)
102	18ME 004	ENTREPRENEURSHIP	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)
			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)
103	18ME 005	HUMAN RIGHTS AND LEGISLATIVE PROCEDURE	Recall the human rights in the global and national context.(BL-1)
			Understand the overall view on working of Indian constitution.(BL-2)
			Analyze the societal problems in the context of human rights .(BL-4)
			Evaluate implementation of right to development and right to information.(BL-5)
			Application of human rights for human safety and clean environment.(BL-3)
104	18ME 006	NANO MATERIALS AND TECHNOLOGY	Understand the basic concepts, developments and challenges in nanotechnology.(BL-2)
			Describe the methods of evaluating magnetic and electronic properties, microstructure by spm and atomic force microscopy.(BL-2)
			Apply heterogeneous methods and characterization techniques of zero & one dimensional nanostructures.(BL-3)
			Evaluate various nano material fabrication techniques.(BL-5)
			Analyze nano materials and nano bio materials for obtaining solutions to societal problems.(BL-4)
105	18ME 007	INTELLECTUAL PROPERTY RIGHTS	Understand the evolution of IP, working of organization's at global level to protect and promote IP.(BL-2)
			Familiarize with the patent filing process at national and international level.(BL-2)
			Draw the logical conclusion of research, innovation and patent filing. (BL-3)
			Compare different kinds of IP and their patenting system.(BL-4)
			Understand the techno-legal-business angle of IP, infringement and enforcement mechanisms for protection. (BL2)
106	18ME 008	MECHATRONICS	Understand the concept of mechatronics and analyze electrical and mechanical systems and their interconnection for a given application.(BL-2)

			Apply mechanical, electronics, control, and computer engineering in the design of mechatronics systems to specific applications.(BL-3)
			Analyze the design, interfacing, and actuation of a mechatronics system to given specifications.(BL-4)
			Recommend the use of industrial electronic devices, fluid power systems in various mechatronics applications.(BL-5)
			Develop the design of modern CNC machines and modern mechatronics systems.(BL-6)
107	18ME O09	ORGANIZATIONAL BEHAVIOUR	Understand Organizational Behavioral principles and practices.(BL-2)
			Compare various organizational designs and cultures enabling organizational development. (BL-4)
			Apply motivational theories and leadership styles in resolving employee's problems and decision making processes. (BL-3)
			Understand the group dynamics, communication network, skills needed to resolve organizational conflicts. (BL-2)
			Analyze the behavior, perception and personality of individuals and groups in organizations in terms of the key factors that influence organizational behavior. (BL-4)
108	18ME O10	INTRODUCTION TO OPERATIONS RESEARCH	Understand the concepts of linear programming problem.(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 concepts for industry applications.(BL-3)
109	18ME O11	MODERN MANUFACTURING PROCESSES	Understand the opportunities, challenges brought about by Industry 4.0 and how organizations and individuals should prepare to reap the benefits.(BL-2)
			Apply the concept, architecture and process of digital manufacturing.(BL-3)
			Evaluate real-life scenarios and recommend the appropriate use of 3D printing technology.(BL-5)
			Compare various non-traditional machining processes.(BL-4)
			Demonstrate the procedure for the fabrication of micro-Electronic devices.(BL-2)
110	18ME O12	3DPRINTING	Understand the concept of 3D printing processes, advantages and limitations.(BL-2)
			Evaluate real-life scenarios and recommend the appropriate 3D printing technology.(BL-5)
			Analyze various pre-processing and post processing techniques.(BL-4)
			Explain current and emerging 3D printing technologies in diversified applications.(BL-2)
			Identify components required in construction of 3D printer.(BL-3)
111	18ME O13	INDUSTRIAL 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)



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(Autonomous)

**Gandipet, Hyderabad -75**

**Department of Mechanical Course Outcomes**

**Statements for B.E (Mech) - R20**

SNo	Course		Course Outcomes Statements
	Code	Name	
1.	20MT C05	CALCULUS	Apply the Matrix Methods to solve system of linear equations.
			Analyse the geometrical interpretation of Mean value theorems.
			Determine the extreme values of functions of two variables.
			Examine the convergence and divergence of infinite Series.
			Calculate the Euler's coefficients for Fourier series of a function
2.	20CY C01	CHEMISTRY	Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.
			Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells.
			Illustrate the major chemical reactions that are used in the synthesis of organic molecules.
			Classify the various methods used in treatment of water for domestic and industrial use.
			Outline the synthesis of various Engineering materials & Drugs.
3.	20CE C01	ENGINEERING MECHANICS – I	Calculate the components and resultant of coplanar forces system.
			Understand free body diagram and apply equilibrium equations to solve for unknown forces.
			Apply concepts of friction for solving engineering problems.
			Analyse simple trusses for forces in various members of a truss.
			Determine centroid for elementary, composite figures and bodies.
4.	20CS C01	PROGRAMMING FOR PROBLEM SOLVING	Identify and understand the computing environments for scientific and mathematical problems.
			Formulate solutions to problems with alternate approaches and represent them using algorithms / Flowcharts.
			Choose data types and control structures to solve mathematical and scientific problem.
			Decompose a problem into modules and use functions to implement the modules.
			Apply arrays, pointers, structures, and unions to solve mathematical and scientific problems.
Develop applications using file I/O			
5.	20CY C02	CHEMISTRY LAB	Identify the basic chemical methods to analyse the substances quantitatively & qualitatively.
			Estimate the amount of chemical substances by volumetric analysis.
			Determine the rate constants of reactions from concentration of reactants/ products as a function of time.
			Calculate the concentration and amount of various substances using instrumental techniques.
			Develop the basic drug molecules and polymeric compounds.
6.	20CS C02	PROGRAMMING FOR PROBLEM SOLVING LAB	Identify and setup program development environment.
			Design and test programs to solve mathematical and scientific problems.
			Identify and rectify the syntax errors and debug program for semantic

