

NAAC 2.6.1 CO STATEMENTS

UG (R20, R18, R16)

MECHANICAL ENGINEERING



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

Kokapet(Village), Gandipet, Hyderabad, Telangana-500075. www.cbit.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.

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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 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-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.


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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.

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.



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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

R-16

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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 errors
			Implement modular programs using functions.
			Represent data in arrays, pointers, structures and manipulate them through a program.

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			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.
			Recognize importance of earthing, methods of earthing and various low-tension switchgear used in electrical installations
			Define the speech sounds in English and understand the nuances of pronunciation in English
13.	20EG C02	ENGLISH LAB	


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			Apply stress correctly and speak with the proper tone, intonation and rhythm. Analyze IELTS and TOEFL 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.
14.	20PY C08	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.	20EE C02	BASIC ELECTRICAL ENGINEERING LAB	Get an exposure to common electrical components, their ratings and basic electrical measuring equipment. Make electrical connections by wires of appropriate ratings and able to measure electric power and energy. Comprehend the circuit analysis techniques using various circuit laws and theorems. Determine the parameters of the given coil and calculate the time response of RL & RC series circuits. Recognize the basic characteristics of transformer and components of switchgear. Understand the basic characteristics of dc and ac machine by conducting different types of tests on them.
16.	20ME C01	CAD AND DRAFTING	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.	20MBC02	COMMUNITY ENGAGEMENT	Gain an understanding of Rural life, Culture and Social realities. Develop a sense of empathy and bonds of mutuality with Local Communities. Appreciate significant contributions of Local communities to Indian Society and Economy. Exhibit the knowledge of Rural Institutions and contributing to Community's Socio-Economic improvements. Utilise the opportunities provided by Rural Development Programmes.
18.	20ME C16	DYNAMICS OF MACHINES	Apply the concept of dynamically equivalent link and determine the fluctuation of energy for flywheel applications in engines and punching presses. Understand the gyroscopic effects in ships, aero planes and road vehicles. Analyze the characteristics of various centrifugal governors. Analyze balancing problems in rotating and reciprocating machinery. Understand free and forced vibrations of single degree freedom systems and two-degree freedom linear systems.
19.	20ME C17	APPLIED THERMODYNAMICS AND HEAT TRANSFER	Estimate the power required and efficiency of reciprocating air compressor using the principles of thermodynamics Understand the working principle of I.C engines and evaluate the performance of I.C. engines. Understand the concepts of normal, abnormal combustion and the functioning of engine systems like cooling, lubrication and ignition. Estimate the heat transfer through composite slabs, composite


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			<p>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>
26.	20ITO01	OBJECT ORIENTED PROGRAMMING USING JAVA	<p>To understand fundamentals of object-oriented programming paradigm.</p> <p>To apply knowledge of string handling, interfaces, packages and inner classes.</p>

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			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 AND HEAT TRANSFER LAB	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.
			Estimate the thermal conductivity of a material and the value of convection heat transfer coefficient under natural/forced convection.


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			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 MANUFACTURING	Understand the fundamental concepts of Additive manufacturing
			Demonstrate the knowledge of various Additive Manufacturing Processes.
			Analyze preprocessing and identify different post processing techniques in AM

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			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	Apply basics of Theory of Elasticity to continuum problems.

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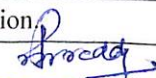
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		ANALYSIS LAB	Analyze finite elements like 1D, 2D and 3D structures for linear static analysis. Solve heat transfer problems. Examine problems of limited complexity in buckling and dynamic analysis. Evaluate solutions to practical problems by finite 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. Distinguish wave, tidal and OTEC energy.
53.	20ME E18	DIGITAL	Understand the Basics and applications of Digital Manufacturing and Industry 4.0.

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


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 Department of Mechanical Engineering
 Chaitanya Bharathi Institute of Technology (A)
 Gandipet, Hyderabad-500 075, Telangana

			Develop various robot structures for different applications.
60.	20EG O01	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 O02	PRINCIPLES OF INTERNET OF THINGS	Comprehend the terminology, protocols and communication models of IoT.
			Define the various IoT enabling technologies and differentiate between M2M and IoT.
			Acquire the basics of Python Scripting Language used in developing IoT applications.
			Describe the steps involved in IoT system design methodology.
			Design simple IoT systems using Raspberry Pi board and interfacing sensors with Raspberry Pi.
62.	20CSO02	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 O04	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 O01	HISTORY OF SCIENCE AND TECHNOLOGY	Demonstrate the process of beginning of science and civilization, knowledge acquisition and philosophical approach of science and its advancements in the Stone Ages and Antiquity period.
			Illustrate the advancements in science and technology in the medieval period across Asia and Arab countries and decline and revival of science in Europe.
			Explain the scientific approach and its advances of the Europeans and how the role of engineer during the industrial revolution and the major advancements.
			Make use of the advancements in the field of science and 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 O01	INTRODUCTION TO PYTHON PROGRAMMING	Explore data operations on list, tuple and dictionary in python.
			Understand deployment of models on different datasets.
			Apply supervised, unsupervised, resembling and NLP models on different datasets.
			Perform data analysis using python packages.
			Build and evaluate the models using python programming.


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 Department of Mechanical Engineering
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 Gandipet, Hyderabad-500 075. Telangana

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.

S. S. S. S.

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Department of Mechanical Engineering
Chaitanya Bharathi Institute of Technology (A)
Gandipet, Hyderabad-500 075. Telangana

			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. Identify the recent advances in the field of engineering/technology.
74.	20ME C34	TECHNICAL SEMINAR	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.

Member, BoS

Chairman, BoS, Biotech



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CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (Autonomous)
Gandipet, Hyderabad -75
Department of Mechanical Course Outcomes
Statements for B.E (Mech) - R18

SNo	Course		Course Outcomes Statements
	Code	Name	
1	18MT C01	MATHEMATICS-I	Solve system of linear equations and identify the Eigen values and Eigenvectors in engineering problems.
			Check the series convergence.
			Find the evolutes of the given curves.
			Expand and find extreme values of function of two variables.
			Understanding the significance of gradient, divergence and curl.
			An ability to solve the problems and interpreting geometrical approach.
2	18PYC03	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 magneto statics.
			Develop the concepts related to electromagnetic behavior.
3	18CSC01	PROGRAMMING FOR PROBLEMS 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

P. Reddy

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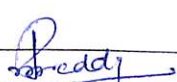
			and appropriate vocabulary in all contexts.
5	18PYC06	MECHANICS AND ELECTROMAGNETIC LABORATORY	Understand the concept of errors and find the ways to minimize the errors
			Demonstrate the various kinds of oscillations.
			Determine the loss of energy of a ferromagnetic material and its uses in electrical engineering.
			Understand the suitability of dielectric materials in engineering applications
			Use LCR circuits in different applications
6	18CSC02	Programming for Problem Solving (Programming Lab - I)	Identify and setup program development environment.
			Implement the algorithms using C programming language constructs.
			Identify and rectify the syntax errors and debug program for semantic errors.
			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, tinsmithy, fitting, house wiring.
			Gain knowledge of different Engineering Materials and Manufacturing Methods.
			Understand trades and techniques used in Workshop and choose 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.

P. Reddy

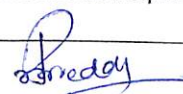
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Department of Mechanical Engineering
 Jaitanya Bharathi Institute of Technology (A)
 Gandipet, Hyderabad-500 075, Telangana

			The students will speak with clarity and confidence.
			The students will work in teams and discuss various topics and demonstrate the 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 solution 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 & Drugs 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 problems in kinematics and kinetics of particles and rigid bodies.
			Analyze body motion using work energy principles, impulse and momentum approach and able to apply the concepts of simple harmonic motion and free vibrations in dynamics.
12	18ME C01	ENGINEERING GRAPHICS AND DESIGN	Introduction to engineering design and its place in society.
			Exposure to the visual aspects of engineering design.
			To become familiar with engineering graphics standards.
			Exposure to solid modelling.

