

**NACC 2.6.1 CO STATEMENTS
PG (THERMAL
ENGINEERING) (R20,R19,R16)
MECHANICAL
ENGINEERING**



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



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

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



COMMITTED TO
RESEARCH,
INNOVATION AND
EDUCATION

44
years

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 Vision

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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.
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- 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):

5. Prepare Graduates with Good Analytical, Computational and Experimental Skills to Design and Develop Energy Efficient Systems for Sustainable Development.
6. 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.
7. Pursue Lifelong Learning for Career and Professional Growth with a Concern for Society and Environment.
8. 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

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

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PSOs of M.E. (Thermal Engineering):

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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 in particular.

PEOs of M.E. (Thermal Engineering):


1. To provide the students with a solid understanding of thermal engineering fundamentals and applications required to solve real life problems.
2. To motivate the students to excel in research and to practice the technologies in field of thermal engineering in a broad way.
3. To train the student with scientific and engineering knowledge so as to comprehend analyze the design products and systems pertaining to broad among thermal engineering
4. To indicate an altitude to face typical thermal engineering problems with confidence through multi-disciplinary team approach.
5. To provide student with an academic environment that is aware of professional excellence and leadership through interaction with practicing engineering and professional bodies.



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CHAITANYABHARATHIINSTITUTE OF TECHNOLOGY(A)**Gandipet, Hyderabad-75****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	ENVIRONMENTAL ENGINEERING AND 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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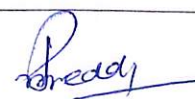
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			Describe the role of classroom practices, curriculum and barriers to learning.
			Understand Research gaps and learn the future directions
14	20EG A101	ENGLISH FOR RESEARCH PAPER WRITING	Interpret the nuances of research paper writing.
			Differentiate 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	PERSONALITY DEVELOPMENT THROUGH LIFE'S ENLIGHTENMENT SKILLS	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.



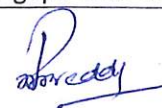
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23	20ME E207	REFRIGERATION AND CRYOGENICS (Program Elective – III)	Learn the applications of refrigeration and ODP, GWP and related environment issues.
			To design the refrigeration systems for domestic applications
			Understand absorption refrigeration 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
			Understand the impact on various elements affected by the disaster and to suggest and apply appropriate measures for the same
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			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.
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.
			Understand Research gaps and learn the future



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			direction
32.	20EG A101	ENGLISH FOR RESEARCH PAPER WRITING	<p>Interpret the nuances of research paper writing.</p> <p>Differentiate the research paper format and citation of sources.</p> <p>To review the research papers and articles in a scientific manner.</p> <p>Avoid plagiarism and be able to develop their writing skills in presenting the research work.</p> <p>Create a research paper and acquire the knowledge of how and where to publish their original research papers.</p>
33	20EG A102	INDIAN CONSTITUTION AND FUNDAMENTAL RIGHTS	<p>Understand the making of the Indian Constitution and its features.</p> <p>Understand the Rights of equality, the Right of freedom and the Right to constitutional remedies.</p> <p>Have an insight into various Organs of Governance - composition and functions.</p> <p>Understand powers and functions of Municipalities, Panchayats and Co-operative Societies.</p> <p>Understand Electoral Process, special provisions.</p>
34	20EG A103	STRESS MANAGEMENT BY YOGA	<p>Understand yoga and its benefits.</p> <p>Enhance Physical strength and flexibility.</p> <p>Learn to relax and focus</p> <p>Relieve physical and mental tension through asanas</p> <p>Improve work performance and efficiency.</p>
35	20EG A104	PERSONALITY DEVELOPMENT THROUGH LIFE'S ENLIGHTENMENT SKILLS	<p>Develop their personality and achieve their highest goal of life.</p> <p>Lead the nation and mankind to peace and prosperity</p> <p>Practice emotional self-regulation.</p> <p>Develop a positive approach to work and duties.</p> <p>Develop a versatile personality.</p>
36	20ME C108	COMPUTER AIDED ENGINEERING LAB	<p>Understand the applications of one and two-dimensional elements</p> <p>Solve engineering problems</p> <p>Find buckling factors</p> <p>Understand industrial applications of forming and sheet metal operations</p> <p>Find fracture toughness</p>
37	20ME C206	COMPUTATIONAL FLUID DYNAMICS LAB	<p>Analyze laminar flow problems in plates and pipes</p> <p>Solve steady and unsteady flow past a cylinder</p> <p>Perform analysis for free and forced convection</p> <p>Evaluate the effect of angle of attack and velocity on NACA airfoil</p> <p>Simulate compressible flow in a nozzle, premixed combustion</p>