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			errors
			Implement modular programs using functions.
			Represent data in arrays, pointers, structures and manipulate them through a program.
			Create, read, and write to and from simple text files.
7.	20ME C02	WORKSHOP / MANUFACTURING PRACTICE	Understand safety measures to be followed in workshop to avoid accidents.
			Identify various tools used in fitting, carpentry, tin smithy, house wiring, welding, casting and machining processes.
			Make a given model by using workshop trades including fitting, carpentry, tinsmithy and House wiring.
			Perform various operations in welding, machining and casting processes.
			Conceptualize and produce simple device/mechanism of their choice.
8.	20ME C03	ENGINEERING EXPLORATION	Understand the role of an engineer as a problem solver.
			Identify multi-disciplinary approaches in solving an engineering problem.
			Build simple systems using engineering design process.
			Analyze engineering solutions from ethical and sustainability perspectives.
			Use basics of engineering project management skills in doing projects.
9.	20MT C06	VECTOR CALCULUS AND DIFFERENTIAL EQUATIONS	Calculate the areas and volumes.
			Apply the vector differential operators to Scalars and Vector functions.
			Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems.
			Calculate the solutions of first order linear differential equations.
			Solve higher order linear differential equations.
10.	20EG C01	ENGLISH	Illustrate the nature, process and types of communication and communicate effectively without barriers.
			Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette.
			Apply techniques of precision to write a précis and formal letters by using acceptable grammar and appropriate vocabulary.
			Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.
			Critique passages by applying effective reading techniques
11.	20PY C05	MECHANICS AND MATERIALS SCIENCE	Compare the various types of oscillations
			Demonstrate rotational motion of rigid body
			Classify different types of crystals and their imperfections
			Identify magnetic and dielectric materials for engineering applications
			Make use of lasers and superconductors in technological applications
12.	20EEC01	BASIC ELECTRICAL ENGI NEERING	Understand the concepts of Kirchhoff's laws and to apply them in superposition, Thevenin's and Norton's theorems to get the solution of simple dc circuits
			Obtain the steady state response of RLC circuits with AC input and to acquire the basics, relationship between voltage and current in three phase circuits.
			Understand the principle of operation, the EMF and torque equations and classification of AC and DC machines
			Explain various tests and speed control methods to determine the characteristic of DC and AC machines.
			Acquire the knowledge of electrical wiring, types of wires, cables used and Electrical safety precautions to be followed in electrical installations.



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			Recognize importance of earthing, methods of earthing and various low-tension switchgear used in electrical installations
13.	20EG C02	ENGLISH LAB	<p>Define the speech sounds in English and understand the nuances of pronunciation in English</p> <p>Apply stress correctly and speak with the proper tone, intonation and rhythm.</p> <p>Analyze IELTS and TOEFL listening comprehension texts to enhance their listening skills.</p> <p>Determine the context and speak appropriately in various situations.</p> <p>Design and present effective posters while working in teams ,and discuss and participate in Group discussions.</p>
14.	20PY C08	MECHANICS AND MATERIALS SCIENCE LAB	<p>Estimate the error in an experimental measurement</p> <p>Make use of lasers and optical fibers in engineering applications</p> <p>Recall the physical properties of dielectrics and magnetic materials</p> <p>Find the mechanical properties of solids and viscosity of liquids</p> <p>Demonstrate the motion of electrons in electric and magnetic fields</p>
15.	20EE C02	BASIC ELECTRICAL ENGINEERING LAB	<p>Get an exposure to common electrical components, their ratings and basic electrical measuring equipment.</p> <p>Make electrical connections by wires of appropriate ratings and able to measure electric power and energy.</p> <p>Comprehend the circuit analysis techniques using various circuit laws and theorems.</p> <p>Determine the parameters of the given coil and calculate the time response of RL &amp; RC series circuits.</p> <p>Recognize the basic characteristics of transformer and components of switchgear.</p> <p>Understand the basic characteristics of dc and ac machine by conducting different types of tests on them.</p>
16.	20ME C01	CAD AND DRAFTING	<p>Become conversant with appropriate use of CAD software for drafting.</p> <p>Recognize BIS, ISO Standards and conventions in Engineering Drafting.</p> <p>Construct the projections of points, lines, planes, solids</p> <p>Analyse the internal details of solids through sectional views</p> <p>Create an isometric projections and views</p>
17.	20MBC02	COMMUNITY ENGAGEMENT	<p>Gain an understanding of Rural life, Culture and Social realities.</p> <p>Develop a sense of empathy and bonds of mutuality with Local Communities.</p> <p>Appreciate significant contributions of Local communities to Indian Society and Economy.</p> <p>Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements.</p> <p>Utilise the opportunities provided by Rural Development Programmes.</p>
18.	20ME C16	DYNAMICS OF MACHINES	<p>Apply the concept of dynamically equivalent link and determine the fluctuation of energy for flywheel applications in engines and punching presses.</p> <p>Understand the gyroscopic effects in ships, aero planes and road vehicles.</p> <p>Analyze the characteristics of various centrifugal governors.</p> <p>Analyze balancing problems in rotating and reciprocating machinery.</p> <p>Understand free and forced vibrations of single degree freedom systems and two-degree freedom linear systems.</p>
19.	20ME C17	APPLIED THERMODYNAMICS	<p>Estimate the power required and efficiency of reciprocating air compressor using the principles of thermodynamics</p> <p>Understand the working principle of I.C engines and evaluate the</p>