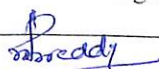

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 Gandipet, Hyderabad-500 075. Telangana

			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	18CYC02	CHEMISTRY LAB	Estimate rate constants of reactions from concentration of reactants/product 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	18MTC05	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 solution of various Transforms.
			Find moments of discrete and continuous random variables as well as familiar with distribution
17	18MB C01	ENGINEER	Apply fundamental knowledge of Managerial economics concepts and tools.



PROFESSOR & HEAD
Department of Mechanical Engineering
Chaitanya Bharathi Institute of Technology (A)
Gandipet, Hyderabad-500 075. Telangana

		RING ECONOMICS ACCOUNTANCY	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 the methods of improvement of mechanical properties by various heat treatment operations
			Understand the methods of production of various metals by extractive metallurgy
19	18ME C04	MECHANICS OF 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 be 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)
			Choose suitable manufacturing process for a given component (level 5)
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

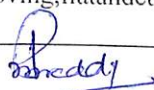

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 Department of Mechanical Engineering
 Jaitanya Bharathi Institute of Technology (A)
 Gandipet, Hyderabad-500 075. Telangana

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.
			Know the contribution of scientists of different eras
23	18ME C05	MATERIAL SCIENCE AND METALLURGY LAB	Identify crystal structure of various metals.
			Measure hardness and can correlate with microstructure.
			Perform a suitable heat treatment operation based on desired properties.
			Underline the importance of grain size in evaluating the desired mechanical properties.
			Correlate the heat treatment methods and the mechanical properties obtained
24	18ME C06	MECHANICS OF MATERIALS LAB	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
			Find the compressive and crushing strengths of concrete cubes and bricks.
25	18CS C05	BASICS OF DATA STRUCTURES	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 problem solving.
			Demonstrate a thorough understanding of searching and sorting algorithms
26	18ME C07	KINEMATICS OF MACHINES	Basic elements of mechanisms and their motion characteristics.
			Designing a suitable mechanism depending on application.
			Principles involved in functioning of brakes and dynamometer
			Drawing displacement diagrams and cam profile diagram for follower executing different types of motions and various configurations of followers.
			Selecting gear and gear train depending on application.
27	18ME C08	THERMODYNAMICS	Estimate the temperature of different scales of thermometers.
			Apply the first law of thermodynamics to various thermodynamic processes.
			Understand the meaning of perpetual motion of machine of second kind and its significance.
			Read data from steam tables, Mollier diagram and its applications.
			Distinguish working principles of various air standard cycles, vapour power cycles and determine air-fuel ratios required for combustion of fuels
28	18ME C09	PRINCIPLES OF MAN	Identify and evaluate the principles of management

P. Reddy

PROFESSOR & HEAD
Department of Mechanical Engineering
Chaitanya Bharathi Institute of Technology (A)
Gandipet, Hyderabad-500 075, Telangana

		AGEMENT	Demonstrate the ability to have an effective and realistic planning
			Identify the nature and the type of organization
			Apply the tools and techniques of directing
			Explain and evaluate the necessity for controlling and further refinement of an organization
29	18ME C10	FLUID PRINCIPLES AND HYDRAULIC MACHINES	Determine the various properties of fluid and their applications Understand the methodology in calculation of impact force exerted by the jet on the vanes.
			Acquire the knowledge of the functionality and performance of Reciprocating pumps.
			Understand the working, estimate the performance and testing of Centrifugal pumps.
			Acquire knowledge in the functionality, performance and testing of hydraulic turbines
30	18CE M01	ENVIRONMENTAL SCIENCE	To define environment, identify the natural resources and ecosystems and contribute for the conservation of bio-diversity.
			To suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
			To relate the social issues and the environment and contribute for the sustainable development.
			To follow the environmental ethics.
			To contribute for the mitigation and management of environmental disasters
31	18CS C08	BASICS OF DATA STRUCTURES LAB	Implement the abstract datatype.
			Implement linear data structures such as stacks, queues using array and linked list.
			Understand and implement non-linear data structures such as trees, graphs.
			Implement various kinds of searching, sorting and traversal techniques.
			Identify the suitable data structure for real world problem.
32	18EG C03	SOFT SKILLS LAB	Be assertive and set short term and long term goals. Also learn to manage time effectively and deal with stress.
			Win in professional communication situations and participate in group discussions with confidence. Write abstracts.
			Write effective resumes. Plan, prepare and face interviews confidently.
			Adapt to corporate culture by being sensitive-personally and sensible-professionally. Draft an SOP.
			Apply the soft skills learnt in the mini-live project, by collecting and analyzing data and making oral and written presentations on the same.
33	18ME C11	FLUID PRINCIPLES AND HYDRAULIC MACHINES	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.


PROFESSOR & HEAD
 Department of Mechanical Engineering
 Chaitanya Bharathi Institute of Technology (A)
 Gandipet, Hyderabad-500 075, Telangana

		CHINESLAB	Evaluate the performance characteristics of pumps.
			Demonstrate the characteristics curves of turbines.
34	18MEC12	DYNAMICS OF MACHINES	Determine the fluctuation of energy and decide the cross section of flywheel. (BL-3)
			Understand the gyroscopic effects in ships, aeroplanes 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-degree freedom linear systems.
35	18ME C13	APPLIED THERMODYNAMICS AND HEAT TRANSFER	Estimate the power required for reciprocating air compressor in the basic principles of thermodynamics for many engineering applications. (BL-4)
			Evaluate the performance of C.I. and S.I. engines with appropriate consideration for public health and safety. (BL-5)
			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, operation of various machine tools and understand jigs & fixtures. (BL-2)
			Classify methods of non-conventional machining and identify suitable method for a given component. (BL-3)
38	18ME E01	REFRIGERATION AND AIR CONDITIONING	Evaluate COP of various aircraft 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)

Sreddy

PROFESSOR & HEAD
Department of Mechanical Engineering
Chaitanya Bharathi Institute of Technology (A)
Gandipet, Hyderabad-500 075, Telangana

			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 workplace 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, CERAMIC 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 method of whitewares, 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 ENGI	Understand the basic layout of automobiles (BL-2)

P. Reddy

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		NEERING	<p>Understand the various systems in an automobile like engine cooling, lubrication, ignition, electrical and air conditioning systems with the principles of thermodynamics. (BL-2)</p> <p>Describe the principles of suspension and steering system using modern tool usage (BL-2)</p> <p>Explore the recent systems in Braking and Transmission. (BL-3)</p> <p>Evaluate the effect of automobile pollution on environment and necessity of pollution norms along with troubleshooting (BL-5)</p>
44	18ME E05	NANOSCIENCE AND TECHNOLOGY	<p>Understand the basic concepts, developments and challenges in Nanotechnology. (BL-2)</p> <p>Describe the methods of evaluating magnetic and electronic properties, microstructure by SPM, atomic force microscopy, friction force microscopy. (BL-2)</p> <p>Apply homogenous & heterogeneous methods and characterization techniques of Zero & One dimensional Nanostructures. (BL-3)</p> <p>Evaluate various Nano Material Fabrication Techniques. (BL-5)</p> <p>Analyze Nanomaterials and Nanobiomaterials for obtaining solution to societal problems. (BL-4)</p>
45	18ME E06	RIGHTS, DUTIES AND LEGISLATION	<p>Recall the human rights in the global and national context. (BL-1)</p> <p>Understand the overall view on working of Indian constitution. (BL-2)</p> <p>Analyze the societal problems in the context of human rights. (BL-4)</p> <p>Evaluate implementation of right to development and right to information. (BL-5)</p> <p>Application of human rights for human safety and clean environment. (BL-3)</p>
46	18PE E04	NONDESTRUCTIVE TESTING AND EVALUATION	<p>Understand Non Destructive Testing techniques of Dye penetrant inspection and Magnetic particle inspection. (BL-2)</p> <p>Compare eddy current testing with other NDT methods. (BL-2)</p> <p>Identify different types of defects using ultrasonic testing. (BL-2)</p> <p>Analyze the radiograph to detect the defects by using principles of radiography. (BL-4)</p> <p>Interpret latest techniques of NDT with other methods. (BL-3)</p>
47	18ME E07	FUELS AND COMBUSTION	<p>Analyze quality of fuels based on its properties with a special emphasis on environment with merits and demerits. (BL-4)</p> <p>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)</p> <p>Estimate the theoretical air fuel ratio for different types of combustion processes using basic laws of thermodynamics in the context of environment. (BL-5)</p> <p>Identify various techniques of utilizing fuels with different combustion appliances for cleaner environment and safety. (BL-3)</p> <p>Understand the impact of pollutants on environment and to demonstrate the knowledge for sustainable development. (BL-2)</p>
48	18ME C15	DYNAMICS AND VIBRATIONS	Demonstrate the dynamic behavior of mechanical systems. (BL-3)