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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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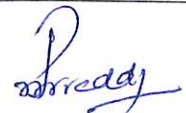
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Course Outcomes Statements for

M.E (Thermal Engineering)-R19

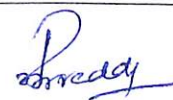
SNo	Course		Course Outcomes Statements
	Code	Name	
1	19MEC 201	THERMO DYNAMICS AND COMBUSTION	Apply various laws of thermodynamics to suit the engineering applications.
			Apply the knowledge of thermodynamics for the behavior of real gases.
			Understand the phenomenon of combustion
			Understand the application of power cycles to engineering practice.
			Understand various non-conventional energy conversion methods like fuel cells etc
2	19MEC 202	ADVANCED FLUID DYNAMICS	Understand the concept of stream and velocity potential function 2. 3. 4. 5.
			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	19MEE 201	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



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4	19MEE 202	ENVIRONMENTAL ENGINEERING AND 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 pollutants like oils, pesticides, noise etc.
			Suggest a suitable instrumentation for pollution control
5	19MEE 103	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	19MEE 203	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 vapour 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	19MEE 204	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	19MEE 205	DESIGN OF SOLAR AND WIND SYSTEMS	Understand the implementation



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		(Program Elective – II)	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	19MEC 103	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
			Analyze problem by statistical techniques: ANOVA, F-test, Chi-square
			Understand apply for patent and copyrights
10	19CEA 101	DISASTER MITIGATION AND MANAGEMENT	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	19EEA 101	SANSKRIT FOR TECHNICAL KNOWLEDGE	Develop passion towards Sanskrit

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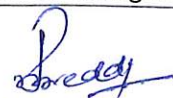
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			language Decipher the latent engineering principles from Sanskrit literature Correlates the technological concepts with the ancient Sanskrit history. Develop knowledge for the technological progress Explore the avenue for research in engineering with aid of Sanskrit
12	19ECA 101	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	19ITA 101	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. Understand Research gaps and learn the future directions.
14	19EGA 101	ENGLISH FOR RESEARCH PAPER WRITING	Interpret the nuances of research paper writing. 2. 3. 4. 5. 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

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			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	19EGA 102	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	19EGA 103	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	19EGA 104	PERSONALITY DEVELOPMENT THROUGH LIFE'S ENLIGHTENMENT SKILLS	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	19MEC 203	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



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			air-conditioned tutors
19	19MEC 204	DESIGN OF SOLAR AND WIND SYSTEMS LAB	<p>Measure radiation using various instruments</p> <p>Find the performance of solar water pump, water heater</p> <p>Determine the effect of tilting angle on pv cell</p> <p>Evaluate efficiency of wind turbine</p> <p>Differentiate KVIC and JANATA bio energy conversion systems</p>
20	19MEC 106	FINITE ELEMENT TECHNIQUES	<p>Apply FE method for solving field problems using virtual work and potential energy formulations</p> <p>Analyze linear problems like axial, truss and beam, torsional analysis of circular shaft</p> <p>Analyze 2D structural problems using CST element and analyze the axisymmetric problems with triangular elements. Write shape functions for 4 node quadrilateral, isoparametric elements and apply numerical integration and Gaussian quadrature to solve the problems.</p> <p>Evaluate the eigen values and eigen vectors for stepped bar, formulate 3 D elements, check for convergence requirements</p> <p>Solve linear 1 D and 2 D heat conduction and convection heat transfer problems, Use of FEA software ANSYS for engineering solutions</p>
21	19MEC 205	ADVANCED HEAT AND MASS TRANSFER	<p>Apply the equations pertaining to unsteady state heat transfer and knowledge in extended surfaces</p> <p>Evaluate mass, momentum and energy equations with approximate and exact methods</p> <p>Apply heat transfer knowledge in calculation of boundary layer thickness and various dimensionless numbers</p>
			Evaluate heat transfer coefficients under phase change phenomena and radiation heat transfer
			Apply the knowledge of mass transfer