		AND HEAT TRANSFER	<p>performance of I.C. engines.</p> <p>Understand the concepts of normal, abnormal combustion and the functioning of engine systems like cooling, lubrication and ignition.</p> <p>Estimate the heat transfer through composite slabs, composite cylinders and understand the dimensionless numbers used in convection.</p> <p>Understand the basic principles of heat exchangers, radiation, boiling and condensation.</p>
20.	20ME C18	DESIGN OF MACHINE ELEMENTS	<p>Understand the standards, codes, various design considerations, failure criteria of members and design for static loads.</p> <p>Design machine members subjected to fluctuating and impact loads.</p> <p>Recommend suitable shafts, couplings and belt drives for a given application.</p> <p>Design and suggest permanent joints for a given application.</p> <p>Design of temporary fasteners.</p>
21.	20ME C19	CAD/CAM	<p>Understand the applications of computer in design, manufacturing, and geometric transformation techniques.</p> <p>Demonstrate the knowledge of mathematical representation of various curves and surfaces and to model engineering components using solid modelling techniques.</p> <p>Distinguish various NC systems and write the CNC part program for simple components.</p> <p>Demonstrate the fundamentals knowledge of robotics.</p> <p>Understand the elements of a modern manufacturing environment.</p>
22.	20ME E05	REFRIGERATION AND AIR CONDITIONING	<p>Distinguish different types of refrigerants and evaluate the performance of different aircraft refrigeration systems.</p> <p>Analyze the performance of vapour compression refrigeration systems and improvement methods.</p> <p>Understand the Vapour absorption, steam-jet and non-conventional refrigeration systems.</p> <p>Analyze air-conditioning processes using the principles of Psychrometry.</p> <p>Evaluate heating and cooling loads in air-conditioning systems.</p>
23.	20ME E06	ROBOTIC ENGINEERING	<p>Understand the basic components and specifications of the Robots.</p> <p>Solve the problems of transformations, direct and inverse kinematics of robots .</p> <p>Analyze forces in links and joints of a robot and find the singularities, Jacobian and trajectory planning of a robot for various tasks.</p> <p>Recommend sensors and controllers for finding position and orientation to take corrective action based on feedback.</p> <p>Design an intelligent robot using machine vision and sensors to perform an assigned task.</p>
24.	20MEE07	RESEARCH METHODOLOGY AND INNOVATION	<p>Define research problem.</p> <p>Review and assess the quality of literature from various sources.</p> <p>Understand and develop various research designs.</p> <p>Collect and analyze the data using statistical techniques.</p> <p>Apply creative thinking and innovative skills in research.</p>
25.	20ME E08	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.</p> <p>Understand creativity, brainstorming and ergonomic concepts.</p> <p>Apply the concept of design for manufacture, assembly, maintenance, reliability and product life cycle in developing a product.</p> <p>Implement the Intellectual Property Rights to a new product or a process.</p> <p>Evaluate and recommend an effective Process Plan and principles of value engineering to new product development.</p>

  
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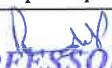
26.	20ITO01	OBJECT ORIENTED PROGRAMMING USING JAVA	To understand fundamentals of object-oriented programming paradigm.
			To apply knowledge of string handling, interfaces, packages and inner classes.
			To implement Exception handling mechanisms and Multithreading.
			To demonstrate knowledge on collection framework, stream classes.
			To develop web applications using Servlets and JSP.
27.	20CSO09	FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS	Classify the difference between FMS and DBMS; describe the roles of different users and the structure of the DBMS. Design the database logically using ER modeling
			Outline the schema of the relational database and key constraints. Develop queries using DDL, DML and DCL of SQL.
			Identify the inference rules for functional dependencies and apply the principles of normal forms to decompose the relations in a database.
			Summarize the concepts of dense, sparse, ISAM and B+ tree indexing and get familiar with states and properties of transactions.
			Interpret the locking, time stamp, graph and validation-based protocols for concurrency control.
			Summarize log-based recovery techniques to increase the robustness of the database, identify to resolve the deadlocks in the transactions.
28.	20EEO03	ENERGY AUDITING	Know the current energy scenario and various energy sources
			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 appliances.
29.	20BTO01	BIOLOGY FOR ENGINEERS	Appraise the values of Biology in classical and modern time
			Develop modern instruments related to skeletal, nervous, and circulatory system.
			Apply concept of respiratory, excretory, and assisted reproductive process for developing related instruments.
			Illustrate the modern interdisciplinary tools related to medical biotechnology and bioremediation.
			Summarize the basic knowledge about nucleic acids, proteins and their sequencing.
30.	20MTO04B	NUMERICAL METHODS	Apply numerical methods to find roots of algebraic and transcendental equations.
			Derive the solutions when system of equations has more than two unknowns and learn to reduce the instability of equations.
			Apply interpolation and extrapolation techniques to fit the numerical tabulated data.
			Find numerical integration by using Simpson's 1/3 rd, 3/8th and Weddle's rules.
			Apply numerical methods to Solve ODE using Taylor, Picard's, Euler's, modified Euler's, Rungakutta methods.
31.	20MEC20	DYNAMICS AND VIBRATIONS LAB	Analyze the cam profile for different motion characteristics.
			Examine the performance of governors and the gyroscopic effect on vehicles.
			Evaluate the static and dynamic balancing masses in a rotating mass system.
			Determine the natural frequency of different single degree freedom vibrating systems.
			Determine the natural frequency of two degree freedom vibrating systems
32.	20ME C21	APPLIED THERMODYNAMICS	Evaluate the performance of petrol and diesel engines.
			Estimate the conversion of heat supplied by the fuel to various other forms of energy in an I.C engine.