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		B	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 scenarios. (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 give 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 generation of various parts. (BL-3)
			Distinguish various NC systems and develop the CNC program. (BL-4)
			Demonstrate the fundamental 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 I.C. engine piston, connecting rod, crankshaft, C-clamp and crane hooks. (BL-6)
53	18ME C19	THERMAL TURBOMACHINES	Design various configurations of nozzles and diffusers with the principles of Thermodynamics, Fluid mechanics 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 gas dynamics for engineering problems. (BL-5)

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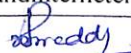
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			Understand the working principle of steam turbines, velocity triangles and performance parameters using principles of turbomachinery. (BL-2)
			Discuss the working principle of gas turbine, jets and rocket propulsions incorporating methods for efficiency improvement in gas turbine cycles. (BL-2)
54	18ME E08	OBJECTORIENTED 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 lamina. (BL-4)
			Determine role of constituent materials in defining the average properties and response of composite material 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 method for controlling abnormal combustion. (BL-2)
			Discuss the need and control of I.C. Engine emissions in the context of human health and

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			environment.(BL-2)
			Understand the need for professional and engineering practices required for identifying alternative fuels in the context of fossil fuels depletion to 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 processes 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 bitcoin, working with consensus in Bitcoin.(BL-2)
			Develop knowledge about designing and building Permissioned blockchains.(BL-3)
			Explain the concepts of supply chain management and internet enabled supply


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			chains.(BL-2)
			Makeuseofblockchainapplicationsinvolvedin varioussectors.(BL-3)
64	18ME E17	RENEWABLEENERG Y SOURCES	Understandtheneed for renewableenergysourcesinthecontextofenvironmentalissues.(BL-2)
			Applytheprinciples ofsolarenergyfordomesticandindustrialusages.(BL-3)
			Understandtheworkingprincipleofwindpowerplantsalongwith meritsand demerits.(BL-2)
			Describetheconcepts ofgeothermalenergysources andbiomassasasourceofenergy.(BL-2)
			Explain theprinciplesandimpactof wave,tidalandOTECplants on theenvironment.(BL-2)
65	18ME E18	CONTROLSYSTEMS THEORY	Understandcontrolsystem,modelingandtransfer functionsofdifferentsystems.(BL-3)
			Applytheconceptofblockdiagramandsignalflowgraphstodifferentsystems .(BL-3)
			Differentiatebetweentimedomainandfrequencydomaintechniques.(BL-2)
			Examinethestabilityofasystemusingdifferentapproaches.(BL-3)
			Analyzethesysteminstatespaceandtofindoutthecontrollabilityandobserva bility.(BL-4)
66	18ME E19	ARTIFICIALINTELLI GENCE	DifferentiatebetweenarudimentaryProblemandanAIproblem, itsCharacteristicsand
			Compareandcontrastthevarious knowledgerepresentationschemes ofAI.(BL-4)
			Analyzevariousreasoningandplanningtechniquesinvolvedin solvingAI problems.(BL-4)
			Understandthedifferentlearningtechniques.(BL-2)
			ApplytheAItechniquesinthefieldofmechanicalengineering.(BL-3)
67	18ME E20	INDUSTRIALADMIN ISTRATIONANDFIN ANCIALMANAGEM ENT	Understand different types of business organizations, functions of management and importance of various typesofplantlayouts.(BL-2)
			Applytechniques ofmethodstudyandworkmeasurementinorganizationstoenhanceproductiv ity(BL-3)
			Use qualitycontrolchartsandtoolsinindustries.(BL-3)
			Applyvariousoptimization andprojectmanagementtechniquesforsolvingrealtimeproblems.(BL-3)
			Understandbasicconcepts ofCostaccountingandfinancialmanagement (BL-2)
68	18PE E11	PRINCIPLESANDAPP LICATIONSOFADDI TIVEMANUFACTURI NG	Understandthefundamentalconcepts ofAdditivemanufacturing,itsadvantages and Disadvantages(BL-2)
			Selectsuitableprocessandmaterialsused inAdditiveManufacturing(BL-5)
			Analyzepre- processingissuesforAdditiveManufacturingandrelatedoperationsforSTLf ilegeneration.(BL-4)

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			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 the 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 conditioning ducts. (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)
			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 FEM 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-

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			symmetric problems.(BL-4)
			Derive stiffness matrix for 4 node quadrilateral isoparametric element for static analysis and 3 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)

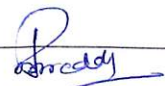

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			Understand the techno-legal-business angle of Intellectual property, infringement and enforcement Mechanisms for protection. (BL-2)
78	18PE E12	SUPPLY CHAIN MANAGEMENT	Understand fundamentals of supply chain and its key concepts. (BL-2)
			Design 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 001	OBJECT ORIENTED PROGRAMMING USING JAVA	Understand Object-Oriented concepts. Create Java applications using sound OOP practices e.g. Inheritance, Interfaces, Packages, and Inner Classes.
			Implement Exception Handling and Multithreading concepts in java programs.
			Develop programs using the Java Collection API and Stream classes.
			Design and Develop GUI applications with the integration of event handling, JDBC.
80	18PY 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 19 th and first half of 20 th 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 20 th century onwards.
81	18EG 002	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 contribution 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.

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			Demonstrate an understanding of personal life, the workplace, the community and active civic engagement through classroom learning
82	18IT O03	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 O09	BASICS OF ARTIFICIAL INTELLIGENCE	<p>Identify various search strategies to solve problems.</p> <p>Compare and contrast knowledge representations 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 & 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 ENGINEERING LAB	<p>Apply basics of Theory of Elasticity to continuum problems. (BL-3)</p> <p>Analyze finite elements like 1D, 2D and 3D structures for linear static analysis. (BL-4)</p> <p>Solve heat transfer problems. (BL-3)</p> <p>Examine problems of limited complexity in buckling and dynamic analysis. (BL-4)</p> <p>Evaluate solutions to practical problems by finite element software. (BL-5)</p>
86	18ME C27	PROJECT: PART - I	<p>Identify a topic in advanced areas of Mechanical/ Allied fields of Engineering. (BL-1)</p> <p>Review literature to identify the gaps, define the objectives and scope of the work. (BL-2)</p> <p>Generate innovative ideas for societal benefit and Nation building. (BL-6)</p> <p>Develop prototypes/models, experimental setup and software systems necessary to meet the objectives.</p> <p>Prepare a technical report and present before the departmental committee (BL-5)</p>
87	18EC O01	REMOTE SENSING AND GIS	<p>Demonstrate the understanding of basic concepts of remote sensing and interpret energy interactions.</p> <p>Choose an appropriate technique for a given scenario by appreciating the types of remote sensing.</p> <p>Distinguish the principle behind the working of microwave and LiDAR sensing.</p>



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			Apply an appropriated data model from the acquired knowledge of the basics of GIS.
			Explain the procedure for encoding data and geospatial data analysis.
88	18MT O01	DECISION THEORY	Calculate the optimum values for given objective function by LPP
			Solve the solution for maximise 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 O03	ENERGY AUDITING	Know the current energy scenario and importance of energy auditing.
			Understand the concept 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 O04	BASICS OF CYBERSECURITY	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 O05	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 O01	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 applying features of technical writing.
			Analyze data, draw inferences to write Journal articles and conference paper

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			<p>sand to compose business letters.</p> <p>Evaluated data to draft technical reports and technical proposals.</p> <p>Design a technical presentation by understanding the nuances of presentation skills and also transfer data from verbal to graphic and vice versa.</p>
93	18BT 001	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 organs and systems.</p> <p>Outline the principle and applications of medical devices.</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 002	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 005	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 007	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>

