



Estd. 2004

## Lakshmi Narain College of Technology, Indore

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### **Branch: B. Tech (Mechanical Engineering)**

#### **Programme Educational Objectives (PEOs)**

- 1) To prepare mechanical engineering graduates with an outstanding knowledge of mathematical, scientific, engineering, technology, management, humanities and various other interdisciplinary subjects for a successful career.
- 2) To equip students with modern tools, technology and advanced software's for deliberating engineering solutions.
- 3) To equip students with broad based knowledge to support the service industries, economic development and to address social and engineering challenges of the nation.
- 4) To inculcate students with leadership skills with high level of integrity and ethical values for team building and team work

#### **Programme Outcomes (POs)**

- 1) Apply mathematics, science, engineering fundamentals and an engineering specialization to the conceptualization of engineering models
- 2) Identify, formulate, research literature and solve complex engineering problems reaching substantiated conclusions using first principles of mathematics and engineering sciences
- 3) Design solutions for complex engineering problems and design systems, components or processes that meet specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations
- 4) Conduct investigations of complex problems including design of experiments, analysis and interpretation of data, and synthesis of information to provide valid conclusions
- 5) Create, select and apply appropriate techniques, resources, and modern engineering tools, including prediction and modeling, to complex engineering activities, with an understanding of the limitations.

- 6) Function effectively as an individual, and as a member or leader in diverse teams and in multi-disciplinary settings
- 7) Communicate effectively on complex engineering activities with the engineering community and with 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.
- 8) Demonstrate understanding of the societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to engineering practice
- 9) Understand and commit to professional ethics and responsibilities and norms of engineering practice
- 10) Understand the impact of engineering solutions in a societal context and demonstrate knowledge of and need for sustainable development
- 11) Demonstrate a knowledge and understanding of management and business practices, such as risk and change management, and understand their limitations
- 12) Recognize the need for, and have the ability to engage in independent and life-long learning
- 13) Demonstrate a knowledge and understanding of contemporary technologies, their applications and limitations, contemporary research in the broader context of relevant fields.
- 14) Demonstrate the ability to succeed in national and international competitive events in the relevant fields.

<b>Course Outcomes (Cos)</b>	
NAME OF SUBJECT: Mathematics	
SUBJECT CODE: BT 301	
Students will be able to	
CO 1	Demonstrate familiarity with emerging mathematical techniques appropriate in industries and other institutions.
CO 2	To develop logical understanding of the subject. from Engineering fields make aware students about the importance and symbiosis between Mathematics and Engineering.
CO 3	The connections between the mathematical series and other scientific and humoristic disciplines.
CO 4	The principles of mathematical reasoning and their use in understanding analyzing and developing formal arguments.
CO 5	To develop mathematical skill so that students are able to apply mathematical methods & principals in solving problem

NAME OF SUBJECT: Thermodynamics	
SUBJECT CODE: ME302	
Students will be able to	
CO 1	Use thermodynamic terminology correctly
CO 2	Explain fundamental thermodynamic properties.
CO 3	Derive and discuss the first and second laws of thermodynamics..
CO 4	Solve problems using the properties and relationships of thermodynamic fluids.
CO 5	Analyze basic thermodynamic cycles.

NAME OF SUBJECT: Materials Technology	
SUBJECT CODE: ME 303	
Students will be able to	
CO 1	Do materials selection for specific applications,
CO 2	Describe microstructures and corresponding properties for selected materials,
CO 3	Solve basic engineering problems related to materials selection and components
CO 4	Acknowledge the importance of surface modification and study the different surface modification methods.
CO 5	Perceive the basics of Powder metallurgy and application of powder metallurgy
CO 6	Select proper metal, alloys, nonmetal and powder metallurgical component for specific application requirement.