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			in process industries
22	19MEE 206	COMPUTATIONAL FLUID DYNAMICS (Program Elective – III)	Derive CFD governing equations and turbulence models 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.
23	19MEE 207	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	19MEE 208	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	19MEE 209	TURBO MACHINES (Program Elective – IV)	Apply gas dynamics equations depending upon applications Estimate the power developed by steam turbines

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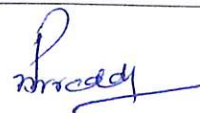
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			Calculate hydraulic efficiency of impulse and reaction turbines
			Find the efficiency, pressure rise, degree of reaction, slip factor and performance of axial flow and centrifugal compressors
			Understand cycles and improve the cycle efficiency in gas turbines
26	19MEE 210	GAS TURBINES (Program Elective – IV)	Design nozzle with known inlet conditions
			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	19MEE 211	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
28	19CEA 101	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

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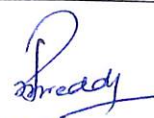
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			to suggest and apply appropriate measures for the same
			Develop an awareness of the chronological phases of disaster preparedness, response and relief operations for formulating effective disaster management plans and ability to understand various participatory approaches/strategies and their application in disaster management
29	19EEA 101	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
30	19ECA 101	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.
31	19ITA 101	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



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			learning. Understand Research gaps and learn the future directions
32	19EGA 101	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.
33	19EGA 102	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.
34	19EGA 103	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
35	19EGA 104	PERSONALITY DEVELOPMENT THROUGH LIFE'S ENLIGHTENMENT SKILLS	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	19MEC 108	COMPUTER AIDED ENGINEERING LAB	Understand the applications of one and two-dimensional elements



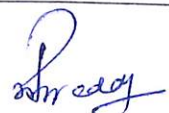
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			Solve engineering problems
			Find buckling factors
			Understand industrial applications of forming and sheet metal operations
			Find fracture toughness
37	19MEC 206	COMPUTATIONAL FLUID DYNAMICS LAB	Analyze laminar flow problems in plates and 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
38	19MEC 207	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	19MEE 212	ADVANCES IN IC ENGINES (Program Elective – V)	Describe the phenomena of combustion and knock in SI engines
			Combustion phenomena of CI engines and various power boosting techniques
			Understand how undesirable pollutants can be measured and controlled
			Demonstrate an understanding of technological, environmental and social impact of alternative fuels
			Explain modern concepts like lean burn, stratification, HCCI and GDI techniques
40	19MEE 213	CONVECTIVE HEAT TRANSFER (Program Elective – V)	Select the mode of convection heat transfer rate and calculate heat transfer rate depending on the application
			Determine rate of heat transfer under forced convection phenomena in pipes
			Determine rate of heat transfer under natural convection phenomena in

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			<p>pipes</p> <p>Calculate the rate of heat transfer with the combination of conduction and convection in applications like heat exchangers</p> <p>Determine heat transfer rate through the porous media</p>
41	19MEE 214	HEAT PIPE (Program Elective – V)	<p>Understand the physics of heat pipe</p> <p>Calculate the heat load on heat pipe</p> <p>Design of heat pipe</p> <p>Test the heat pipe</p> <p>Model different types of heat pipes under different conditions</p>
42	19MEO 101	INDUSTRIAL SAFETY (Open Elective)	<p>Identify the causes for industrial accidents and suggest preventive measures. 2. 3. 4. 5.</p> <p>Identify the basic tools and requirements of different maintenance procedures.</p> <p>Apply different techniques to reduce and prevent Wear and corrosion in Industry.</p> <p>Identify different types of faults present in various equipment like machine tools, IC Engines, boilers etc.</p> <p>Apply periodic and preventive maintenance techniques as required for industrial equipment like motors, pumps and air compressors and machine tools etc</p>
43	19MEO 102	INTRODUCTION TO OPTIMIZATION TECHNIQUES (Open Elective)	<p>Formulate a linear programming problem (LPP).</p> <p>Build and solve Transportation Models and Assignment Models.</p> <p>Apply project management techniques like CPM and PERT to plan and execute project successfully</p> <p>Apply queuing and inventory concepts in industrial applications</p> <p>Apply sequencing models in industries</p>
44	19MEO 103	COMPOSITE MATERIALS (Open Elective)	<p>Classify and characterize the composite materials.</p> <p>Describe types of reinforcements and their properties.</p> <p>Understand different fabrication methods of metal matrix composites.</p> <p>Understand different fabrication</p>