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			Develop the skills and expertise in report writing. (BL-6)
			Compile the content and prepare comprehensive report. (BL-4)
			Demonstrate skills required for preparation of a technical report. (BL-3)
			Present technical know-how and professional skills before the committee. (BL-3)
98	18ME C29	PROJECT: PART -2	Summarize the literature review for the identified problem. (BL-2)
			Identify methods and materials to carry out experiments/develop code/simulation. (BL-4)
			Integrate the methodology and engineering tools adopted for solving the problem. (BL-6)
			Analyze and discuss the results to draw valid conclusions (BL-4)
			Exhibit knowledge, skill, attitude and technical know-how in preparing reports and presenting as a professional engineer. (BL-3)
			Describe the basic components, specifications and applications of the Robots. (BL-1)
			Understand transformations, direct and inverse kinematics of robots. (BL-2)
99	18ME O01	ROBOTICS	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)
			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)
100	18ME O02	HUMAN VALUES AND PROFESSIONAL ETHICS	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 risks and safety measures in the engineering practice. (BL-3)
			Define research problem. (BL-1)
			Review and assess the quality of literature from various sources. (BL-2)
101	18ME O03	RESEARCH METHODOLOGIES	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 O04	ENTREPRENEURSHIP	Understand the concept and essence of entrepreneurship. (BL-2)


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 Department of Mechanical Engineering
 Chaitanya Bharathi Institute of Technology (A)
 Gandipet, Hyderabad-500 075, Telangana

			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 O05	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 O06	NANOMATERIALS AND TECHNOLOGY	Understand the basic concepts, developments and challenges in nanotechnology. (BL-2)
			Describe the methods of evaluating magnetic and electronic properties, microstructure by SPMD and atomic force microscopy. (BL-2)
			Apply heterogeneous methods and characterization techniques of zero & one dimensional nanostructures. (BL-3)
			Evaluate various nanomaterial fabrication techniques. (BL-5)
			Analyze nanomaterials and nanobiomaterials for obtaining solutions to societal problems. (BL-4)
105	18ME O07	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. (BL-2)
106	18ME O08	MECHATRONICS	Understand the concept of mechatronics and analyze electrical and mechanical systems and their interconnection for a given application
			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 Behavioural principles and practices. (BL-2)

P. Reddy

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 Gandipet, Hyderabad-500 075, Telangana

			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 concept so 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	3D PRINTING	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 organization 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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Gandipet, Hyderabad -75

Department of Mechanical Course Outcomes

Statements for B.E (Mech) – R16

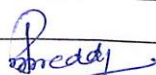
SNo	Course		Course Outcomes Statements
	Code	Name	
1.	16MT C01	ENGINEERING MATHEMATICS – I	<p>Solve system of linear equations and identify the Eigen values and Eigen vector in engineering problems</p> <p>Expand and find extreme values of functions of two variables</p> <p>Trace and interpret curve behavior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


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 Department of Mechanical Engineering
 Chaitanya Bharathi Institute of Technology (A)
 Gandipet, Hyderabad-500 075, Telangana

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


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 Gandipet, Hyderabad-500 075, Telangana

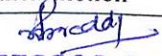
		PHYSICS	Demonstrate the wave nature of the light
			Develop the concepts related to electromagnetic behavior
			Identify the various crystal systems and defects
			Explain the origin of magnetism and dielectric polarization and applications of these materials in the field of engineering & technology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


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 Department of Mechanical Engineering
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 Gandipet, Hyderabad-500 075. Telangana

		GRAPHICS	Ability to improve visualization skills
			Ability to sketch Engineering Objects
20.	16PY C03	ENGINEERING PHYSICS LABORATORY	Understand the concept of errors and find the ways to minimize the errors
			Demonstrate interference and diffraction phenomena experimentally
			Distinguish between polarized and unpolarized light
			Determine the loss of energy of a ferromagnetic material and its uses in electrical engineering
			Understand the suitability of dielectric materials in engineering applications
21.	16CY C04	APPLIED CHEMISTRY LABORATORY	This syllabus helps the student to understand importance of analytical instrumentation for different chemical analysis.
			The above knowledge also helps students to carry out inter disciplinary research such that the findings benefit the common man.
22.	16EG C02	PROFESSIONAL COMMUNICATION LABORATORY	The students will understand the speech sounds in English and the nuances of pronunciation.
			The students will understand tone, intonation and rhythm and apply stress correctly.
			The students will be able to participate in group discussions with clarity and confidence.
			The students will speak confidently on stage with appropriate body language.
			The students will debate on various issues and learn to work in teams.
23.	16MT C05	ENGINEERING MATHEMATICS-III	Expand functions in the given intervals.
			Solve linear and non linear PDEs.
			Solve one-dimension, two-dimension, Heat steady state equations and also one-dimension wave equation.
			Solve problems on Analytic functions, Cauchy's theorem and Cauchy's integral formula.
			Expand functions by using Taylor's and Laurent's series.
			Solve Real and Complex integrals by using Cauchy Theorems.
24.	16ME C04	MATERIAL SCIENCE AND METALLURGY	Know the fundamental science and engineering principles relevant to material.
			Suggest appropriate physical metallurgical methods (phase diagrams).
			The type of heat treatment operation to be given to any metal in order to improve desired Mechanical properties.
			Basic ability to plan an extraction process for given ore.
			Suggest the appropriate methods for prevention of failures.
			Analyze the applications of conventional metals and alloys.
25.	16ME C05	MECHANICS OF MATERIALS	Classify the materials, stresses, strains and understand engineering constants, poisson's ratio along with relation between them. Also analyze axially loaded members.
			Draw shear force, bending moment diagrams for different types of beams and calculate stresses and strains due to simple bending.
			Determine slope and deflection for various configurations of beams using different methods and stress, strain and deflection due to torsion of circular members.
			Analyze shear stress distribution in different sections of beams.
			Understand compound stresses, calculation of principal stresses analytically and graphically using Mohr's circle.
			Estimate stresses in thin and thick cylinders. Also estimate critical load in buckling for various columns and struts.
26.	16ME C06	FLUID DYNAMICS	Differentiate different types of fluids.
			Calculate centre of buoyancy and metacentric height.
			Differentiate rotational and irrotational flows.


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 Gandipet, Hyderabad-500 075, Telangana

			Determine forces exerted on fluid body.
			Differentiate laminar over turbulent flows.
			Determine various losses incurred in fluid flows.
27.	16ME C07	MACHINE DRAWING	Draw conventional representation of different materials and mechanical components.
			Read the working drawings in the machine shop.
			Draw the orthographic projections and sectional views of machine parts.
			Draw missing views as well as to analyze and interpret drawings of machine components.
			Understand the shape and structure of different types of screws, keys, couplings, and rivets.
			Draw assembly drawings of certain Machine Tools, Engine parts and Valves etc.
28.	16MB C01	ENGINEERING ECONOMICS AND ACCOUNTANCY	Apply fundamental knowledge of Managerial economics concepts and tools.
			Understand various aspects of demand analysis and forecasting.
			Understand price determination for different markets.
			Study production theory and analyze various costs and benefits involved in it so as to make best use of resources available.
			Analyze different opportunities and come out with best feasible capital investment decisions.
			Apply accountancy concepts and conventions, Final accounts and financial analysis.
29.	16ME C08	MATERIAL SCIENCE AND METALLURGY LAB	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.
			Understand the process of heating and cooling for various heat treatment methods.
			Correlate the heat treatment methods and the mechanical properties obtained.
30.	16ME C09	MECHANICS OF MATERIALS LAB	Draw stress-strain curve for an isotropic material and understand the salient features of it.
			Demonstrate in determining the Young's modulus of various beam materials by conducting load-deflection test.
			Evaluate 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 and also estimate the impact resistance of a material by conducting impact tests.
			Find the compressive and crushing strengths of concrete cubes and bricks.
31.	16ME C10	COMPUTER DRAFTING LAB	Demonstrates Graphics and design competencies.
			Apply CAD techniques for 2D modeling.
			Develops an ability to think 3D and interpret data from blue prints and sketches, layers concepts.
			Apply and draw orthographic projections with the knowledge of correct graphics communication (drawings).
			Draw 2D drawings and sectional views of part models.
			Draw 2D drawings and sectional views of assembly models.
32.	16ME C14	KINEMATICS OF	Understanding basic elements of machinery and their motion


