NAAC 2.6.1 CO STATEMENTS

PG (THERMAL ENGINEERING)

(R20)

MECHANICAL ENGINEERING

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

Department Of Mechanical Engineering
M. E (Thermal Engineering)

R 20

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.

Program Educational Objectives (PEOs) of M.E. (Thermal Engineering):

1. Prepare Graduates with Good Analytical, Computational and Experimental Skills to Design and Develop Energy Efficient Systems for Sustainable Development.
2. Prepare Graduates with High Level of Technical Competency combined with Research and Complex Problem-Solving Ability to Generate Innovative Solutions in Thermal Engineering and allied areas.
3. Pursue Lifelong Learning for Career and Professional Growth with a Concern for Society and Environment.
4. Inculcate Teamwork, Communication and Interpersonal Skills adapting to Changing needs of society.

Program Outcomes (POs) of M.E. (Thermal Engineering):

PO 1: An ability to independently carry out research /investigation and development work to solve practical problems

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PO 2: An ability to write and present a substantial technical report/document

PO 3: Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program

PO 4: Ethics: apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice

PO 5: 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

PO 6: 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 technology

PSOs of M.E. (Thermal Engineering):

1. Apply domain knowledge of thermal and fluid sciences to solve engineering problems with the help of advanced technology.
2. Develop alternative energy sources for sustainable growth.
3. Demonstrate knowledge and skill in the use of CFD software tools.

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Department of Mechanical Engineering

Course Outcomes Statements for

M.E (Thermal Engineering)-R20

SNo	Course		Course Outcomes Statements
	Code	Name	
1	20ME C201	THERMODYNAMICS AND COMBUSTION	Apply various laws of thermodynamics to suit the engineering application
			Apply the knowledge of thermodynamics for the behavior of real gases.
			Understand the phenomenon of combustion
			Understand the application of power cycles to engineering practice.
			Understand various non-conventional energy conversion methods like fuel cells etc
2	20ME C202	ADVANCED FLUID DYNAMICS	Understand the concept of stream and velocity potential function
			Apply of the knowledge of equations for analysis in cfd
			Calculate thickness of boundary layer and shear stress
			Design nozzles and diffusers
			Estimate various parameters in fluids subjected to shocks
3	20ME E201	THERMAL AND NUCLEAR POWER PLANTS (Program Elective – I)	Analyze on combustion of coal and find performance of different power plant cycles
			Analyze the combined cycle power plants and waste heat recovery systems
			Design various types of nuclear reactors taking safety precautions and making economically beneficial
			Calculate the energy rates of power distribution considering the factors affecting the economy
			Determine the pressure, temperature and flow measurements of steam and water to operate the power plant most efficiently and suggest various remedies to control pollutants
4.	20ME E202	ENVIRONMENTALENGINEERINGAND POLLUTION CONTROL (Program Elective – I)	Estimate air pollutants and suggest suitable remedial methods to control them
			Suggest a suitable solid waste disposal system
			Suggest suitable remedy to control water pollution
			Suggest suitable remedy to control other

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			pollutants like oils, pesticides, noise etc
			Suggest a suitable instrumentation for pollution control
5.	20ME E103	OPTIMIZATION TECHNIQUES (Program Elective – I)	Formulate a managerial decision problem into a mathematical model.
			Apply Operations Research models to real time industry problems
			Build and solve Transportation Models and Assignment Models
			Apply project management techniques like CPM and PERT to plan and execute project successfully
			Apply sequencing and concepts in industry applications
6.	20ME E203	AIR CONDITIONING SYSTEM DESIGN (Program Elective – II)	Effect of refrigerants on environment and ozone depletion
			List out merits and demerits of absorption refrigeration system over simple vapor compression refrigeration system
			List out factors effecting design of air conditioning system
			Importance of air conditioning in engineering applications
			Design components used in air conditioning circuits
7.	20ME E204	ENERGY CONSERVATION AND MANAGEMENT (Program Elective – II)	Know energy scenario both India and world.
			. Review and asses 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
8	20ME E205	DESIGN OF SOLAR AND WIND SYSTEMS (Program Elective – II)	Understand the implementation status of NCES in India along with basic concepts of Solar Energy
			Analyze the performance of Solar Collectors
			Understand PV Cell technology and storage methods
			Conceptually design the wind turbine and understand fuel cells functioning
			Understand various Waste to Energy conversion technologies.
9	20ME M103	RESEARCH METHODOLOGY AND IPR	Define research problem, review and asses the quality of literature from various sources
			Improve the style and format of writing a report for technical paper/ Journal report, understand and develop various research designs
			Collect the data by various methods: observation, interview, questionnaires