NAME OF SUBJECT: Strength of Material	
SUBJECT CODE: ME 304	
Students will be able to	
CO 1	Predict mechanical behavior of the member by determining the stresses, strains and deflections produced by the load up to the elastic limit.
CO 2	Solve the stresses in determinate and indeterminate, homogeneous and composite bar under concentrated loads, self weight and thermal loads.
CO 3	Construct Shear Force and Bending Moment diagrams for statically determinate beam due to concentrated load, uniformly distributed load, uniformly varying load and couple.
CO 4	Determine bending and shear stresses in machine elements
CO 5	Evaluate Slope and Deflection of Statically Determinate beams subjected to concentrated load, uniformly distributed load, uniformly varying load and couple and also strain energy in member subjected to Gradual, sudden and impact loads
CO 6	Estimate stresses, strain and deformations in indeterminate shafts of solid and hollow, homogeneous and composite circular cross-section subjected to twisting moment also critical load of columns under various end conditions.
CO 7	Design the components subjected to various loadings with the help of various theories of failures.
CO 8	Design component to meet desired needs with in realistic constraints of health and safety.

NAME OF SUBJECT: Manufacturing Process	
SUBJECT CODE: ME 305	
Students will be able to	
CO 1	Select appropriate Manufacturing Processing to manufacture any component.
CO 2	Interpret foundry practices like pattern making, mold making Core making and Inspection of defects.
CO 3	Classify different plastic molding processes, Extrusion of Plastic and Thermoforming.
CO 4	Select appropriate Joining Processes to join Work piece.

CO 5	Design different sheet metal working processes.
CO 6	Demonstrate operation such as Turning, Facing, Threading, Knurling and Grooving on Centre Lathe.
CO 7	Implement the Knowledge of Gained Subject in Industry.

NAME OF SUBJECT: Thermal Engineering Lab	
SUBJECT CODE: ME 306	
Students will be able to	
CO 1	Estimation of uncertainty in experiments and the so obtained results.
CO 2	Exposure to inverse heat conduction technique.
CO 3	Identify the various fuel characterizations through experimental testing.
CO 4	Analyze the performance characteristics of an internal combustion engines
CO 5	Analyze the air compressor characteristics

NAME OF SUBJECT: Energy & Environmental Engineering	
SUBJECT CODE: ES 401	
Students will be able to	
CO 1	Estimate the population - economic growth, energy requirement and demand.
CO 2	Identify environmental problems arising due to engineering and technological activities and the science behind those problem.
CO 3	Analyze material balance for different environmental systems.
CO 4	Realize the importance of ecosystem and biodiversity for maintaining ecological balance.
CO 5	Identify the major pollutants and abatement devices for environmental management and sustainable development.

NAME OF SUBJECT: Instrumentation & Control	
SUBJECT CODE: ME 402	
Students will be able to	
CO 1	Define and explain various fundamentals of spectroscopy, qualitative and quantitative analysis.
CO 2	Discuss the terms, principle, instrumentation, operation and applications of Molecular spectroscopic techniques.
CO 3	Differentiate between principle, instrumentation and operation of Atomic absorption and emission Spectroscopy.
CO 4	Explain the various Separation techniques and its instrumentation.
CO 5	Describe the principle and working of various Radiation detectors.
CO 6	Discuss the principle and working of various Gas analyzers.
CO 7	Handle different types of controller like electronic, pneumatic and hydraulic.
CO 8	Understand batch process with an example.

NAME OF SUBJECT: Theory of Machines
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SUBJECT CODE: ME 403	
Students will be able to	
CO 1	Theory of Machines study of velocity, acceleration and force analysis of different mechanisms, power transmitting elements.
CO 2	Conversant with commonly used mechanism for industrial application.
CO 3	The students will get competency in drawing velocity and acceleration diagram for simple and complex mechanism.
CO 4	Students will get analytical competency in solving kinematic problems using complex algebra method.
CO 5	The students will get competency in graphical and analytical method for solving problems.

NAME OF SUBJECT: Fluid Mechanics	
SUBJECT CODE: ME 404	
Students will be able to	
CO 1	Describe the physical properties of a fluid.
CO 2	Calculate the pressure distribution for incompressible fluids.
CO 3	Calculate the hydrostatic pressure and force on plane and curved surfaces.
CO 4	Demonstrate the application point of hydrostatic forces on plane and curved surfaces.
CO 5	Describe the motion of fluids..
CO 6	Identify derivation of basic equations of fluid mechanics and apply
CO 7	Make dimensional analysis and similitude.
CO 8	Apply the similitude concept and set up the relation between a model and a prototype.