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 Gandipet, Hyderabad-500 075. Telangana

		MACHINES	<p>characteristics.</p> <p>Designing a suitable mechanism depending on application.</p> <p>Drawing displacement diagrams and cam profile diagram for followers executing different types of motions and various configurations of followers.</p> <p>Drawing velocity and acceleration diagrams for different mechanisms.</p> <p>Selecting gear and gear train depending on application.</p> <p>Selection of suitable clutch, brake.</p>
33.	16ME C15	THERMODYNAMICS	<p>Estimate the temperature of different scales of thermometers.</p> <p>Apply the first law of thermodynamics process to various thermodynamics processes.</p> <p>Understand the meaning of perpetual motion of machine of second kind and its significance.</p> <p>Read data from the chart of Mollier diagram and its applications.</p> <p>Distinguish working principles of various IC engines like diesel engine, petrol engine.</p> <p>Calculate theoretical air-fuel ratios required for combustion of fuels and also convert from gravimetric analysis to volumetric analysis and vice versa.</p>
34.	16ME C16	HYDRAULIC MACHINERY AND SYSTEMS	<p>Apply the various fluid laws to different hydraulic machines.</p> <p>Understand the methodology of selection of reciprocating pumps.</p> <p>Acquire the knowledge the functionality of rotary pumps.</p> <p>Understand the selection procedure and estimate the power developed by various hydraulic turbines.</p> <p>Compare the performance of hydraulic turbines and pumps based on characteristics curves.</p> <p>Acquire knowledge the functionality of various hydraulic systems.</p>
35.	16ME C17	MANUFACTURING PROCESSES	<p>Select the suitable manufacturing process for a given component.</p> <p>Design pattern, gating system and risers for a simple casting.</p> <p>Identify defect and suggest the remedy for the same.</p> <p>Select suitable welding process for a given requirement.</p> <p>Decide minimum capacity of the machine for a given forming operation.</p> <p>Select suitable forming process for a simple component.</p>
36.	16EE C14	ELECTRICAL MACHINES AND MICROCONTROLLER APPLICATIONS	<p>Identify the compatibility of DC machines for a given application.</p> <p>Identify the applications of 3-phase induction motor.</p> <p>Know the calculation of Efficiency and regulation of transformer.</p> <p>Program using 8051 microcontrollers.</p> <p>Use 8051 microcontrollers for basic applications.</p>
37.	16ME C18	HYDRAULIC MACHINERY AND SYSTEMS LAB	<p>Measure the discharge in pipes.</p> <p>Carry out discharge measurements in open channel.</p> <p>Determine the energy loss in conduits.</p> <p>Calculate forces and work done by a jet on fixed or moving, flat and curved blades.</p> <p>Evaluate the performance characteristics of pumps.</p> <p>Demonstrate the characteristics curves of turbines.</p>
38.	16ME C19	MANUFACTURING PROCESSES LAB	<p>Prepare the mould for a single piece and split patterns.</p> <p>Test the moulding sand and analyse the same.</p> <p>Test the bead geometry and correlate the results to the input parameters.</p>


PROFESSOR & HEAD
 Department of Mechanical Engineering
 Chaitanya Bharathi Institute of Technology (A)
 Gandipet, Hyderabad-500 075. Telangana

			Use TIG, MIG and Spot welding machines and experiment with them.
			Test the formability characteristics of a given sheet metal.
			Demonstrate the understanding of the parts of simple, compound, progressive and combination dies and use them for production of parts.
39.	16EG C03	SOFT SKILLS AND EMPLOYABILITY ENHANCEMENT LAB	Be effective communicators and participate in group discussions and case studies with confidence. Also 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. Also learn to manage time effectively and deal with stress.
			Make the transition smoothly from Campus to Corporate. Also use media with etiquette and know what academic ethics are.
			To do a live, mini project by collecting and analyzing data and making oral and written presentation of the same
40.	16ME C11	PRIME MOVERS AND PUMPS	Estimate the loss of head due to friction.
			Determine power developed by different types of the hydraulic turbines.
			Differentiate fire tube boilers from water tube boilers.
			Estimate power developed by different types of the steam turbines and gas turbines.
			Evaluate the power required by reciprocating pumps.
			Determine the power required by centrifugal pumps.
41.	16ME C12	PRIME MOVERS AND PUMPS LAB	Determine the principle of measurement of discharge of fluid.
			Determine the direction of flow of fluid in a pipe.
			Determine loss of head due to friction.
			Estimate the power developed by Pelton, Francis and Kaplan turbines.
			Determine the power required by various types of pumps.
			Evaluate the performance of internal combustion engines.
42.	16ME C13	MECHANICAL ENGINEERING LAB	Evaluate the properties of material by tensile testing and performance of diesel engine.
			Produce the parts by simple turning process.
			Understand the concepts of welding, casting (moulding) process.
43.	16ME C20	DYNAMICS OF MACHINES	Graduates are expected to demonstrate the ability of the analysis of forces in mechanism which provide them the required inputs to design the systems which withstand operating conditions
			Graduates are expected to understand the turning moment diagram, cyclic fluctuation in speed, fluctuation in energy and get the ability of designing flywheel.
			Graduates are expected to understand gyroscopic and centrifugal actions of vehicles and will be able to reckon additional bearings reactions due to gyroscopic and centrifugal effects
			Graduates will have ability to control speed using governors
			Graduates will have ability to identify the unbalance in rotor and engines and will get the knowledge of balancing.
			Graduates will understand the concepts of vibration thereby they are able to design the systems free from ill effects of vibration.
44.	16ME C21	APPLIED THERMODYNAMICS & HEAT TRANSFER	Estimate power required for reciprocating air compressor, used for many engineering applications.
			Evaluate the performance of diesel and petrol engines and suggest some suitable methods for remedy of abnormal combustion
			Understand the importance of accessories of IC engines
			Apply appropriate equations depending on mode of heat transfer
			Distinguish the radiation heat transfer from other modes of heat transfer


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			Design heat exchangers with the basic knowledge acquired in heat exchangers
45.	16ME C22	DESIGN OF MACHINE ELEMENTS	Select material based on type of load and manufacturing considerations.
			Design the components subjected to static loads.
			Design the components subjected to fluctuating loads.
			Become familiar with mechanical elements like shafts, keys, couplings and pulleys.
			Become familiar with permanent types of joints and their design concepts.
			Become familiar with detachable joints and power screws.
46.	16ME E01	REFRIGERATION AND AIR CONDITIONING	Differentiate refrigeration from air conditioning
			Understand merits and demerits of vapor compression refrigeration system over air refrigeration system
			Know the importance of absorption refrigeration system over vapor refrigeration system
			Apply a suitable psychrometric process depending on requirement or application
			Know the condition necessary for comfort condition
			Estimate the load required for AC system depending on application
47.	16ME E02	MECHANICAL VIBRATIONS	Ability to construct a Free Body Diagram, formulates the equations of motion, analytically solves the equations of motion for arbitrary linear single-degree-of- freedom systems in undamped, damped cases.
			Ability to analyze the basic principles of vibration isolation and absorption and ability to apply them to the design of mechanical systems such as automotive suspensions.
			Ability to formulate the equations of motion analytically solves the equations of motion for arbitrary linear two -degree-of-freedom systems in undamped, damped, free and forced cases,
			Ability to analyze normal mode vibration, coordinate coupling and orthogonal property of modeshape.
			Ability to differentiate discrete and continuous systems, formulate equation of motion and solve for string, bar and beams in continuous systems.
			Ability to understand vibration measuring instruments, display and recording to elements, frequency analysis.
48.	16PE E01	PRINCIPLES OF INDUSTRIAL ENGINEERING	Conceptualize the essence of industrial engineering techniques
			Select and design plant location and layouts
			Plan, execute and control production related issues
			Analyze and choose right inventory control techniques
			Plot control charts and apply quality control tools
			Apply productivity improvement techniques
49.	16PE E02	PRODUCT DESIGN AND PROCESSES PLANNING	Have overall view of Product Design and Process Planning
			Apply creativity techniques in Product Development
			Applying ergonomically enabled concepts in developing a new product
			Have awareness and apply Intellectual Property Rights
			Integrate various stages of developing a new product
			Develop and execute an effective Process Plan
50.	16ME E03	FUELS, COMBUSTION AND ENVIRONMENT	Know different types of solid fuels along with the properties
			Understand different manufacturing methods of gaseous fuels
			Understand the refining methods of various liquid fuels
			Estimates the theoretical air fuel ratio for various fuels