		AND HEAT TRANSFER LAB	Determine the performance of multi stage reciprocating air compressor. Estimate the thermal conductivity of a material and the value of convection heat transfer coefficient under natural/forced convection. Determine the Stefan - Boltzmann constant, emissivity of grey plate and overall heat transfer coefficient of heat exchanger.
33.	20ME C22	CAD/CAM LAB	Make use of appropriate features to generate 3D model using CAD software Apply constraints to assemble the components Demonstrate the knowledge splines and surface modelling Select tools required for performing specific job on CNC mill and CNC lathe Write CNC part program to generate tool path for different machining operations
34.	20ME C23	METROLOGY AND INSTRUMENTATION	Understand the need, accuracy and associated concepts of linear and angular measurements. Select appropriate gauges for inspection and design. Calculate surface roughness by using appropriate instruments. Analyze and interpret the types of errors, strain measurement and instrument characteristics. Evaluate measuring methods and devices for displacement, pressure & temperature.
35.	20ME C24	MACHINE DESIGN	Understand the design procedure of helical, leaf springs under static and fluctuating loads. Design the spur, helical and bevel gears based on beam strength and wear strength. Demonstrate the ability in designing sliding contact bearings & selection of rolling contact bearings. Design of IC engine piston, connecting rod and crank shaft. Analyze the curved beams and selection of chain drives for a given application.
36.	20ME C25	THERMAL TURBO MACHINES	Design various configurations of nozzles and diffusers with the principles of Gas Dynamics. Design the ducts for friction with the principles of Fanno Flow. Estimate the power required for various types of rotary compressors. Determine the various efficiencies related to Steam Turbines. Determine the power output of the Gas Turbine and understand the working principle of jet and rocket propulsion.
37.	20ME C26	FINITE ELEMENT ANALYSIS	Understand FE method for solving field problems using energy formulations. Analyze bars, trusses, beams and circular shafts for static and dynamic analysis. Formulate 2D structural components using triangular element for plane stress, plane strain and axi- Symmetric problems. Derive stiffness matrix for 4 node quadrilateral isoparametric element for static analysis and 3 D elements. Solve heat transfer problems and apply finite element analysis software for engineering solutions.
38.	20ME E09	COMPUTATIONAL FLUID DYNAMICS	Describe and develop mathematical models for flow phenomena. Apply Finite Difference Method for fluid flow and heat transfer problems Classify PDE for fluid flow and heat transfer applications. Use different solvers based on applications Solve fluid flow and heat transfer problems using commercial CFD tools for turbulence models Formulate numerical equations by Finite Volume Method for fluid flow and heat transfer problems
39.	20ME E10	ADDITIVE	Understand the fundamental concepts of Additive manufacturing

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		MANUFACTURING	Demonstrate the knowledge of various Additive Manufacturing Processes. Analyze preprocessing and identify different post processing techniques in AM Demonstrate the design rules for product development through Additive manufacturing. Create awareness of Additive manufacturing in various applications.
40.	20ME E11	OPERATIONS RESEARCH	Understand the concepts of linear programming problems and Solve. Solve the given transportation problem. Develop optimum pair of operations and resources by using Assignment technique. Analyze project management techniques like CPM and PERT to plan and execute projects successfully. Apply sequencing and queuing theory concepts for industry applications.
41.	20ME E12	INDUTRIAL SAFETY AND MAINTENANCE	Identify the causes for industrial accidents and suggest preventive measures. Identify the basic tools and requirements of different maintenance procedures. Apply different techniques to reduce and prevent Wear and corrosion in Industry. Identify different types of faults present in various equipments like machine tools, IC Engines, boilers etc. Apply periodic and preventive maintenance techniques as required for industrial equipments like motors, pumps and air compressors and machine tools etc.
42.	20ME C27	METROLOGY AND INSTRUMENTATION LAB	Measure the linear dimension by using appropriate method & device. Demonstrate the knowledge of angular measurements and use measuring instruments as per requirements. Determine the gear and screw thread parameters using profile projector and tool makers' microscope. Design and test plain limit gauges for a given specimen. Evaluate and estimate the measurement of flatness, roundness and surface roughness.
43.	20ME C28	MACHINE DRAWING LAB	Understand the importance and need of machine drawing in industries. Model different machine components using CAD software. Draw a detailed dra. wing of a component to facilitate its manufacture. Analyze aspects of orthographic views in the preparation of the part/assembly drawings. Identify the sequence of steps to assemble the machine/system components.
44.	20ME C29	PRODUCTION DRAWING LAB	Interpret the working drawing/ industrial blueprint of various components. Identify the different parts of the object with dimensional tolerances Create the various part drawings using solid modelling package Use the various functions of modelling soft ware: annotations, sheet making etc. Prepare Bill of materials for assembly and process sheet in manufacturing industry.
45.	20ME C30	THERMAL ENGINEERING LAB	Determine thermal conductivity of a metal rod and critical heat flux of a copper wire. Estimate the convective heat transfer coefficients for phase change heat transfer and effectiveness of cross flow heat exchanger. Determine the overall efficiency of centrifugal/axial-flow compressor. Study of COP of refrigeration/air conditioning tutor.

			Determine the - pressure distribution in a nozzle/cylinder/aero-foil; lift and drag forces for different geometrical profiles.
46.	20ME C31	FINITE ELEMENT ANALYSIS LAB	Apply basics of Theory of Elasticity to continuum problems. Analyze finite elements like 1D, 2D and 3D structures for linear static analysis. Solve heat transfer problems. Examine problems of limited complexity in buckling and dynamic analysis. Evaluate solutions to practical problems by finite element software.
47.	20EG CO3	EMPLOYABILITY SKILLS	Become effective communicators, participate in group discussions with confidence and be able to make presentations in a professional context. Write resumes, prepare and face interviews confidently. Be assertive and set short term and long term goals, learn to manage time effectively and deal with stress. Make the transition smoothly from campus to work, use media with etiquette and understand the academic ethics. Enrich their vocabulary, frame accurate sentences and comprehend passages confidently.
48.	20ME E13	AUTOMOBILE ENGINEERING	Identify principal parts of an automobile and its layout. Understand the various systems in automobile like engine cooling, lubrication, ignition, electrical and air conditioning systems with the principles of thermodynamics. Understand the various suspension and steering systems. Analyse the functioning of drive train, transmission and braking systems. Understand the importance of alternative power trains for pollution control.
49.	20ME E14	CONTROL SYSTEMS THEORY	Understand control system, modeling and transfer functions of different systems. Apply the concept of block diagram and signal flow graphs to different systems. Differentiate between time domain and frequency domain techniques. Examine the stability of a system using different approaches. Analyze the system in state space and to find out the controllability and observability.
50.	20ME E15	MECHANICAL VIBRATIONS	Apply Newton's law of motion and energy method to get governing differential equations of vibrating systems. Analyze response of machine members in forced vibration with different excitation frequencies, Recommend suitable vibration parameters for isolation and compute critical speeds. Analyze mode shape and decoupling of equation of motion for 2 degree of freedom systems. Predict natural frequency and mode shape for all continuous systems. Understand working principles of vibration measuring instruments.
51.	20MEE16	SUPPLY CHAIN MANAGEMENT	Understand fundamentals of supply chain and its key concepts. Design an effective supply chain network. Understand the essence of demand and supply and associated gaps Apply inventory management techniques. Evaluate pricing and revenue management systems.
52.	20ME E17	RENEWABLE ENERGY SOURCES	Recognize the importance of renewable energy and solar geometry. Select the solar collector based on the application. Understand the working principles of wind power plants. Understand the principles of geothermal and biogas plants.

