MEPC2002 ENGINEERING THERMODYNAMICS (3-0-0)

Course Objective:"The course aims to provide students with a comprehensive understanding of the principles of thermodynamics and their applications in engineering so that students will be able to analyze and solve problems related to energy conversion, heat transfer, and the properties of pure substances, preparing them for advanced studies and professional practice in mechanical engineering."

Module-I(06hrs)

Review of First and Second laws, First law analysis of steady andtransient flow control volumes, Entropy generation,Entropy balance for closed systems and steady flow systems.

Module-II(06hrs)

Available energy, Quality of energy,Availability for non-flow and flow process, Irreversibility, Exergy balance, Second law efficiency.

Module-III(06hrs)

Vapour Power Cycles: The carnot vapor cycle and its limitations, The Rankine cycle, Means of increasing the Rankine cycle efficiency, The reheat cycle, The regenerative feed heating cycle, Cogeneration (Back pressure and Pass-out turbines).

Module-IV(06hrs)

General Thermodynamic property relations: The Maxwell relations, The Clapeyron equation, The TdS relations, Isothermal compressibility and volume expansivity, The Joule-Thomson coefficient.

Gas Power Cycles: Air standard cycles- Otto, Diesel, Dual Combustion cycles, Simple Brayton cycle.

Module-V(06hrs)

Reciprocating Air Compressors: Introduction (Uses of compressed air), The reciprocating cycle neglecting and considering clearance volume, Volumetric efficiency and its effect on compressor performance, Limitations of single stage compression, Multistage compression and intercooling, Optimum intercooler pressure, Simple calculations on reciprocating compressors.

Course Outcomes:

Upon completion of the course, students will be able to:

CO1 Define the concepts of continuum, Thermodynamic systems, Thermodynamic properties, Thermodynamic equilibrium and evaluate properties of pure substance, Work and Heat.

CO2 Apply the First law of thermodynamics to analyze closed system and control volume.

CO3 Apply the Second Law of Thermodynamics to evaluate the performance of thermal power plant, refrigerator and heat pump and evaluate principle of increase of entropy.

CO4 Evaluate Availability, Irreversibility and the Second Law efficiency.

CO5 Analyze Air standard cycles.

Books:

- EngineeringThermodynamicsbyP.K.Nag,Publisher: TMH
- EngineeringThermodynamicsbyP.Chattopadhyay, OXFORD
- FundamentalsofThermodynamicsbySonntag,Borgnakke,VanWylen,JohnWiley&Sons
- ThermodynamicsAnEngineeringApproach byYunusA.CingelandMichaleA.Boles,TMH
- EngineeringThermodynamicsbyM.Achyuthan,PHI