PROFESSOR & HEAD
 Department of Mechanical Engineering
 Chaitanya Bharathi Institute of Technology (A)
 Gandipet, Hyderabad-500 075, Telangana

			Select the different types of burners according to the application
			Know various techniques to control pollutants and emission standards
51.	16PE E03	NON-DESTRUCTIVE TESTING AND EVALUATION	The knowledge of different NDT techniques.
			Clear understanding of liquid penetrant inspection and magnetic particle inspection.
			View and interpret radiographs, utilize the various principles of radiography for different components of different shapes.
			The knowledge of acoustic emission for NDT and the instrumentation used for NDT.
			The ability to analyze and prepare a technical report.
			The knowledge of latest research, developments and trends in NDT.
52.	16PE E04	PLASTICS, CERAMICS AND COMPOSITE MATERIALS	Describe about types of plastics, their properties and uses
			Suggest the suitable method of manufacturing a plastic component.
			Describe about types of ceramics, refractoriness, their uses.
			Express the details about white wares ceramic coatings and glass.
			Suggest the suitable method of manufacturing processes of ceramics.
			Describe about types composites and their uses
53.	16MT EO4	PROBABILITY AND NUMERICAL METHODS	Analyse the statistical averages and different properties for probability function.
			Fit the probability distribution for the random data.
			Solve the non-linear equations for finding the roots.
			Solving the Differentiation & Integration for numerical data.
			Solving the ordinary differential equations using single & multi-step methods
54.	16ME C23	DYNAMICS AND VIBRATIONS LAB	Evaluate the effect of gyroscopic couple
			Evaluate the effect of CAM Follower Motions in machines
			Estimate the performance of governors
			Evaluate the static and dynamic balancing of rotating masses
			Estimate the natural frequency of different un-damped vibrating systems
			Estimate the natural frequency of different damped vibrating systems
55.	16ME C24	APPLIED THERMODYNAMICS & HEAT TRANSFER LAB	To demonstrate basic knowledge and exposure to determine valve and port diagram and also to evaluate the performance of the petrol engine and diesel engine
			Student will determine the importance of heat balance sheet of IC engine n
			Students will acquire knowledge in evaluating the performance of multi-stage reciprocating compressor
			To demonstrate knowledge in evaluating thermal conductivity and heat transfer coefficient under natural convection phenomena and forced convection phenomena
			Students will understand the basic concepts of radiation heat transfer
			Student will understand the effectiveness of parallel and counter flow heat exchanger
56.	16EE C22	ELECTRICAL MACHINES AND MICROCONTROLLER APPLICATIONS LAB	Test the 1-phase transformer.
			Know the right instrument and its usage for the given circuit.
			Identify the suitable machine for required application.
			Process the data using 8051 microcontroller
			Interface the given device with 8051 microcontroller
57.	16ME C25	INDUSTRY VISIT	A minimum of two industrial visits will be arranged by department and students have to attend the visits and prepare a data report of their visits to the industries and submit to the department. Students are

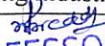
			required to present a seminar based on their report which is evaluated by Head of the Department and two senior faculty to award the grade and these grades are categorized as follows. Excellent / Very Good / Good / Satisfactory / Unsatisfactory.
58.	16ME C26	CAD and CAM	Apply design concepts in design , analysis and modeling of entities and curves Apply surface and solid modeling techniques for the generating various parts and implement transformations on various geometric models for manipulation. Visualize the models through the graphics standards and implement NC,CNC systems and programming Implement and practice the DNC and AC controls , analyze the manipulator motions, configurations including end effectors, actuators, drives and sensors and programming Learn and Implement GT and Coding methods and CAPP. Understand and implement FMS, CIMS, RPT ,QC- methods & controls and Turnkey CAD/CAM systems.
59.	16ME C27	METAL CUTTING AND MACHINE TOOL ENGINEERING	Grind single point cutting tool with various angles Perform taper turning and knurling on lathe Perform drilling and thread cutting operations To manufacture a gear using milling machine To do operation on shaper Exposed to various unconventional processes
60.	16ME C28	THERMAL TURBO MACHINES	Design various configurations of steam nozzles by the principles of gas dynamics which are essential or pre-requisite to computational fluid dynamics Understand Fanno curves along with shock waves Understand the importance of Rayleigh curves in gas dynamics Calculate power required by various types of rotary compressors with the principles of gas dynamics Specify steam turbine as per the application and also calculate power developed by them Calculate thermal efficiency of gas turbines with the principles of gas dynamics and suggest suitable methods to improve work output and efficiency of the plant
61.	16ME C29	MACHINE DESIGN	Graduates demonstrate the ability to design helical, leaf springs for static and fluctuating loads. Graduates expected to have an ability to design gears for power transmission considering beam strength, dynamic factors and wear life. Graduates demonstrate the ability in designing sliding contact bearings, considering power lost in friction, heat dissipation. Graduates are expected to have the ability of selection of rolling contact bearings based on load-life relationship. Graduates demonstrate the ability of designing IC engine parts such as piston, connecting rod and crank shaft considering gaseous impulse and thermal aspects. Graduate demonstrate the ability of designing curved beams like C-clamp, crane hooks etc.
62.	16ME E04	ADVANCED IC ENGINES	Evaluate the performance of the diesel/petrol engine Distinguish abnormal combustion from normal combustion in CI and SI engine Ascertain the need for formation of various pollutants from IC engines Determine various pollutants from IC engine with different analyzers Stress the need for alternative fuels and their technological, environmental and social impacts.


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 Gandipet, Hyderabad-500 075. Telangana

			Evaluate the performance of IC engine with recent trends with modern concepts like Lean burn, stratification, HCCI and GD
63.	16ME E05	COMPUTATIONAL FLUID DYNAMICS	Classify basic equations of fluid flow
			Choose appropriate boundary conditions
			Choose proper numerical technique to solve equations.
			Critically analyze different mathematical models and computational methods for flow simulations
			Interpret computational results.
			Acquire the required knowledge to take advanced courses in CFD.
64.	16ME E06	AUTOMOBILE ENGINEERING	Identify the different parts of the automobile
			Explain the working of various parts like engine, transmission, clutch, brakes
			Describe how the steering and the suspension systems operate.
			Understand the environmental implications of automobile emissions
			Develop a strong base for understanding future developments in the automobile industry
			Formation of pollutants in I.C Engines & Their remedial methods to control them
65.	16PE E05	DIGITAL MANUFACTURING	Understand the concept ,Architecture and process of Digital manufacturing.
			Relate Different Additive manufacturing processes as a part of Digital manufacturing
			Understand the concept of Virtual prototyping and Importance of reverse engineering in Digital manufacturing
			Understand Intelligent Multi Information Sensing Concept and its application in digital manufacturing
			Understand the Various Digital Processing Technologies in Product Lifecycle, Digital Equipment
			Understand Future Scope , precision, Environmental protection of Digital Manufacturing
66.	16ME E07	HEAT AND MASS TRANSFER	Apply various laws pertaining to conduction heat transfer
			Establish relation between various dimensionless numbers in convection heat transfer
			Acquire the basic knowledge in understanding the principles of radiation
			Evaluate convective heat transfer coefficient for condensation heat transfer
			Design heat exchanger s
			Estimate mass diffusion phenomena for industrial processes
67.	16ME E08	OBJECT ORIENTED PROGRAMMING WITH C++	The difference between object oriented programming and Structured programming and data types in C++.
			To program using C++ features such as classes and objects.
			The write C++ programs for simple applications in mechanical engineering.
			The overload operators
			The use inheritance and polymorphism
			Capability to use effectively templates and exception handling.
68.	16PE E06	MODERN MACHINING AND FORMING METHODS	Select the non-conventional machining process for a particular application
			Demonstrate the capability of comparison of various non-conventional machining methods
			Describe the various non-conventional machining processes
			Exhibit the proficiency of selecting working media for various non-conventional machining processes
			Exhibit the basic understanding of non-conventional forming