  
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			Distinguish wave, tidal and OTEC energy.
53.	20ME E18	DIGITAL MANUFACTURING AND INDUSTRY 4.0	Understand the Basics and applications of Digital Manufacturing and Industry 4.0. Understand the role of Additive Manufacturing, Virtual prototyping and Reverse Engineering processes and their adaptability to Digital Manufacturing. Understand the concepts of digital manufacturing based product life cycle and its management. Understand the concept of Industry 4.0 and allied technologies. Understand the basics of Internet of things and cloud computing pertaining the fourth industrial revolution.
54.	20ME E19	COMPOSITE MATERIALS AND TESTING	Understand composite materials, classification, types of matrix and fibre materials. Understand types of analyses, stress strain relationships for different materials and characterization of UD lamina. Understand the variation of properties with orientation and failure theories of UD lamina. Analyze the laminates for stresses and strains using CLT. Summarize the various fabrication methods of composite materials and measurements of properties through tests.
55.	20ME E20	BLOCK CHAIN TECHNOLOGY	State the basic concepts and design primitives of blockchain. Understand the significance of Consensus mechanisms. Understand different types of blockchain. Demonstrate the significance of blockchain in financial, supply chain and government sector based use cases. Analyze the applications of Blockchain in industry & governance
56.	20CS O05	BASICS OF ARTIFICIAL INTELLIGENCE	Differentiate between a rudimentary Problem and an AI problem, its Characteristics and problem-solving Techniques. Compare and contrast the various knowledge representation schemes of AI. Appraise knowledge in Uncertainty and Probabilistic reasoning approaches. Understand the different learning techniques. Apply the AI techniques to solve the real-world problems.
57.	20CH O06	FUNDAMENTALS OF FUEL CELLS	Apply know-how of thermodynamics, electro-chemistry and principle of fuel cell. Understand the different types of fuel cell. Understand the components of hydrogen-based fuel cell. Evaluate the performance of fuel cells. Explain the application of fuel cell in transport, stationary and portable sector. Understand the impact of this technology in a global and societal context.
58.	20CE O02	DISASTER AND RISK REDUCTION MANAGEMENT	Identify and understand the concepts of hazards, causes and impacts of disasters. Develop a critical capacity to evaluate the principles and practices of disaster risk reduction and management. Develop a deep awareness of disaster resilience, risk mitigation, and recovery policies as they arise from natural hazards around the globe; Apply knowledge about existing global frameworks and existing agreements and role of community in successful Disaster Risk Reduction Evaluate DM study including data search, analysis and presentation as a case study.
59.	20EC O05	SYSTEM	Understand the features of various automatic and process control systems.

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		AUTOMATION AND CONTROL	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.
60.	20EG 001	TECHNICAL WRITING SKILLS	Communicate effectively, without barriers and understand aspects of technical communication. Differentiate between general writing and technical writing and write error free sentences using technology specific words Apply techniques of writing in business correspondence and in writing articles. Draft technical reports and technical proposals. Prepare agenda and minutes of a meeting and demonstrate effective technical presentation skills.
61.	20IT 002	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.
62.	20CS002	INTRODUCTION TO WEB TECHNOLOGY	Understand the technologies required for developing web application. Identify and choose XHTML tags, CSS and java scripts to develop well-structured and easily maintained web pages. Design and Develop interactive and innovative web pages using various platforms/technologies like XHTML, CSS, XML, JAVASCRIPT. Create and deploy web applications in web server by using server-side programming concepts like PHP Build a data driven web site using Databases. Evaluate different web applications to implement optimal solutions for real time problems
63.	20EC 004	PRINCIPLES OF EMBEDDED SYSTEMS	Understand hardware and software details of embedded system. Analyze the architecture and instruction set of embedded processors. Develop the embedded system design cycle Apply various debugging tools for embedded system applications. Design different case studies for embedded applications
64.	20PY 001	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 technology by adopting new philosophies of 19th and first half of 20th century in finding ethical solutions to the societal problems. 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.
65.	20AD 001	INTRODUCTION TO PYTHON	Explore data operations on list, tuple and dictionary in python. Understand deployment of models on different datasets.

  
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		PROGRAMMING	Apply supervised, unsupervised, resembling and NLP models on different datasets. Perform data analysis using python packages. Build and evaluate the models using python programming.
66.	20EG M04	GENDER SENSITIZATION	Understand the difference between “Sex” and “Gender” and be able to explain socially constructed theories of identity. Recognize shifting definitions of “Man” and “Women” in relation to evolving notions of “Masculinity” and “Femininity”. Appreciate women’s contributions to society historically, culturally and politically. 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. Demonstrate an understanding of personal life, the workplace, the community and active civic engagement through classroom learning.
67.	20MB C01	ENGINEERING ECONOMICS AND ACCOUNTANCY	Apply fundamental knowledge of Managerial Economics concepts and tools. Analyze various aspects of Demand Analysis, Supply and Demand Forecasting. Understand Production and Cost relationships to make best use of resources available. Apply Accountancy Concepts and Conventions and preparation of Final Accounts. Evaluate Capital and Capital Budgeting decision based on any technique.
68.	20ME C33	PROJECT PART-1	Identify a topic in advanced areas of Mechanical / Allied fields of Engineering. Review literature to identify the gaps, define the objectives and scope of the work. Generate innovative ideas for societal benefit and Nation building. Develop prototypes/models, experimental setup and software systems necessary to meet the objectives. Prepare a technical report and present before the departmental committee
69.	20IT O03	INTRODUCTION TO CLOUD COMPUTING	Understand the characteristics and models in Cloud computing. Asses Cloud services applications and the challenges associated with Cloud Computing. Apply various cloud services and deployment models and virtualization techniques for business. Analyze the concepts of cloud storage and demonstrate their use. Evaluate various cloud programming models and apply them in virtual office management.
70.	20CS O08	BASICS OF MACHINE LEARNING	Define the basic concepts related to Python and Machine Learning Describe the feature engineering methods, regression techniques and classification methods Apply Python packages for data visualization, text and time series data analysis using NLP toolkit Evaluate and interpret the results of the various machine learning techniques Solve real world problems using deep learning framework.
71.	20EC O06	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.