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			<p>methods of polymer matrix composites.</p> <p>. Decide the failure of composite materials.</p>
45	19CEO 101	COST MANAGEMENT OF ENGINEERING PROJECTS (Open Elective)	<p>Acquire in-depth knowledge about the concepts of project management and understand the principles of project management.</p> <p>Determine the critical path of a typical project using CPM and PERT techniques.</p> <p>Prepare a work break down plan and perform linear scheduling using various methods.</p> <p>Solve problems of resource scheduling and leveling using network diagrams.</p> <p>Learn the concepts of budgetary control and apply quantitative techniques for optimizing project cost.</p>
46	19EEO 101	WASTE TO ENERGY (Open Elective)	<p>Understand the concept of conservation of waste</p> <p>Identify the different forms of wastage</p> <p>Chose the best way for conservation to produce energy from waste</p> <p>Explore the ways and means of combustion of biomass</p> <p>Develop a healthy environment for the mankind</p>
47	19MEC 208	DISSERTATION PHASE - I	<p>Students will be exposed to self-learning various topics</p> <p>Students will learn to survey the literature such as books, national/international refereed journals and contact resource persons for the selected topic of research.</p> <p>Students will learn to write technical reports.</p> <p>Students will develop oral and written communication skills to present.</p> <p>Student will defend their work in front of technically qualified audience.</p>
48	19MEC 209	DISSERTATION PHASE - II	<p>Students will be able to use different experimental techniques and will be able to use different software/computational/analytical tools.</p> <p>Students will be able to design and develop an experimental set up/</p>



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			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.
			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



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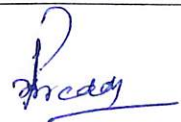
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Course Outcomes Statements for

M.E (Thermal Engineering)-R16

SNo	Course		Course Outcomes Statements
	Code	Name	
1	16MEC 105	FINITE ELEMENT TECHNIQUES	Implement finite element formulations to axial and quadratic elements and solve problems with hand calculations numerically
			Formulate numerically the truss, beam and frame elements and solve for deflection, strains and stresses
			Formulate numerically the plane and axisymmetric triangular elements and quadrilateral elements then solve for deflections, strains and stresses in structural mechanics problems
			Apply FE formulations to heat transfer of 1D and 2D elements and solve for temperature and heat flux in slabs, walls and plates
			Apply FE formulations to dynamic analysis of 1D and 2D elements and solve for eigen values and eigen vectors in bars and beams
			Apply FE formulations to 3D solids, plates and for non linear problems
2	16MEC 201	FLUID FLOWS & GAS 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
			Apply SFEE for various types of turbomachines
			Design nozzles and diffusers
3	16MEC 202	ADVANCED THERMODYNAMICS	Estimate various parameters in fluids subjected to shocks
			apply various laws of thermodynamics to suit the engineering applications. 2. 3. 4. 5. 6.
			apply the knowledge of thermodynamics for the behavior of