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			Analyze problem by statistical techniques: ANOVA, F-test, Chi-square
			Understand apply for patent and copyrights
10	20CE A101	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.
11	20EE A101	SANSKRIT FOR TECHNICAL KNOWLEDGE	Develop passion towards Sanskrit language
			Decipher the latent engineering principles from Sanskrit literature
			Correlates the technological concepts with the ancient Sanskrit history
			Develop knowledge for the technological progress
			Explore the avenue for research in engineering with aid of Sanskrit
12	20EC A101	VALUE EDUCATION	Gain necessary Knowledge for self-development
			Learn the importance of Human values and their application in day-to-day professional life
			Appreciate the need and importance of interpersonal skills for successful career and social life
			Emphasize the role of personal and social responsibility of an individual for all-round growth
			Develop a perspective based on spiritual outlook and respect women, other religious practices, equality, non-violence and universal brotherhood.
13	20IT A101	PEDAGOGY STUDIES	Illustrate the pedagogical practices followed by teachers in developing countries both in formal and informal classrooms.
			Examine the effectiveness of pedagogical practices.
			Understand the concept, characteristics and types of educational research and perspectives of research.

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			Describe the role of classroom practices, curriculum and barriers to learning.
			Understand Research gaps and learn the future directions
14	20EG A101	ENGLISH FOR RESEARCH PAPER WRITING	Interpret the nuances of research paper writing.
			Differentiate the research paper format and citation of sources
			To review the research papers and articles in a scientific manner
			Avoid plagiarism and be able to develop their writing skills in presenting the research work.
			Create a research paper and acquire the knowledge of how and where to publish their original research papers.
15	20EG A102	INDIAN CONSTITUTION AND FUNDAMENTAL RIGHTS	Understand the making of the Indian Constitution and its features
			Understand the Rights of equality, the Right of freedom and the Right to constitutional remedies.
			Have an insight into various Organs of Governance - composition and functions.
			Understand powers and functions of Municipalities, Panchayats and Co-operative Societies.
			Understand Electoral Process, special provisions
16	20EG A103	STRESS MANAGEMENT BY YOGA	Understand yoga and its benefits.
			Enhance Physical strength and flexibility.
			Learn to relax and focus
			Relieve physical and mental tension through asanas
			Improve work performance and efficiency.
17	20EG A104	PERSONALITYDEVELOPMENTTHROUGHLIFE'S ENLIGHTENMENTSKILLS	Develop their personality and achieve their highest goal of life.
			Lead the nation and mankind to peace and prosperity
			Practice emotional self-regulation.
			Develop a positive approach to work and duties.
			Develop a versatile personality.
18	20ME C203	THERMAL SYSTEMS LAB	Estimate the thermal efficiency of IC engine
			Prove that value of convection heat transfer coefficient is very high with two phase heat transfer
			Estimate the effectiveness of cross flow heat exchanger and prove that it is very high compared with other configurations
			Find out properties of fluids such as coefficient of thermal expansion, enthalpy of fusion
			Determine COP of Refrigeration and air-conditioned tutors

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19	20ME C204	DESIGN OF SOLAR AND WIND SYSTEMS LAB	Measure radiation using various instruments
			Find the performance of solar water pump, water heater
			Determine the effect of tilting angle on pv cell
			Evaluate efficiency of wind turbine
			Differentiate KVIC and JANATA bio energy conversion systems
20	20ME C106	FINITE ELEMENT TECHNIQUES	Apply FE method for solving field problems using virtual work and potential energy formulations 2. 3.. 4. 5.
			Analyze linear problems like axial, truss and beam, torsional analysis of circular shaft
			Analyze 2D structural problems using CST element and analyze the axi-symmetric problems with triangular elements. Write shape functions for 4 node quadrilateral, iso parametric elements and apply numerical integration and Gaussian quadrature to solve the problems
			Evaluate the eigen values and eigen vectors for stepped bar, formulate 3 D elements, check for convergence requirements
			Solve linear 1 D and 2 D heat conduction and convection heat transfer problems, Use of FEA software ANSYS for engineering solutions
21	20ME C205	ADVANCED HEAT AND MASS TRANSFER	Apply the equations pertaining to unsteady state heat transfer and knowledge in extended surfaces
			Evaluate mass, momentum and energy equations with approximate and exact methods
			Apply heat transfer knowledge in calculation of boundary layer thickness and various dimensionless numbers
			Evaluate heat transfer coefficients under phase change phenomena and radiation heat transfer
			Apply the knowledge of mass transfer in process industries
22	20ME E206	COMPUTATIONAL FLUID DYNAMICS (Program Elective – III)	Derive CFD governing equations and turbulence models 2. 3 4. 5.
			Apply elliptical, parabolic and hyperbolic pdes and forward, backward and center difference methods
			Understand errors, stability, consistency and develop O, H and C grid generated models
			Evaluate the use of Crank-Nicholson, Implicit and Explicit methods and analyze problem by Jacobi, Gauss Seidel and ADI methods
			Solve conduction and convection problems using FVM.

