- **Department Name: Mechanical Engineering Department**

- **PG Program Name: M.Tech. Mech. Heat Power Engineering**

- **Vision :-**

  To transform the department into center of excellence by synergizing teaching, learning and research to produce globally competent, innovative and entrepreneurial Mechanical Engineers.

- **Mission** :-

  i. To develop state of the art facilities to stimulate faculty, staff and students to create, analyze, apply and disseminate knowledge.
  ii. To build the competency to transform students into globally competent mechanical engineers by imparting quality education.
  iii. To collaborate with research organizations, reputed educational institutions, industries and alumni for excellence in teaching, research and consultancy practices.

Sr. No.	Program Outcomes
1.	An ability to independently carry out research /investigation and development work to solve practical problems
2.	An ability to write and present a substantial technical report/document
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
4.	To accomplish collaborative and multi-disciplinary scientific research with consideration of professional, legal, and ethical issues
5.	Manage the projects and its financial aspects on the strength of engineering knowledge and management principles
6.	Engage in lifelong learning to address contemporary issues through independent and reflective learning

Sr. No.	Semester	Course Code	Course Name	Course Outcome
1	I	SHP513	Advanced Mathematical Methods in Engineering	CO_1 Evaluate Fourier Series and Fourier Transforms for given function and apply it to solve the partial differential equations in Engineering problems. CO-2 Apply the specific method of solution of partial differential equations for solving the given problems. CO-3 Formulate and solve a boundary value problem (Partial differential equation, boundary and initial

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				conditions). CO-4 Use the relevant method for solving the simultaneous linear equations and compute the Eigen values. CO-5 Estimate numerically the solution of given algebraic equation. CO-6 Analyze the variance and explain the different research designs.
2	I	**MHP1012**	**Advanced Thermodynamics and Combustion**	**CO_1.** Illustrate different thermodynamic relations. **CO_2.** Explain different behavior of thermodynamics gases and their relations. **CO_3.** Interpret thermodynamics properties relations to various mixtures and solutions. **CO_4.** Compare thermodynamics equilibrium of system **CO_5.** Analyze combustion theories of various fuels. **CO_6.** Assess the combustion applications to various systems
3	I	MHP1022	**Advanced Heat Transfer**	1. Develop a solution to Heat Transfer problem. 2. Analyze heat transfer problem. 3. Solve Heat Transfer Problem **4.** Formulate Heat transfer problem by analytical and numerical method
4	I	**Program Elective I MHP 1032**	**Compressible and Incompressible flows**	1. Explain basic concepts in the fluid mechanics. 2. Analyze practical problems of fluid flow. 3. Explain concepts of boundary layer theory. 4. Understand the performance of fluid flow devices in laminar and Turbulent flows. 5. Apply the concepts in the analysis of fluid flow problems
5	I	**MHP1052**	**Design of Pumps, Compressor and Blower**	**CO_1.** Select suitable Pump, Blower, fan or compressor for a given application. **CO_2.** Design Pump, Blower, fan or compressor for a given application. **CO_3.** Model and simulate Pump, Blower, fan or compressor.

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6	I	**MHP1062**	**Advanced Refrigeration**	**CO_1.** Identify and explain different components of refrigeration. **CO_2.** Calculate cooling load of given system. **CO_3.** Select and design various equipment of refrigeration system. **CO_4.** Develop and suggest refrigeration plants for given conditions. **CO_5.** Apply the basic principles of low temperature engineering and applications
7	I	MHP1072	**Gas turbine and Jet Propulsion**	**CO_1.** Describe the ideal and real thermodynamic cycles of air-breathing engines and Industrial gas turbines. **CO_2.** Design the blading, study the velocity triangles and estimate the performance of centrifugal and axial flow compressors. **CO_3.** Explain the combustion process and design the combustion chamber of a gas turbine. **CO_4.** Design the blading, study the velocity triangles and estimate the performance of axial and radial in-flow turbines. **CO_5.** Analyze the off-design performance and matching of the components of a gas turbine.
8	I	**Program Elective II MHP1092**	**Advanced I C Engines**	**CO_1.** Analyze SI and CI engines fuel system and combustion process. **CO_2.** Summarize recent engine trends **CO_3.** Compare simulated and/or experimental performance and emissions of I C Engines with alternative fuels **CO_4.** Model engines flow and combustion process.
9	I	**MHP 1082**	Air Conditioning System Design	1. Determine cooling load on the system by considering various heat sources 2. Select suitable air distribution method, distribution outlet and inlet, and fan. 3. Design cooling and heating equipment, air handling system