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			real gases.
			understand the phenomenon of combustion in IC engines
			select and design air conditioning or psychrometric process depending on application and comfort conditions
			understand the application of power cycles to engineering practice.
			understand various non-conventional energy conversion methods like fuel cells etc.
4	16MEC 203	ADVANCED HEAT & 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
			Apply the knowledge of radiation heat transfer in various fields like solar engineering, design of reactors etc,
			Apply the knowledge of mass transfer in process industries
5	16MEC 204	ADVANCED I.C. ENGINES	Describe the phenomena of combustion and knock in SI engines
			Understand the normal and abnormal combustion in CI engines
			Explain the sources and formation of various pollutants from IC engines
			Understand how the undesirable exhaust emissions from IC engines are controlled
			Demonstrate an understanding of technological, environmental and social impacts of alternative fuels
			Explain modern concepts like Lean burn, stratification, HCCI and GD
6	16MEC 205	COMPUTATIONAL FLUID DYNAMICS	Derive CFD governing equations and turbulence models.
			Apply elliptical, parabolic and hyperbolic PDEs and forward, Backward and center difference

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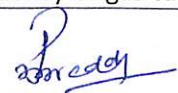
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			methods.
			Understand errors, stability, consistency and develop O, H and C grid generated models
			Evaluate the use of Crank-Nicholson, Implicit and Explicit methods.
			Analyze problem by Jacobi, Gauss Seidel and ADI methods.
			Solve conduction and convection problems using FVM
7	16MEE 201	COMPUTER AIDED GRAPHICS AND DESIGN	Apply design concepts in design, analysis and can visualize the models through the graphics standards.
			Implement Various transformations on geometric models for manipulation
			Recognize various wireframe entities and model them.
			Apply surface modeling techniques for the generating various parts and implement
			Differentiate various solid modeling techniques
			Able to perform modeling using the software by understanding advanced modeling concepts
8	16MEE105	OPTIMIZATION TECHNIQUES	Formulate and solve Linear programming problem
			Apply different techniques to solve Non-Linear programming problem
			Implement constrained optimization techniques
			Analyze dynamic programming and integer programming problems
			Develop schedule for projects and apply PERT/CPM techniques
			Apply Queuing theory to real life situations
9	16MEE 207	ENGINEERING RESEARCH METHODOLOGY	Define research problem.
			Review and asses the quality of literature from various sources
			Understand and develop various research designs.
			Collect the data by various methods: observation, interview, questionnaires.
			Analyze problem by statistical

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			techniques: ANOVA, F-test, Chi-square Improve the style and format of writing a report for technical paper/ Journal report
10	16MEE 202	TURBO MACHINES	Apply gas dynamics equations depending upon applications. Estimate the power developed by steam turbines Calculate hydraulic efficiency of Impulse and Reaction turbines Find efficiency, pressure rise and degree of reaction of axial flow compressor Analyze the slip factor and performance of centrifugal compressor Understand cycles and improve the cycle efficiency in gas turbines
11	16MEE 203	FLUID POWER SYSTEMS	Understand various types of fluids along with properties used for different applications. Select motor and pump depending on application Analyze the various types of hydraulic valves Calculate design nozzles and other elements used for hydraulic purposes such as in pneumatics Apply the principles of engineering for linear dynamics Design feedback control of elements
12	16MEE 204	DESIGN FOR THERMAL SYSTEMS	Select heat exchangers depending on application and need Design heat exchanges using LMTD & NTU approach Understand the importance of double principle & exchanger in industry and its design methods. Specify shell and the heat exchanger depending upon application in industry Design shell and tube heat exchanger based on importance and specifications Know the necessity of cooling towards in industry and its design methodology
13	16MEE 205	DESIGN OF GAS TURBINES	Thermal efficiency of gas turbine cycle



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			and its improvements by different methods
			Various methods used in improving performance of the gas turbine cycle
			Design elements in rotary compressors
			Understand the importance of various types of combustion chambers used in gas turbines
			Design or analyze the forces on blade of gas turbine
			Suggest different cooling methods of gas turbine blades
14	16MEE 206	ADVANCED ENERGY SYSTEMS	Design solar collectors, wind mill as per specifications
			Understand the potential of biogas plants and need for waste heat recovery in the scenario of energy savings
			Understand the need for cogeneration and various methods adopted for it
			Optimize the power plant efficiency
			Optimize power plant efficiency
			Design rotors of wind mill according to consideration of aerodynamics
15	16MEE 207	FUELS & COMBUSTION	List different solid fuels for different applications
			Know the various methods of processing solid fuels
			Know the properties handling and storage of liquid fuels
			Understand the production of various methods of gaseous fuels and identify fuels for various applications
			Understand different methods of combustion and estimate the air fuel ratio, adiabatic flame temperature based on the fuel.
			Understand design considerations of burners
16	16MEE 208	POWER PLANT CONTROL AND INSTRUMENTATION	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
			Model power systems using various