72.	20EE O05	WASTE MANAGEMENT	Categorize the waste based on the physical and chemical properties.
			Explain the Hazardous Waste Management and Treatment process.
			Illustrate the Environmental Risk Assessment, methods, mitigation and control.
			Interpret the Biological Treatment of Solid and Hazardous Waste.
			Identify the waste disposal options, describe the design and construction, Operation, Monitoring, Closure of Landfills
73.	20BT O02	BIOMATERIALS FOR ENGINEERS	Explain types and properties of Biomaterials.
			Compare the techniques for manufacture of metallic Biomaterials and their use in health care industry.
			Outline the physiological properties and various techniques for manufacture of ceramic biomaterials.
			Illustrate the preparation of polymer and composite Biomaterials.
			Apply the different type of Biomaterials in health industry.
74.	20ME C34	TECHNICAL SEMINAR	Identify the recent advances in the field of engineering/technology.
			Develop the skills and expertise in report writing.
			Compile the content and prepare comprehensive report.
			Demonstrate skills required for preparation of a technical report.
			Present technical know-how and professional skills before the committee.
75.	20ME C35	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 (A)  
 Gandipet, Hyderabad-500 075, Telangana

**CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (Autonomous)  
Gandipet, Hyderabad -75**

**Department of Mechanical Course Outcomes**

**Statements for B.E (Mech) - R22**

SNo	Course		Course Outcomes Statements
	Code	Name	
1.	22MTC02	Calculus	<p>Apply the Matrix Methods to solve system of linear equations.</p> <p>Analyze the geometrical interpretation of Mean value theorems and curvature.</p> <p>Determine the extreme values of functions of two variables.</p> <p>Find the shape of the curve, surface areas and volumes of revolution.</p> <p>Examine the convergence and divergence of infinite Series.</p>
2.	22CYC01	Chemistry	<p>Identify the microscopic chemistry in terms of molecular orbitals, intermolecular forces and rate of chemical reactions.</p> <p>Discuss the properties and processes using thermodynamic functions, electrochemical cells and their role in batteries and fuel cells.</p> <p>Illustrate the major chemical reactions that are used in the synthesis of organic molecules.</p> <p>Classify the various methods used in treatment of water for domestic and industrial use.</p> <p>Outline the synthesis of various Engineering materials &amp; Drugs</p>
3.	22EEC01	Basic Electrical Engineering	<p>Understand the concepts of Kirchhoff's laws and their application various theorems to get solution of simple dc circuits.</p> <p>Predict the steady state response of RLC circuits with AC single phase/three phase supply.</p> <p>Infer the basics of single phase transformer</p> <p>Describe the construction, working principle of DC machine and 3-phase Induction motor.</p> <p>Acquire the knowledge of electrical wires, cables, earthing, Electrical safety precautions to be followed in electrical installations and electric shock and its safety and energy calculations</p>
4.	22CSC01	Problem Solving and Programming	<p>Understand real world problems and develop computer solutions for those problems.</p> <p>Understand the basics of Python.</p> <p>Apply Python for solving basic programming solutions.</p> <p>Create algorithms/flowcharts for solving real-time problems.</p> <p>Build and manage dictionaries to manage data</p> <p>Handle data using files</p>
5.	22CYC02	Chemistry Lab	<p>Identify the basic chemical methods to analyse the substances quantitatively &amp; qualitatively.</p> <p>Estimate the amount of chemical substances by volumetric analysis.</p> <p>Determine the rate constants of reactions from concentration of reactants/ products as a function of time.</p> <p>Calculate the concentration and amount of various substances using instrumental techniques.</p> <p>Develop the basic drug molecules and polymeric compounds</p>
6.	22MBC02	Community Engagement	<p>Gain an understanding of Rural life, Culture and Social realities.</p> <p>Develop a sense of empathy and bonds of mutuality with Local Communities.</p> <p>Appreciate significant contributions of Local communities to Indian Society and Economy.</p>

			Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements. Utilise the opportunities provided by Rural Development Programmes
7.	22CSC02	Problem Solving and Programming Lab	Understand various Python program development Environments Demonstrate the concepts of Python. Implement algorithms/flowcharts using Python to solve real-world problems. Build and manage dictionaries to manage data. Write Python functions to facilitate code reuse. Use Python to handle files and memory
8.	22MEC37	Robotics & Drones Lab	Demonstrate knowledge of the relationship between mechanical structures of robotics and their operational workspace characteristics Understand mechanical components, motors, sensors and electronic circuits of robots and build robots. Demonstrate knowledge of robot controllers. Use Linux environment for robotic programming. Write Python scripts to control robots using Python and Open CV
9.	22EEC02	Basic Electrical Engineering Lab	Comprehend the circuit analysis techniques using various circuitual laws and theorems. Analyse the parameters of the given coil and measurement of power and energy in AC circuits Determine the turns ration/performance parameters of single-phase transformer Infer the characteristics of DC shunt motor different tests. Illustrate different parts and their function of electrical components, equipment and machines
10.	22MTC05	Vector Calculus and Differential Equations	Apply the vector differential operators to Scalars and Vector functions. Solve line, surface & volume integrals by Greens, Gauss and Stoke's theorems. Calculate the solutions of first order linear differential equations. Solve higher order linear differential equations. Find solution of algebraic, transcendental and ODE by Numerical Methods
11.	22PYC05	Mechanics and Materials Science	Compare the various types of oscillations Demonstrate rotational motion of rigid body Classify different types of crystals and their imperfections Identify magnetic and dielectric materials for engineering applications Make use of lasers and superconductors in technological applications
12.	22CEC01	Engineering Mechanics	Calculate the components and resultant of coplanar forces system and Draw free body diagrams to analyze the forces in the given structure Understand the mechanism of friction and can solve friction problems Analyse simple trusses for forces in various members of a truss. Determine the centroid of plane areas, composite areas and centres of gravity of bodies. Determine moments of inertia, product of inertia of plane and composite areas and mass moments of inertia of elementary bodies
13.	22EGC01	English	Illustrate the nature, process and types of communication and communicate effectively without barriers. Construct and compose coherent paragraphs, emails and adhering to appropriate mobile etiquette. Apply techniques of precision to write a précis and formal letters