NAME OF SUBJECT: Manufacturing Technology	
SUBJECT CODE: ME 405	
Students will be able to	
CO 1	Choose machining processing to manufacture any component
CO 2	Estimate machining time for milling and drilling process.
CO 3	Understand finishing processes
CO 4	Calculate forces during orthogo0l metal cutting.
CO 5	Explain principle and applications of advanced machining processes
CO 6	Develop part program for turning.
CO 7	Design jig Sand fixture for given component
CO 8	Implement the knowledge of machining processes in Manufacturing Industries.

NAME OF SUBJECT: Software Lab.	
SUBJECT CODE: ME 406	
Students will be able to	
CO 1	Simulate simple problems in vibrations and simple mechanisms using simulation software.

CO 2	Perform analysis of stress, truss/beam and dynamic analysis of mechanical members.
CO 3	Perform two dimensional stress analysis in plate and asymmetric shells
CO 4	Analyze the temperature distribution in one dimensional heat transfer problems (walls and fins)

NAME OF SUBJECT: I C Engines	
SUBJECT CODE: ME 501	
Students will be able to	
CO1	Classify various types of Engines, to compare Air standard, Fuel Air and Actual cycles Also make out various losses in real cycles.
CO2	Understand Theory of Carburetion, Types of carburetors, Modern Carburetor.
CO3	To understand the main theory behind Internal Combustion Engine along with the understanding of all the components and systems used in the automotive systems and carry out the performance and emission in IC Engines. To understand Stages of Combustion in S. I. Engines and Theory of Detonation, Pre-ignition and factors affecting detonation.

NAME OF SUBJECT: Mechanical Vibration	
SUBJECT CODE: ME 502	
Students will be able to	
CO1	Study of vibration. Basically in this subject students will undergone through, the causes of vibration in the machines. And how to control it. Also they are come to know analytical relationships and using this relationships, students will able to analyze the dynamic conditions of the machine and its components. In addition to this students can able to know, the noise measurement of machine and its components.
CO2	Determine the unbalance in rotating & reciprocating machines and to determine the correction required.
CO3	Understand the concept of Single DOF free and force vibrations to various system.
CO4	Model and analyze simple, two degrees of freedom vibration systems.
CO5	Measure the vibration using methods

NAME OF SUBJECT: Dynamics of Machine	
SUBJECT CODE: ME 503 (B)	
Students will be able to	
CO1	Apply knowledge in the field of automobile, aerospace and oval industries, where mechanisms and moving members force and kinematic analysis and power transmitting elements play vital role.
CO2	Understand working principles of various types of brakes, clutches and dynamometers.
CO3	Get competency in conducting laboratory experiments for finding moment of inertia of rigid bodies, verification of displacement relation for Hooke's joints, to measure power transmitted and absorbed by dynamometer and brakes respectively.
CO4	Get competency in graphical and analytical method for solving problems in static and dynamic force analysis.
CO5	Get analytical competency in solving kinematic problems using complex algebra method

NAME OF SUBJECT: Industrial Engineering & Ergonomics	
SUBJECT CODE: ME 504 (A)	
Students will be able to	
CO1	Apply industrial engineering concept in industrial environment.
CO2	Understand different concepts regarding Organization and Productivity in industries.
CO3	Manage and implement different concepts involved in work and method study and understanding of work contents in different situations.
CO4	Undertake small case study based project works regarding work measurement and time study.

NAME OF SUBJECT: Thermal Engineering and Gas Dynamics	
SUBJECT CODE: ME 601	
Students will be able to	
CO1	understand Stoichiometric air required for combustion, performance of steam generators and natural draught requirements in boiler plants
CO2	Examine the condition of steam and performance of vapour power cycle
CO3	Explain the basic principles and applications of the thermodynamics to the various real life systems.
CO4	Overall applications of the laws of nature which governs the energy and work transformations, equilibrium and entropy to the various engineering devices.