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10	I	**MHP1102**	**Utilization of Solar Energy**	**CO_1.** Estimate and quantify available solar radiation **CO_2.** Judiciously design the solar energy collection system **CO_3.** Justify basic economics of solar energy systems
11	I	MHP1112	**Combustion Engineering**	**CO_1.** Calculate the stoichiometry, adiabatic flame temperature and heat of combustion of a fuel and oxidizer mixture **CO_2.** Use computer codes to solve combustion problems **CO_3.** Calculate the structure and properties of a premixed flame: propagation speed, thickness, quenching distance, and minimum ignition energy.
12	I	MHP1122	**Advanced Power Plants**	**CO_1.** Explain analytical and technological aspects of power plant design, systems and their effects. **CO_2.** Analyze and explain various power plants. **CO_3.** Summarize advanced power cycles. **CO_4.** Recognize environmental issues. **CO_5.** Estimate economics of power plants.
13	I	SHP551	**Technical Communication**	**1. Acquire skills required for good oral and written communication** **2.** Demonstrate improved writing and reading skills **3. Ensure the good quality of oral and written communication**
14	I	MHP1132	Modeling and Meshing Laboratory.	**CO_1.** Model the thermal component or part using suitable software **CO_2.** Create computational domain for selected geometry **CO_3.** Generate mesh and refine mesh elements of given geometry
15	I	**MHP1142**	**Thermal Engineering Lab-I**	**CO_1.** Conduct test and interpret the theoretical and experimental data of conduction and convection experiments. **CO_2.** Relate the theory and the experimentation pertaining to thermal system. **CO_3.** Examine various thermal systems
16	I	**MHP1152**	**Computational Methods in**	**CO_1.** Develop codes for numerical methods to tackle simple thermal

Sr. No.	Semester	Course Code	Course Name	Course Outcome
			Thermal Engineering Lab	problems **CO_2.** Simulate codes of computational methods of given conditions **CO_3.** Analyze and validate output of written codes with analytical solution
1	II	MHP2012	**Computational Fluid Dynamics**	**CO_1.** Derive governing equations for fluid dynamics and heat transfer. **CO_2.** Develop finite difference implicit & explicit algorithms for fluid flow and heat transfer problems. **CO_3.** Develop finite volume algorithms for fluid dynamics equations. **CO_4.** Select appropriate grid generation methods for CFD analysis. **CO_5.** Apply different CFD Techniques to various fluid flow problems
2	II	**MHP2022**	**Design of Thermal System**	**CO_1.** Illustrate basic principles of modeling and optimization of design of thermal systems. **CO_2.** Develop mathematical model of real processes and systems. **CO_3.** Design thermal systems. **CO_4.** Simulate thermal system.
3	II	MHP2032	**Design of Heat Exchanger**	**CO_1.** Select suitable heat exchanger for particular application. **CO_2.** Formulate basic design method for heat exchangers **CO_3.** Analyze fouling in heat exchangers. **CO_4.** Design heat exchangers
4	II	MHP2042	Cryogenics	**CO_1.** Apply the basic principles of low temperature engineering. **CO_2.** Explain the behavior of solids and liquid at low temperatures **CO_3.** Analyze cryogenic systems. **CO_4.** Discuss gas separation systems. **CO_5.** Design Heat Exchangers for Cryogenic System.
5	II	MHP2052	**Advanced Materials for Thermal System**	**CO_1.** Select suitable material for thermal systems **CO_2.** Justify use and suitability of thermal materials for different systems **CO_3.** Prepare advanced materials