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23	20ME E207	REFRIGERATION AND CRYOGENICS (Program Elective – III)	Learn the applications of refrigeration and ODP, GWP and related environment issues.
			To design the refrigeration systems for domestic applications
			Understand absorption refrigeration system and its advantages over vapor compression refrigeration
			Design equipment needed for refrigeration system like evaporators, condensers.
			To understand the applications in cryogenics and gas-liquefaction system
24	20ME E208	DESIGN OF HEAT EXCHANGERS (Program Elective – III)	Explain different types of heat exchangers, LMTD method and NTU methods
			List out co-relations for forced convection heat transfer coefficient for various geometries
			Estimate the pressure drop in laminar and turbulent flow in heat exchangers
			Determine pressure drop in hair pin and finned tube heat exchangers
			. Explain design and operational considerations in condensers and heat pipes
25	20ME E209	TURBO MACHINES (Program Elective – IV)	Apply gas dynamics equations depending upon applications
			Estimate the power developed by steam turbines
			Calculate hydraulic efficiency of impulse and reaction turbines
			Find the efficiency, pressure rise, degree of reaction, slip factor and performance of axial flow and centrifugal compressors
			Understand cycles and improve the cycle efficiency in gas turbines
26	20ME E210	GAS TURBINES (Program Elective – IV)	Design nozzle with known inlet conditions 2. 3. 4. 5.
			Evaluate thermal efficiency of gas turbines and its improvement
			Determine overall efficiency of Axial flow compressor and Centrifugal compressors
			Design combustion system for gas turbine plant
			Determine thrust and propulsive force developed by jets and rockets.
27	20ME E211	POWER PLANT CONTROL AND INSTRUMENTATION (Program Elective – IV)	Estimate static and dynamic characteristics of instruments
			Estimate the influence of electrical parameters on measurements
			Understand theory on stability of instruments used for thermal systems and model power systems using various numerical methods
			Estimate the role of computers for data acquisition
			Represent various types of process control system

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28	20CE A101	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
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			Emphasize the role of personal and social responsibility of an individual for all-round growth.
			Develop a perspective based on spiritual outlook and respect women, other religious practices, equality, non-violence and universal brotherhood.
31	20IT A101	PEDAGOGY STUDIES	Illustrate the pedagogical practices followed by teachers in developing countries both in formal and informal classrooms.
			Examine the effectiveness of pedagogical practices
			Understand the concept, characteristics and types of educational research and perspectives of research.
			Describe the role of classroom practices, curriculum and barriers to learning.
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			direction
32.	20EG A101	ENGLISH FOR RESEARCH PAPER WRITING	Interpret the nuances of research paper writing.
			Differentiate the research paper format and citation of sources.
			To review the research papers and articles in a scientific manner.
			Avoid plagiarism and be able to develop their writing skills in presenting the research work.
			Create a research paper and acquire the knowledge of how and where to publish their original research papers.
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			Understand the Rights of equality, the Right of freedom and the Right to constitutional remedies.
			Have an insight into various Organs of Governance - composition and functions.
			Understand powers and functions of Municipalities, Panchayats and Co-operative Societies.
			Understand Electoral Process, special provisions.
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			Enhance Physical strength and flexibility.
			Learn to relax and focus
			Relieve physical and mental tension through asanas
			Improve work performance and efficiency.
35	20EG A104	PERSONALITYDEVELOPMENTTHROUGHLIFE'S ENLIGHTENMENTSKILLS	Develop their personality and achieve their highest goal of life.
			Lead the nation and mankind to peace and prosperity
			Practice emotional self-regulation.
			Develop a positive approach to work and duties.
			Develop a versatile personality.
36	20ME C108	COMPUTER AIDED ENGINEERING LAB	Understand the applications of one and two-dimensional elements
			Solve engineering problems
			Find buckling factors
			Understand industrial applications of forming and sheet metal operations
			Find fracture toughness
37	20ME C206	COMPUTATIONAL FLUID DYNAMICS LAB	Analyze laminar flow problems in plates and pipes
			Solve steady and unsteady flow past a cylinder
			Perform analysis for free and forced convection
			Evaluate the effect of angle of attack and velocity on NACA airfoil
			Simulate compressible flow in a nozzle, premixed combustion