NAME OF SUBJECT: Machine Component Design	
SUBJECT CODE: ME 602	
Students will be able to	
CO1	Select standard items and preferred numbers for designing simple machine elements
CO2	Calculate resisting area of simple machine element subjected to direct independent stress
CO3	state modulus of various sections subjected to pure bending like levers, beams and axles
CO4	Calculate numerical on the design procedure of machine elements subjected to twisting moment.

NAME OF SUBJECT: Turbo Machinery	
SUBJECT CODE: ME 603 A	
Students will be able to	
CO1	To understand the concept of conversion of available energy in to useful form.
CO2	To understand the concept of Turbo Machines and to study turbines for utilizes kinetic water energy.
CO3	learn types and applications of Reaction Water Turbine.
CO4	To learn the types, applications and classification of Steam Turbines.
CO5	To understand the concept of power absorbing devices and detail understanding of Centrifugal Pump. (Incompressible Fluids)

NAME OF SUBJECT: Renewable Energy Technology	
SUBJECT CODE: ME 604 C	
Students will be able to	
CO1	Describe the environmental aspects of non-conventional energy resources. In Comparison with various conventional energy systems, their prospects and limitations

CO2	Compare Solar, Wind and bio energy systems, their prospects, Advantages and limitations
CO3	Acquire the knowledge of fuel cells, wave power, tidal power and geothermal principles and applications
CO4	Understand the concept of Biomass energy resources and their classification, types of biogas Plant.

NAME OF SUBJECT: Heat and Mass Transfer	
SUBJECT CODE: ME701	
Students will be able to	
CO1	Analyze steady & unsteady heat transfer in composite systems with & without heat generation and extended surfaces.
CO2	Calculate free and forced convection heat transfer in external and internal flows.
CO3	Describe film wise & drop wise condensation, pool & flow boiling and analyze heat exchanger using LMTD and NTU approaches.
CO4	Analyze radiation heat transfer between surfaces using shape factor algebra.
CO5	Analyze diffusion and convective mass transfer occurring in different applications.

NAME OF SUBJECT: I C Engines and Alternate Fuels	
SUBJECT CODE: ME 702(C)	
Students will be able to	
CO1	Explain the various subsystems of coal power plant and calculate the efficiency of Rankine cycle.
CO2	Discuss the merits & demerits of combined power plants and calculate the efficiency of gas power cycles.
CO3	Differentiate pressurized water reactor & boiling water reactor and explain the various waste disposal system in nuclear power plant.
CO4	Explain the working principle of various renewable energy power plants.
CO5	Explain the different tariff procedures for energy consumption and differentiate fixed and operating costs involved in power production.

NAME OF SUBJECT: Operations Research & Supply Chain	
SUBJECT CODE: ME 703 (A)	
Students will be able to	
CO1	Identify and formulate LP problems using various methods for maximization and minimization problems.
CO2	Apply mathematical techniques in different application areas of operations research like transportation and network models.
CO3	Formulate mathematical models for quantitative analysis of Inventory control practice in industry.
CO4	Calculate the queue length and waiting time for queuing models to make business decisions in operational research.
CO5	Apply mathematical techniques to solve decision models using search technique and dynamic programming method.



NAME OF SUBJECT: CAD/CAM/CIM LAB	
SUBJECT CODE: ME 704	
Students will be able to	
CO1	Create 2D and 3D models using modeling software.
CO2	Understand the CNC control in modern manufacturing system.
CO3	Prepare CNC part programming and perform manufacturing.
CO4	Create the CL Data and Post process generation using CAM packages.
CO5	Apply CAPP in Machining and Turning Centre.

NAME OF SUBJECT: Mat lab& R Programming	
SUBJECT CODE: ME 705	
Students will be able to	
CO1	Understand the Features of MATLAB as a programming tool. They are fully familiar to all the features of MATLAB software and easily handle the software.
CO2	Understand the basics in R programming in terms of constructs, control statements, string functions.
CO3	Understand the use of R for Big Data analytics.
CO4	Learn to apply R programming for Text processing.
CO5	Able to appreciate and apply the R programming from a statistical perspective.