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 Department of Mechanical Engineering
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 Gandipet, Hyderabad-500 075. Telangana

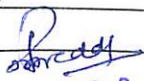
			processes
			Compare various non-conventional forming processes based on their merits, limitations and applicability
69.	16PE E07	SURFACE ENGINEERING	Demonstrate basic understanding of friction, and be familiar with adhesion theories and the effect of adhesion on friction.
			Demonstrate basic understanding of wear processes, and able to describe wear mechanisms on engineering components.
			Demonstrate basic understanding of corrosion and know the methods to reduce the corrosion on engineering components.
			Design a tribological system for optimal performance, and Justify, critical analysis on surface engineering techniques and surface design for relevant applications.
			Apply surface engineering principles and methods to modify and improve the properties of surfaces for structural and functional applications.
			Identify suitable surface processing method from various methods to create surface engineering solutions for specific materials, specific environments and specific applications in modern engineering practice.
70.	16ME C30	CAD AND CAM LAB	Draw complex geometries of parts in sketcher mode.
			Generate freeform shapes in part mode to visualize parts.
			Create complex engineering assemblies using appropriate assembly constraints.
			Develop various machine components and generate their orthographic view modeling software
			Have a fundamental knowledge of Computer Numerical Control machines.
			Write part programs using G and M codes for lathe and milling operations
71.	16ME C31	METAL CUTTING AND MACHINE TOOL ENGINEERING LAB	Grind single point cutting tool with various angles
			Perform taper turning and knurling on lathe
			Perform drilling and thread cutting operations
			Manufacture a gear using milling machine
			Do operation on shaper
			Exposed to various unconventional processes
72.	16ME C32	THERMAL ENGINEERING LAB	Estimate thermal conductivity of a metal
			Estimate the convective heat transfer coefficients for phase change heat transfer
			Know pressure distribution across the length of convergent and divergent nozzle.
			Evaluate the overall efficiency of rotary compressors
			Determine COP of Refrigeration and air conditioned tutors
			Evaluate drag and lift coefficients for different profiles of automobiles
73.	16ME C33	METROLOGY AND INSTRUMENTATION	Learn and understand the need for measurement and fundamental concepts of measurement.
			Demonstrate sound knowledge in gauges design and gauge selection for inspection.
			Demonstrate an ability to select and use the appropriate measuring instruments to measure surface roughness.
			Recognize the concepts of errors, strain measurement, classification and instrument characteristics.
			Apply the skills in measuring various quantities like displacement, pressure & temperature.
74.	16ME C34	OPERATIONS RESEARCH	Formulate a managerial decision problem into a mathematical model;
			Apply transportation problems in manufacturing industries;


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 Gandipet, Hyderabad-500 075. Telangana

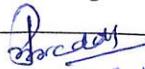
			Build and solve assignment models and travelling salesmen problems. Apply project management techniques like CPM and PERT to plan and execute project successfully Apply sequencing and queuing theory concepts in industry applications
75.	16PE C10	PRODUCTION DRAWING	Draw part drawings from given assembly drawings of machine parts. Indicate tolerance values on the parts drawn on sheet as per alpha numeric codes for given assembly drawings Indicate form tolerances and position tolerances on the parts drawn on the sheet as per universally accepted norms for a given assembly drawing Indicate values of surface finish and heat treatment process on the parts drawn for a given assembly drawings. Write process sheet for the part that is drawn from given assembly drawing and interpret production drawing and process sheet.
76.	16PE C11	PRODUCTION AND OPERATIONS MANAGEMENT	Identify and evaluate the processes, tools and principles of production and operations management to better understand the logistics and supply chain operations Demonstrate the ability to apply mathematical forecasting techniques Identify future challenges and directions that relate to production and operations management to effectively and efficiently respond to market changes Apply the tasks, tools and underlying principles of operations management in the manufacturing and service sectors to improve organizational performance Explain and evaluate the quality process in manufacturing and service sector to improve the operational performance
77.	16ME C35	FINITE ELEMENT ANALYSIS	Apply FE method for solving field problems using Virtual work and Potential energy formulations Analyze linear problems like axial, trusses, beam problem and circular shaft problems Analyze 2D structural problems using CST element and analyze plane stress, plane strain and axi-symmetric problems with triangular elements. Write shape functions for 4 node quadrilateral isoparametric elements, apply numerical integration, Gaussian quadrature and to estimate natural frequencies for stepped bar Check for convergence requirements, Solve linear 1D and 2D heat conduction and convection heat transfer problems, formulate 3D elements, apply finite element analysis software for engineering solutions
78.	16ME E10	RENEWABLE ENERGY SOURCES	Understand the depletion and of environmental impact conventional sources of energy and will suggest suitable renewable energies in place of conventional energies Determine the principles of absorption Understand the problems associated with utilizing the wind energy Describe the physics of geothermal resources and describe how biomass is currently used as a source of energy Explain the physical principles of wave energy, tides and the environmental impact of OTEC plants
79.	16ME E11	ENERGY CONSERVATION, MANAGEMENT AND AUDIT	Know energy scenario both India and world Review and assess the various audit tools Understand energy policy planning and take energy management as a profession Analyze energy security, codes, standards Arrange the financial arrangements for industries
80.	16ME E12	ENGINEERING	Define research problem


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 Gandipet, Hyderabad-500 075, Telangana


		RESEARCH METHODOLOGY	Review and assess the quality of literature from various sources. Understand and develop various research designs. Analyze problem by statistical techniques: ANOVA, F-test, Chi-square Improve the style and format of writing a report for technical paper/ Journal report
81.	16ME E13	ENVIRONMENTAL POLLUTION	Factors affecting global warming The method of reducing water contamination The methods of disposal of nuclear waste, related law and regulation The method of reduction of air pollution from industry The methods of controlling sound pollution
82.	16ME C36	METROLOGY AND INSTRUMENTATION LAB	Identify methods and devices for measurement of length, height and diameter. Acquire the knowledge about angular measurement and various measuring instruments. Recognize & measure the gear and screw thread parameters using profile projector and tool maker microscope. Demonstrate the sound knowledge in gauges selection, design and measurement. Acquire adequate knowledge in the measurement of flatness, roundness and surface roughness.
83.	16ME C37	COMPUTER AIDED ENGINEERING LAB	Apply basics of Theory of Elasticity to continuum problems. Formulate finite elements like beam elements for linear static structural analysis. Develop models for 2D and axisymmetric finite elements and 1D heat transfer Solve problems of limited complexity in buckling and dynamic analysis Utilize finite element software to simulate practical problems
84.	16ME E15	POWER PLANT ENGINEERING	Select the suitability of site for a power plant. Propose ash handling, coal handling method in a thermal power plant Understand the water cycle, flow-sheet of hydro-power plant and types of dams and spillways Explain working principle of different types of nuclear power plant. Know the various factors of plant load and economy and safety aspects of power plants
85.	16ME E16	PRINCIPLES OF ENTREPRENEURSHIP	Analyse ideas for new and innovative products or services Identify opportunities and deciding nature of industry Analyze the feasibility of a new business plan and preparation of Business plan Use project management techniques like PERT and CPM Analyze behavioral aspects and use time management matrix
86.	16ME E17	INNOVATIONS, PROTECTION AND LEGAL ASPECTS	Will respect intellectual property of others Learn the art of understanding IPR Develop the capability of searching the stage of innovations. Will be capable of filing a patent document independently. Completely understand the techno-legal business angle of IPR and converting creativity into IPR and effectively protect it.
87.	16PE E11	SUPPLY CHAIN MANAGEMENT	Plan an effective transportation and warehouse management systems Design an effective supply chain networks Integrate and optimize demand and supply gaps Apply inventory management techniques


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 Department of Mechanical Engineering
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 Gandipet, Hyderabad-500 075. Telangana