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38	20ME C207	MINI PROJECT WITH SEMINAR	Formulate a specific problem and give solution
			Develop model/models either theoretical/practical/numerical form
			Solve, interpret/correlate the results and discussions
			Conclude the results obtained
			Write the documentation in standard format
39	20ME E212	EXPERIMENTAL METHODS IN THERMAL ENGINEERING (Program Elective - V)	Understand the concepts of errors in measurements.
			Recognize different techniques of temperature measurement
			Manage with different pressure and flow measuring instruments
			Understand working of radiation measuring equipment.
			Familiarize with advanced measurement techniques.
40	20ME E213	FLUID POWER SYSTEMS (Program Elective - V)	Identify and analyze the functional requirements of a fluid power transmission system for a given application
			Visualize how a hydraulic/pneumatic circuit will work to accomplish the function.
			Design an appropriate hydraulic or pneumatic circuit or combination circuit like electro-hydraulics, electro-pneumatics for a given application.
			Select and size the different components of the circuit.
			Develop a comprehensive circuit diagram by integrating the components selected for the given application.
41	20ME E214	ENGINE EMISSIONS AND POLLUTION CONTROL (Program Elective - V)	Understand the importance of IC engine as prime mover and the combustion phenomenon in SI engine.
			Understand the phenomenon of combustion in CI engine along with turbocharging and supercharging
			Understand the formation of different pollutants in IC engines and their effect on environment and human beings.
			Understand the measurement and control techniques of various pollutants from IC engines.
			Understand the significance of various alternative liquid and gaseous fuels in IC engines
42	20CEO101	COST MANAGEMENT OF ENGINEERING PROJECTS (Open Elective)	Acquire in-depth knowledge about the concepts of project management and understand the principles of project tmanagement. 2. 3. 4. 5.
			Determine the critical path of a typical project

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			using CPM and PERT techniques.
			Prepare a work break down plan and perform linear scheduling using various methods.
			Solve problems of resource scheduling and leveling using network diagrams.
			Learn the concepts of budgetary control and apply quantitative techniques for optimizing project cost.
43	20EEO101	WASTE TO ENERGY (Open Elective)	Understand the concept of conservation of waste
			Identify the different forms of wastage
			Chose the best way for conservation to produce energy from waste
			Explore the ways and means of combustion of biomass
			Develop a healthy environment for the mankind
44	20CSO101	BUSINESS ANALYTICS (Open Elective)	Identify and describe complex business problems in terms of analytical models.
			Apply appropriate analytical methods to find solutions to business problems that achieve stated objectives.
			Interpret various metrics, measures used in business analytics.
			Illustrate various descriptive, predictive and prescriptive methods and techniques.
			Model the business data using various business analytical methods and techniques.
			Create viable solutions to decision making problems.
45	20ME C110	INDUSTRIAL PROJECT / DISSERTATION PHASE - I	Students will be exposed to self-learning various topics.
			Students will learn to survey the literature such as books, national/ international refereed journals and contact resource persons for the selected topic of research.
			Students will learn to write technical reports.
			Students will develop oral and written communication skills to present.
			Student will defend their work in front of technically qualified audience.
46	20MEC111	INDUSTRIAL PROJECT / DISSERTATION PHASE - II	Students will be able to use different experimental techniques and will be able to use different software/ computational/analytical tools.
			Students will be able to design and develop an experimental set up/ equipment/test rig.
			Students will be able to conduct tests on existing set ups/equipment and draw logical conclusions from the results after analyzing them.

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			Students will be able to either work in a research environment or in an industrial environment.
			Students will be conversant with technical report writing and will be able to present and convince their topic of study to the engineering community.
47	20MEO101	INDUSTRIAL SAFETY (Open Elective)	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 equipment like machine tools, IC Engines, boilers etc.
			Apply periodic and preventive maintenance techniques as required for industrial equipment like motors, pumps and air compressors and machine tools etc
48	20MEO102	INTRODUCTION TO OPTIMIZATION TECHNIQUES (Open Elective)	Formulate a linear programming problem (LPP)
			Build and solve Transportation Models and Assignment Models.
			Apply project management techniques like CPM and PERT to plan and execute project successfully
			Apply queuing and inventory concepts in industrial applications
			Apply sequencing models in industries
49	20MEO103	COMPOSITE MATERIALS (Open Elective)	Classify and characterize the composite materials.
			Describe types of reinforcements and their properties.
			Understand different fabrication methods of metal matrix composites.
			Understand different fabrication methods of polymer matrix composites
			Decide the failure of composite materials.

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