NAME OF SUBJECT: Minor Project	
SUBJECT CODE: ME 706	
Students will be able to	
CO1	Develop the ability to solve a specific problem right from its identification and Literature review till the successful solution of the same.

NAME OF SUBJECT: Refrigeration and Air Conditioning	
SUBJECT CODE: ME801	
Students will be able to	
CO1	Illustrate the fundamental principles and applications of refrigeration and air conditioning system.
CO2	Obtain cooling capacity and coefficient of performance by conducting test on vapor compression refrigeration systems.
CO3	Present the properties, applications and environmental issues of different refrigerants.
CO4	Calculate cooling load for air conditioning systems used for various.
CO5	Operate and analyze the refrigeration and air conditioning systems.

NAME OF SUBJECT: Automobile Engineering	
SUBJECT CODE: ME 802(A)	
Students will be able to	
CO1	Explain the various types of chassis, frame and functions of IC engine parts.
CO2	Describe the engine auxiliary system used in SI and CI engine.
CO3	Distinguish between the manual transmissions systems with automatic transmission systems.
CO4	Demonstrate how the steering, brakes and the suspension system operate.

NAME OF SUBJECT: Energy Conservation Management & Audit	
SUBJECT CODE: ME 803(B)	
Students will be able to	
CO1	Identify the demand supply gap of energy in Indian scenario.
CO2	Carry out energy audit of an industry/Organization.
CO3	Draw the energy flow diagram of an industry and identify the energy wasted or a waste stream.
CO4	Select appropriate energy conservation method to reduce the wastage of energy.
CO5	Evaluate the techno economic feasibility of the energy conservation technique adopted.

NAME OF SUBJECT: Simulation and Modeling Lab	
SUBJECT CODE: ME 804	
Students will be able to	
CO1	Simulate simple problems in vibrations and simple mechanisms using simulation software.
CO2	Perform analysis of stress, truss/beam and dynamic analysis of mechanical members.
CO3	Perform two dimensional stress analysis in plate and asymmetric shells.
CO4	Analyze the temperature distribution in one dimensional heat transfer problems (walls and fins).
CO5	Analyze the temperature distribution in two dimensional heat transfer problems (plates and shell).

NAME OF SUBJECT: Major Project	
SUBJECT CODE: ME 805	
Students will be able to	
CO1	Develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.



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### **Branch: M. Tech (Thermal Engineering)**

#### **Programme Educational Objectives (PEOs)**

1. To enhance the foundation and the knowledge-base of students in thermal science and to make them capable for effectively analyzing and solving the problems associated in this field.
2. To deliver comprehensive education in Thermal Engineering to ensure that the students have core competency to be successful in industry or research laboratory and motivate them to pursue higher studies and research in interrelated areas.
3. To encourage the students to take up real life and/or research related problems and to create innovative solutions of these problems through comprehensive analysis and designing.
4. To inculcate a sense of ethics, professionalism and effective communication skills amongst graduates for their successful careers.
5. To provide an academic environment that gives adequate opportunity to the students to cultivate lifelong skills needed for their successful professional career.”

#### **Programme Outcomes (POs)**

1. Apply Graduates will demonstrate sound domain knowledge on wider perspective to become successful professionals.
2. Graduates will demonstrate an ability to identify, formulate and solve thermal engineering problems.
3. Graduates will demonstrate an ability to conceptualise designs of thermal system or component and evaluate them to select optimal feasible solution considering safety, environment and other realistic constraints.
4. Graduates will demonstrate skill of good researcher to work on a problem, starting from scratch, to research into literatures, methodologies, techniques, tools, and conduct experiments and interpret data.
5. Graduates will demonstrate research skills to critically analyse complex thermal engineering problem for synthesizing new and existing information for their solutions.
6. Graduates will demonstrate skills to use modern engineering tools, software and equipment to analyze and solve complex engineering problems.