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			numerical methods
			Estimate the role of computers for data acquisition
			Represent various types of process control system
17	16MEE 209	DESIGN OF PUMPS AND COMPRESSORS	Apply the laws of fluid mechanics to turbo machines
			Install a pumping system & monitor the maintenance of the pumps
			Select pump depending on application
			Do testing of pumping systems
			To select drive and develop layout of the compressor system
			To design different types of impellers of centrifugal compressor
18	16MEE 210	NUMERICAL METHODS	Apply different techniques in solving linear and nonlinear sets of equations
			Apply different methods of interpolation techniques
			Solve numerical differentiation by different methods concerned to engineering practice
			Apply different techniques for numerical differentiation
			Identify various techniques of numerical methods applicable to engineering applications
			Apply different procedures to solve ordinary differential equations
19	16MEE 211	ENVIRONMENTAL ENGINEERING AND POLLUTION CONTROL	Estimate pollution levels in various resources and suggest suitable remedial methods to control them
			analyze air pollutants and suggest controlling methods
			suggest a suitable solid waste disposal system
			suggest suitable remedy to control water pollution
			suggest suitable remedy to control other pollutants like oils, pesticides, noise etc.
			Suggest a suitable instrumentation for pollution control
20	16MEE 212	REFRIGERATION MACHINERY & COMPONENTS	Estimate energy efficiency aspects of Hermetic compressors
			Analyze heat transfer coefficient, Fouling factor, Friction factor

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			Design of evaporators Evaluate different types Refrigerant driers strainers, Receivers, Accumulators, Low pressure receivers Deal with refrigerant pumps, cooling tower fans, Treat air conditioners, refrigerators, visi coolers, cold rooms
21	16MEE 213	ENERGY MANAGEMENT	Grasp the importance of energy auditing Estimate the requirement of any proposed industry Evaluate the projects and he can act as energy consultant Realize the importance of alternative energy techniques in the context of depletion of conventional energy resources Evaluation of projects: payback – annualized costs – investor’s rate of return – present worth – internal rate of return know importance of alternative energy sources
22	16MEE 214	CONVECTIVE HEAT TRANSFER	Select the mode of convection heat transfer rate and calculate heat transfer rate depending on the application Use this theory in advanced subjects like CFD and various software packages Calculate the heat transfer rate in conjugative system like porous media, Calculate the rate of heat transfer with the combination of conduction and convection in applications like heat exchangers Evaluate forced and free convection Analyze flow through the porous media
23	16MEE 215	THERMAL AND NUCLEAR POWER PLANTS	Analyze on combustion of coal and find performance of different power plant cycles. Analyze various steam generators, cooling towers, turbines & condensers. Analysis on combined cycle, power

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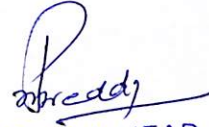
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			plants and waste heat recovery systems.
			Design various types of nuclear reactors taking safety precautions and making economically beneficial.
			Calculate the energy rates of power distribution considering the factors affecting the economy.
			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.
24	16MEC 2062	THERMAL SYSTEMS LABORATORY (Lab-1)	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
			Calculate heat of condensation and vaporization pipe
			Estimate the efficiency of solar collector
			Find out properties of fluids such as coefficient of thermal expansion, enthalpy of fusion
25	16MEC 207	COMPUTATIONAL FLUID DYNAMICS LABORATORY (Lab-II)	Analyze laminar flow problems in plates and pipes
			Solve steady and unsteady flows
			Perform analysis free and forced convection
			Evaluate thermal flow in hot and cold fluid
			Simulate NACA aero foil blades
			Analyze problems related to combustion
26	16MEC210	MINI PROJECT	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 and write the documentation in standard

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