			Understand and design pricing and revenue management systems
88.	16ME E18	NANO SCIENCE AND TECHNOLOGY	Understand the developments and challenges in nano technology
			Understand magnetic and electronic properties and its microstructure
			Learn synthesis and characterization techniques of Zero and One dimensional Nano structures and their applications
			Study various Nano Material Fabrication Techniques
			Understand the applications of special nano materials and nano bio materials
89.	16CE O02	DISASTER MITIGATION AND MANAGEMENT	Analyze and critically examine existing programs in disaster management regarding vulnerability, risk and capacity at different levels
			Understand and choose the appropriate activities and tools and set up priorities to build a coherent and adapted disaster management plan
			Understand various mechanisms and consequences of human induced disasters for the participatory role of engineers in disaster management
			Understand the impact on various elements affected by the disaster and to suggest and apply appropriate measures for the same
			Develop an awareness of the chronological phases of disaster preparedness, response and relief operations for formulating effective disaster management plans and ability to understand various participatory approaches/strategies and their application in disaster management
90.	16IT O02	PRINCIPLES OF INTERNET OF THINGS	Comprehend the terminology, protocols and communication models of IoT.
			Define the various IoT enabling technologies and differentiate between M2M and IoT.
			Acquire the basics of Python Scripting Language used in developing IoT applications.
			Describe the steps involved in IoT system design methodology.
			Design simple IoT systems using Raspberry Pi board and interfacing sensors with Raspberry Pi.
91.	16EE O03	ENERGY AUDITING	Know the current energy scenario and importance of energy auditing.
			Understand the concepts of energy auditing.
			Evaluate the performance of existing engineering systems
			Explore the methods of improving energy efficiency in different engineering systems
			Design different energy efficient devices.
92.	16EC O07	SYSTEM AUTOMATION AND CONTROL	Understand various process control systems.
			Measure the physical parameters in the industry.
			Design PID controllers
			Understand the role of digital computers in automation
			Understand the applications of Robots.
93.	16CS O09	BASICS OF ARTIFICIAL INTELLIGENCE	Differentiate between a rudimentary Problem and an AI problem, it's Characteristics and problem- solving Techniques.
			Compare and contrast the various knowledge representation schemes of AI.
			Understand and analyze the various reasoning and planning techniques involved in solving AI problems.
			Understand the different learning techniques.
			Apply the AI techniques to solve the real-world problems.
94.	16IT O01	OBJECT ORIENTED PROGRAMMING	Understand Object-Oriented concepts.
			Create Java applications using sound OOP practices e.g. Inheritance, Interfaces, Packages, and Inner classes.


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 Gandipet, Hyderabad-500 075. Telangana

		USING JAVA	Implement Exception Handling and Multithreading concepts in java programs. Develop programs using the Java Collection API and Stream classes. Design and Develop GUI applications with the integration of event handling, JDBC.
95.	16PY 001	HISTORY OF SCIENCE AND TECHNOLOGY	Demonstrate knowledge of broad concepts in the history of science, technology ranging over time, space and cultures. Recognize the values of a wide range of methodologies, conceptual approaches and the impact of competing narratives within the history of science, technology. Identify, locate and analyze relevant primary and secondary sources in order to construct evidence- based arguments. Think independently and critically, using appropriate methodologies and technologies to engage with problems in the history of science, technology. Demonstrate academic rigor and sensitivity to cultural and other diversity, and understanding of the ethical implications of historical and scientific enquiry within a global context.
96.	16EE 005	WASTE MANAGEMENT	Understand the various processes involved in allied disciplines of engineering Infer the regulations of governance in managing the waste Distinguish the nature of waste materials concerned to the particular branch of engineering Explore the ways and means of disposal of waste material Identify the remedies for the disposal of a selected hazardous waste material
97.	16EC 005	MEMS AND ITS APPLICATIONS	Select various materials used for MEMS. Design the micro devices and systems using the MEMS fabrication process. Understand the operation of different Sensors and Actuators. Design the micro devices and systems using Polymer MEMs. Apply different MEMS devices in various disciplines.
98.	16CS 007	BASICS OF CYBER SECURITY	Discuss different types of cybercrimes and analyze legal frameworks to deal with these cybercrimes. Describe Tools used in cybercrimes and laws governing cyberspace. Analyze and resolve cyber security issues. Recognize the importance of digital evidence in prosecution. Analyze the commercial activities in the event of significant information security incidents in the Organization.
99.	16ME 001	ENTREPRENEURSHIP	Identify opportunities and deciding nature of industry Brainstorm ideas for new and innovative products or services Analyze the feasibility of a new business plan and preparation of Business plan Use project management techniques like PERT and CPM Analyze behavioural aspects and use time management matrix
100.	16MEO02	ROBOTICS	Equipped with the knowledge of robot anatomy, work volume and robot applications Familiarized with the kinematic motions of robot and robot dynamics Having good knowledge about robot end effectors and their design concepts Equipped with the knowledge of Programming methods & drives used in robots Equipped with the principles of various Sensors and their applications in robots.
101.	16ME 003	HUMAN RIGHTS	Process of evolution of human rights


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 Department of Mechanical Engineering
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 Gandipet, Hyderabad-500 075, Telangana

		AND LEGISLATIVE PROCEDURE	Constitutional protection available Conditions of under privileged persons and will adopt a positive attitude towards. Role of Law in protecting environment and will recognize right to life. Safe means of using advanced technology and become part of NGO's in protecting human rights and environment.
102.	16ME 004	INTELLECTUAL PROPERTY RIGHTS	Will respect intellectual property of others Learn the art of understanding IPR Develop the capability of searching the stage of innovations. Will be capable of filing a patent document independently. Completely understand the techno-legal business angle of IPR and converting creativity into IPR and effectively protect it.
103.	16ME 005	NANO MATERIALS AND TECHNOLOGY	Understand the developments and challenges in nano technology Understand magnetic and electronic properties and its microstructure Learn synthesis and characterization techniques of Zero and One dimensional Nano structures and their applications Study various Nano Material Fabrication Techniques Understand the applications of special nano materials and nano bio materials
104.	16ME 006	RESEARCH METHODOLOGIES	Define research problem Review and assess the quality of literature from various sources. Understand and develop various research designs. Analyze problem by statistical techniques: ANOVA, F-test, Chi-square Improve the style and format of writing a report for technical paper/ Journal report
105.	16ME 007	INTRODUCTION TO OPERATIONS RESEARCH	Formulate a managerial decision problem into a mathematical model; Apply transportation problems in manufacturing industries; Build and solve assignment models Apply project management techniques like CPM and PERT to plan and execute project successfully Apply sequencing concepts in industry applications
106.	16ME 008	INDUSTRIAL ADMINISTRATION AND FINANCIAL MANAGEMENT	Understand the role of different types of business organizations along with the need and importance of various types of layouts used in manufacturing industries Apply the techniques of method study and work measurement in industry to enhance productivity Understand the importance of quality control and plot the control charts Apply the techniques of project management in industry Calculate the total cost of the product based on its elements.
107.	16ME 009	ORGANIZATIONAL BEHAVIOUR	Enable the students to practically implement the Organizational Behavior principles and practice in real time situations. Analyze the behavior, perception and personality of individuals and groups in organizations in terms of the key factors that influence organizational behavior. Acquire knowledge in applying motivational theories to resolve problems of employees and identify various leadership styles and the role of leaders in decision making process. To examine various organizational designs and explain concepts of organizational culture, climate and organizational development. To explain group dynamics and skills required for working in groups and identify the processes used in developing communication and resolving conflicts, power conflicts in organization


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 Department of Mechanical Engineering
 Chaitanya Bharathi Institute of Technology (A)
 Gandipet, Hyderabad-500 075. Telangana

108.	16ME O10	3D PRINTING	Understand the concept of 3D printing processes, its advantages and limitations
			Understand different fabrication processes in regard to different materials
			Resolve the various STL file issues during preprocessing stage
			Apply different post processing techniques to obtain a finished component and understand rapid tooling concept
			Understand the applications of RP in various fields of engineering
109.	16ME O11	ESSENTIALS OF MANAGEMENT	Identify and evaluate the principles of management
			Demonstrate the ability to have an effective and realistic planning
			Identify the nature and the type of organization
			Apply the tools and techniques of directing
			Explain and evaluate the necessity for controlling and further refinement of an organization.


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 Department of Mechanical Engineering
 Chaitanya Bharathi Institute of Technology (A)
 Gandipet, Hyderabad-500 075. Telangana