  
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			by using acceptable grammar and appropriate vocabulary.
			Distinguish formal from informal reports and demonstrate advanced writing skills by drafting formal reports.
			Critique passages by applying effective reading techniques
14.	22PYC08	Mechanics and Materials Science Lab	Estimate the error in an experimental measurement
			Make use of lasers and optical fibers in engineering applications
			Recall the physical properties of dielectrics and magnetic materials
			Find the mechanical properties of solids and viscosity of liquids
			Demonstrate the motion of electrons in electric and magnetic fields
15.	22EGC02	English lab	Define the speech sounds in English and understand the nuances of pronunciation in English
			Apply stress correctly and speak with the proper tone, intonation and rhythm.
			Analyze listening comprehension texts to enhance their listening skills.
			Determine the context and speak appropriately in various situations.
			Design and present effective posters while working in teams ,and discuss and participate in Group discussions
16.	22MEC01	CAD and Drafting Lab	Become conversant with appropriate use of CAD software for drafting.
			Recognize BIS, ISO Standards and conventions in Engineering Drafting.
			Construct the projections of points, lines, planes, solids
			Analyse the internal details of solids through sectional views
			Create an isometric projections and views
17.	22MEC38	Digital Fabrication Lab	Understand safety measures to be followed in workshop to avoid accidents.
			Identify various tools used in fitting, carpentry, tin smithy, house wiring, welding, casting and machining processes.
			Make a given model by using workshop trades including fitting, carpentry, tinsmithy and House wiring.
			Perform various operations in welding, machining and casting processes.
			Conceptualize and produce simple device/mechanism of their choice
18.	22MTC10	Partial differential Equations and Statistics	Calculate the Euler's coefficients for Fourier series expansion of a function.
			Solve Linear and Non-Linear PDE's.
			Solve One-Dimension Wave and Heat equations and Two Dimension Laplace equation.
			Use the basic probability for fitting the Random phenomenon.
			Analyze the random fluctuations of probability distribution and Principles of Least Squares approximations for the given data
19.	22CSC35	Data Structures using Python	Understand classes, objects, linear data structures, nonlinear data structures, time complexity.
			Use python packages to work with datasets.
			Implement sorting, searching algorithms and analyse their performance.
			Build solutions for problems using linear, nonlinear data structures and hashing.
			Apply pattern matching algorithms for real time problems
20.	22MEC02	Material Science and Heat Treatment	Understand the crystal structure and various imperfections of crystals.

		Metallurgy	<p>Related material failure by fatigue and creep</p> <p>Interpret phase diagrams and TTT diagrams.</p> <p>Understand the methods of improvement of mechanical properties by various heat treatment operations.</p> <p>Differentiate the properties and applications of ceramics, polymers and composites</p>
21.	22MEC03	Strength of Materials	<p>Determine stresses and strains in members subjected to axial loads and 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 able to calculate critical buckling loads in columns and struts</p>
22.	22MEC04	Thermodynamics	<p>Understand the concepts of system, thermodynamic properties, thermodynamic equilibrium and various methods of pressure and temperature measurements.</p> <p>Apply the first law of thermodynamics to various thermodynamic processes along with the applications of steady flow energy equation.</p> <p>Apply the Second law of thermodynamics to analyze heat pumps, refrigerators, heat engines and to evaluate entropy changes.</p> <p>Evaluate the properties of pure substances and analyze the performance of steam power cycles.</p> <p>Evaluate performance of air standard cycles and analyze the properties of gas mixtures</p>
23.	22MEC05	Heat Transfer	<p>Estimate heat transfer through composite slabs and cylinders with and without heat generation.</p> <p>Estimate the heat transfer through rectangular straight and pin fins; and temperature distribution in unsteady state conduction.</p> <p>Estimate the heat transfer in case flow over plates, cylinders and flow through tubes.</p> <p>Estimate radiation heat exchange between surfaces in different situations and the effect of radiation shield.</p> <p>Estimate the effectiveness of heat exchanger by LMTD, NTU methods and acquire knowledge of boiling and condensation phenomenon</p>
24.	22EEM01	Universal Human Values II: Understanding Harmony	<p>Become familiar about themselves, and their surroundings (family, society, nature).</p> <p>Develop empathy and respect for diversity by gaining an appreciation for different cultures, perspectives, and identities</p> <p>Exhibit responsible and ethical behavior by adhering to principles of integrity, honesty, compassion, and justice</p> <p>Recognize their role as global citizens.</p> <p>Exhibit a sense of social responsibility</p>
25.	22CEM01	Environmental Science	<p>Identify the natural resources and realise the importance of water, food, forest, mineral, energy, land resources and effects of over utilisation.</p> <p>Understand the concept of ecosystems and realise the importance of interlinking of food chains.</p> <p>Contribute for the conservation of bio-diversity.</p> <p>Suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.</p> <p>Follow the environmental ethics and contribute to the mitigation and management of environmental disasters</p>
26.	22MEC06	Material Science and	Identify crystal structure of various metals.