7. Graduates will exhibit the traits of professional integrity and ethics and demonstrate the responsibility to implement the research outcome for sustainable development of the society.	
8. Graduates will be able to communicate effectively to comprehend and write effective reports following engineering standards.	
9. Graduates will demonstrate skills of presenting their work unequivocally before scientific community, and give and take clear instructions.	
10. Graduate will demonstrate traits of manager in handling engineering projects and related finance, and coordinate workforce towards achieving their goals.	
11. Graduates will exhibit the traits of good academician and engage in independent and reflective lifelong learning.	
12. Graduates will demonstrate an ability to work on laboratory and multidisciplinary tasks.”	
<b>Course Outcomes (Cos)</b>	
NAME OF SUBJECT: Advanced Mathematics	
SUBJECT CODE: MMTP101	
Students will be able to	
CO1 :	Understand fundamental concepts of a special topic in computational mathematics and its role in modern mathematics and applied contexts.
CO2 :	Demonstrate accurate and efficient use of specific computational mathematics techniques.
CO3 :	Demonstrate capacity for mathematical reasoning through analyzing, proving and explaining concepts from computational mathematics.

NAME OF SUBJECT: Thermodynamics and Combustion	
SUBJECT CODE: MMTP 102	
Students will be able to	
CO1 :	Understand the concepts of combustion phenomena in energy conversion devices.
CO2 :	Apply the knowledge of adiabatic flame temperature in the design of combustion devices.
CO3 :	Identify the phenomenon of flame stabilization in laminar and turbulent flames.
CO4 :	Analyze the implementation limits with regard to performance, emission and materials compatibility
CO5 :	Identify and understand possible harmful emissions and the legislation standards

NAME OF SUBJECT: Heat and Mass Transfer	
SUBJECT CODE: MMTP 103	
Students will be able to	
CO1 :	Understand physics and mathematical treatment of heat and mass transfer
CO2 :	Apply the principles of heat transfer in the analysis of steady and transient conduction problems
CO3 :	Analyze free and forced convection problems involving complex geometries.
CO4 :	Apply the concepts of radiation heat transfer for enclosure analysis.
CO5 :	Design heat transfer equipment using LMTD and NTU methods

NAME OF SUBJECT: Advanced Fluid Mechanics	
SUBJECT CODE: MMTP 104	
Students will be able to	
CO1 :	Understand the fundamental equations of fluid mechanics
CO2 :	Apply the concepts of fluid mechanics in the analysis of flow problems
CO3 :	Analyze the performance of fluid flow devices in laminar and turbulent flows
CO4 :	Design of turbomachines and R&AC ducts using the principles of compressible flow

NAME OF SUBJECT: I C Engines and Alternate Fuels	
SUBJECT CODE: MMTP 105	
Students will be able to	
CO1 :	Categorize, interpret and understand the essential properties of fuels for IC engines
CO2 :	Identify the need for alternate fuels and characterize prospective alternate fuels
CO3 :	evaluate the storage and dispensing facility requirements
CO4 :	Analyze the implement limitations with regard to performance, emission and materials compatibility

NAME OF SUBJECT: Thermal Power Plant Engineering	
SUBJECT CODE:MMTP 201	
Students will be able to	
CO1 :	Apply the principles of thermodynamics to analyse the performance of steam, gas, combined and modern power plants
CO2 :	Design and develop power plant components for optimum performance
CO3 :	Select appropriate site and technology for hydroelectric, and nuclear power plants
CO4 :	Evaluate economic and environmental implications on power plants.

NAME OF SUBJECT: Design of Heat Exchanger	
SUBJECT CODE: MMTP 202	
Students will be able to	
CO1 :	Understand the physics and the mathematical treatment of typical heat exchangers
CO2 :	Apply LMTD and Effectiveness - NTU methods in the design of heat exchangers
CO3 :	Design and analyze the shell and tube heat exchanger.
CO4 :	Apply the principles of boiling and condensation in the design of boilers and condensers
CO5 :	Design cooling towers from the principles of psychrometry

NAME OF SUBJECT: Advanced Refrigeration Systems	
SUBJECT CODE: MMTP 203	
Students will be able to	
CO1 :	Apply thermodynamic principles to analyze refrigeration systems
CO2 :	Analyze vapour absorption refrigeration system making use of principles of thermodynamics
CO3 :	Evaluate conventional and alternate refrigerants and their impact on environment.
CO4 :	Evaluate the complete refrigeration system by balancing different system components.