Sr. No.	Semester	Course Code	Course Name	Course Outcome
				for different applications **CO_4.** Explain applications of thermal materials
6	II	MHP2062	**Food Processing, Preservation and Transport**	**CO_1.** Analyze mechanism of food spoilage **CO_2.** Design suitable food processing and preservation system **CO_3.** Select suitable cold storage system **CO_4.** Design and analysis transport system of preserved foods **CO_5.** Model the preservation system
7	II	**Program Elective-III MHP2072**	Advanced Thermal Storage Technilogy.	**CO_1.** Select thermal storage systems and the storage materials **CO_2.** Develop a model and analyze the thermal storage systems **CO_3.** Explain applications of thermal storage systems
8	II	**Program Elective-IV MHP2092**	**Finite Element Method for Thermal Engineering**	**CO_1.** Establish the mathematical models for the complex analysis problems and predict the nature of solution. **CO_2.** Formulate element characteristic matrices and vectors. **CO_3.** Identify the boundary conditions and their incorporation in to the FE equations **CO_4.** Solve the problems with simple geometries, with hand calculations involving the fundamental concepts. **CO_5.** Interpret the analysis results for the improvement or modification of the system
9	II	MHP2102	**Simulation of IC Engines**	**CO_1.** Conversant with Basic Concept of Modeling **CO_2.** Develop modeling of IC engines. **CO_3.** Simulate IC Engines processes and its new concepts cycles. **CO_4.** Analyze engine processes and performance using advanced simulation models.
10	II	MHP2112	**Cogeneration and waste heat Management**	**CO_1.** Estimate and quantify available waste heat **CO_2.** Tap opportunities of waste heat recovery **CO_3.** Explain economics of cogeneration and waste heat recovery systems

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11	II	**MHP2122**	**Steam Engineering**	**CO_1.** Explain different types of boilers with their constructional and functional significance. **CO_2.** Design fuel preparation units and boilers. **CO_3.** Analyze the emission aspects of boiler.
12	II	MHP2132	**Research Methodology & IPR**	**1.** Formulate a research problem. **2. Analyze research related information.** **3.** Prepare and present research proposal/paper by following research ethics. **4.** Make effective use of computers and computing tools to search information, analyze information and prepare report. **5.** Describe nature and processes involved in development of intellectual property rights
13	II	MHP2142	**Computational Fluid Dynamics Lab**	**CO_1.** Formulate problems in fluid flow and heat transfer. **CO_2.** Develop codes for numerical methods to solve heat transfer problems. **CO_3.** Use commercial software ANSYS for solving real life engineering problems
14	II	MHP2152	**Thermal Engineering Lab-II**	**CO_1.** Conduct test and interpret the theoretical and experimental data of conduction and convection experiments. **CO_2.** Relate the theory and the experimentation pertaining to thermal system. **CO_3.** Examine various thermal systems
15	II	MHP2162	**Comprehensive Viva-Voce**	**CO_1.** At the end of the course the students will be able to, **CO_2.** Comprehend the knowledge gained in the course work. **CO_3.** Defend principles of working of thermal energy systems. **CO_4.** Show the ability in problem solving and to communicate effectively
16	II	MHP2172	Mini Project	**CO_1.** Solve a live problem using software/analytical/computational tools **CO_2.** Write technical reports. **CO_3.** Develop skills to present and defend their work in front of technically qualified audience

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17	II	MHP2182	**Industry Internship**	.1 Identify the real applications and practices of courses studied, at industry level 2. Recognize various modeling , analysis and validation techniques adopted at industries. 3. Demonstrate the issues at design, manufacturing and assembly levels. 4. Summarize and present technical data in report format.
1	III	**MHP3012**	**Online courses**	
2	III	MHP3022	**Dissertation Phase I**	**CO_1.** Explain the contributions of various researchers in the field of thermal engineering after carrying out literature survey from reputed journals **CO_2.** Recognize the gap in the research and define a problem statement **CO_3.** Explain significance and applicability of problem statement **CO_4.** Summarize and present technical data in report format
3	III	**MHP3032&30342**	**Dissertation Phase II**	**CO_1.** Outline the work plan for problem statement **CO_2.** Identify the proper modeling and analysis tool **CO_3.** Reproduce the preliminary results of problem statement **CO_4.** Summarize and present technical data in report format
1	IV	MHP4012	Dissertation Phase III	**CO_1.** Explain the issues related to method adopted in solving the problem **CO_2.** Select proper technique in solving the problem **CO_3.** Compare the results with available literature.
2	IV	MHP4022 & 4032	**Dissertation Phase IV**	**CO_1.** Design new methodology to address the problem **CO_2.** Justify the results obtained from new methodology **CO_3.** Write technical report and defend work.