  
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		Metallurgy Lab	<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>
27.	22MEC07	Strength 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 and leaf spring by conducting load-deflection test.</p> <p>Rigidity modulus of a given shaft specimen by torsion test and shear modulus of closely coiled helical spring.</p> <p>Evaluate hardness of different materials using different scales</p> <p>Find the compressive and crushing strengths of concrete cubes and bricks.</p>
28.	22CSC36	Data Structures using Python Lab	<p>Demonstrate Classes, Objects, linear data structures, nonlinear data structures.</p> <p>Store, retrieve and visualize datasets using Python built-in packages.</p> <p>Evaluate the performance of sorting techniques.</p> <p>Build optimal solutions using linear data structures, nonlinear data structures and hashing.</p> <p>Apply pattern matching algorithms for real time problems</p>
29.	22MEC08	Heat Transfer lab	<p>Determine thermal conductivities, thermal resistances of conducting and insulating materials.</p> <p>Determine the experimental value of heat transfer coefficients in natural and forced convection modes and compare the results with analytical values.</p> <p>Determine the Stefan-Boltzmann constant and the value of emissivity of a grey plate.</p> <p>Calculate the heat transfer coefficient of heat exchanger for various configurations.</p> <p>Calculate the heat transfer coefficient in boiling and condensation heat transfer</p>
30.	22MEI01	MOOCs/Training/Internship	<p>Understand Engineer's responsibilities and ethics.</p> <p>Use various materials, processes, products and quality control.</p> <p>Provide innovative solutions to solve real world problems.</p> <p>Acquire knowledge in technical reports writing and presentation.</p> <p>Apply technical knowledge to real world industrial/rural situations</p>
31.	22MEC09	Kinematics of Machines	<p>Understand basic elements of mechanisms and their motion characteristics, DOF.</p> <p>Analyze Velocity and Acceleration of various mechanisms.</p> <p>Understand and Evaluate Principles involved in functioning of pivots, collars, clutches, belts, brakes and dynamometers.</p> <p>Design displacement diagrams and cam profile diagram for followers executing different types of motions and various configurations of followers.</p> <p>Select gear and gear train depending on application</p>
32.	22MEC10	Applied Thermodynamics	<p>Estimate the power required and efficiency of reciprocating air compressor using the principles of thermodynamics.</p> <p>Understand the working principle of I.C engines and their performance evaluation.</p> <p>Understand the concepts of normal, abnormal combustion and the functioning of engine systems like cooling, lubrication and ignition.</p> <p>Understand the types of boilers and their performance.</p> <p>Determine the efficiency of Rankine cycle with performance</p>

			improvement techniques; Understand the nozzle performance and the condition for the maximum discharge
33.	22MEC11	Fluid Mechanics and Hydraulic Machines	Determine the various properties of fluids
			Understand the laws related to fluid flow and their applications
			Acquire the knowledge of the functionality and performance of reciprocating pumps.
			Acquire knowledge in the functionality, performance and testing of hydraulic turbines
			Estimate the performance and testing of centrifugal pumps
34.	22MEC12	Manufacturing Processes	Define various terms related to manufacturing processes
			Demonstrate the understanding of various manufacturing processes
			Solve simple problems such as riser design and sheet metal calculations
			Compare various manufacturing processes
			Choose suitable manufacturing process for a given component
35.	22MEE01	Power Plant Engineering	Identify different handling equipment used in steam plant.
			Understand various coal combustion methods.
			Recognize different types of dams, spill ways and hydroelectric power plants.
			Classify nuclear power plants based on moderator and coolant.
			Analyze economics related to power plants and effect of pollutants
36.	22MEE02	Production and Operations Management	Understand the role of production system and its design in production and operations management.
			Apply forecasting techniques for predicting demand
			Use aggregate planning, master scheduling and materials requirement planning in a production system
			Compare various inventory control techniques used in production system.
			Apply the quality control tools to improve performance of production system
37.	22MEE03	Entrepreneurship	Understand the concept and essence of entrepreneurship.
			Identify business opportunities and nature of enterprise.
			Analyze the feasibility of new business plan.
			Apply project management techniques like PERT and CPM for effective planning and execution of projects.
			Use behavioral, leadership and time management aspects in entrepreneurial journey
38.	22MEE04	Mechatronics and Automation	Apply the methodology of choosing the suitable sensor for a mechatronics system.
			Select the suitable actuator for various electrical and mechanical systems.
			Design a microcontroller and microprocessor with emphasis on process controllers (P, PD, PI and PID) for a mechatronics system
			Design an automated system for industrial applications.
			Integrate the concepts of AI and IOT while designing a robotic automated system for various industrial applications
39.	22EGM01	Indian Constitution and Fundamental Principles	Understand the history of framing of the Indian Constitution and its features.
			Assess the realization of Fundamental Rights and Directive Principles of State Policy.
			Analyze the challenges to federal system and position of the President and the Prime Minister in the Union Government.
			Underline the role of the Legislature and the Judiciary in Union Government and their mutual relations.
			Evolve the development of the local governments in India and assess

  
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			the role of Collector in district administration
40.	22MEC13	Computer Aided Machine drawing	Understand the representation of materials and conventions used in machine drawing
			Draw the orthographic projections and sectional views of machine parts.
			Draw the different types of fasteners.
			Construct an assembly drawing using part drawings of machine components.
			Represent tolerances and the levels of surface finish of machine elements and prepare the process sheet
41.	22MEC14	Fluid Mechanics and Hydraulic Machines Lab	Carry out discharge measurements
			Determine the energy loss in conduits.
			Calculate forces and work done by a jet on fixed or moving, flat and curved blades.
			Demonstrate the characteristics curves of turbines.
42.	22MEC15	Manufacturing Processes Lab	Evaluate the performance characteristics of pumps
			Test the moulding sand and analyze the same.
			Test the bead geometry and correlate the results to the input parameters.
			Use TIG, MIG and spot welding machines and experiment with them.
			Test the formability characteristics of a given sheet metal.
43.	22MEC16	Applied Thermodynamics Lab	Demonstrate the understanding of various types of dies
			Evaluate the performance of petrol and diesel engines.
			Estimate the conversion of heat supplied by the fuel to various other forms of energy in an I.C engine.
			Determine the performance of multi stage reciprocating air compressor.
			Determination of fuel properties of liquids fuels
			Determination of performance parameters and pollution levels of an alternative fuel

Member, BoS

  
Chairman, BoS, Mech

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