NAME OF SUBJECT: Steam and Gas Turbines	
SUBJECT CODE: MMTP 204	
Students will be able to	
CO1 :	Understand the ideal and real thermodynamic cycles of air-breathing engines and industrial gas turbines
CO2 :	Design the blading, study the velocity triangles and estimate the performance of centrifugal and axial flow compressors
CO3 :	Understand the combustion process and design the combustion chamber of a gas turbine
CO4 :	Design the blading, study the velocity triangles and estimate the performance of axial and radial in-flow turbines
CO5 :	Analyse the off-design performance and matching of the components of a gas turbine

NAME OF SUBJECT: Maintenance of Thermal Power Plant	
SUBJECT CODE: MMTP 205	
Students will be able to	
CO1 :	Understand the concepts of ERP and managing risks.
CO2 :	Choose the technologies needed for ERP implementation.
CO3 :	Develop the implementation process.
CO4 :	Analyze the role of Consultants, Vendors and Employees.
CO5 :	Evaluate the role of PLM, SCM and CRM in ERP.

NAME OF SUBJECT: Engine System Modeling and Analysis	
SUBJECT CODE: MMTP 301	
Students will be able to	
CO1 :	Perform economic analysis of a thermal system.
CO2 :	Design turbomachines and heat exchangers
CO3 :	Use numerical techniques to solve thermal system models
CO4 :	Apply optimization procedures to design thermal systems
CO5 :	Formulate problems in fluid flow and heat transfer.
CO6 :	Develop codes for numerical methods to solve 1D and 2D heat conduction and convection problems.
CO7 :	Use commercial software ANSYS for solving real life engineering problems.

NAME OF SUBJECT: Non Conventional Energy Sources	
SUBJECT CODE: MMTP 302	
Students will be able to	
CO1 :	Identify the renewable energy sources and their utilization
CO2 :	Understand the basic concepts of the solar radiation and analyze the solar thermal system for their utilization
CO3 :	Understand the principle of working of solar cells and their modern manufacturing techniques
CO4 :	Understand the concepts of the wind energy conversion systems and their applications
CO5 :	Outline the methods of energy storage and identify the appropriate methods of energy storage for specific applications

NAME OF SUBJECT: Seminar	
SUBJECT CODE: MMTP 303	
Students will be able to	
CO1 :	Identify and compare technical and practical issues related to Thermal Engineering
CO2 :	Outline annotated bibliography of research demonstrating scholarly skills.
CO3 :	Prepare a well-organized report employing elements of technical writing and critical thinking
CO4 :	Demonstrate the ability to describe, interpret and analyze technical issues and develop competence in presenting.

NAME OF SUBJECT: Dissertation Part- I	
SUBJECT CODE: MMTP 304	
Students will be able to	
CO1 :	Identify a topic in advanced areas of Thermal Engineering
CO2 :	Review literature to identify gaps and define objectives & scope of the work
CO3 :	Employ the ideas from literature and develop research methodology
CO4 :	Develop a model, experimental set-up and / or computational techniques necessary to meet the objectives.



NAME OF SUBJECT: Dissertation Part- II

SUBJECT CODE: MMTP 401

Students will be able to

CO1 :	Identify the materials and methods for carrying out experiments/develop a code
CO2 :	Execute the research methodology with a concern for society, environment and ethics
CO3 :	Analyse, discuss and justify the results/trends and draw valid conclusions
CO4 :	Prepare the report as per recommended format and present the work orally adhering to stipulated time
CO5 :	Explore the possibility to publish/present a paper in peer reviewed journals/conference without plagiarism