ME 6205 Thermodynamics

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TIMETABLE

The module will be conducted through

- LECTURES & Tutorials

ASSESSMENT

- The course will be assessed by continuous assessment (CA) and End of semester examination
  - **CA Tests 40%**
  - **End of Semester Examination 60%**

  Total 100%

- **No printed or handwritten material will be allowed during tests or semester examination.**

Description of the Course Module

- **Code:** ME 6205
- **Name:** **Thermodynamics**
- **Number of Credits:** **6**

Sub Enabling Outcomes

1. **Fundamental Concepts**
2. **Laws of Perfect Gases**
3. **Thermodynamic Processes on Gases**
4. **Laws of Thermodynamics**
5. **Ideal and Real Gases**
6. **Air Standard Power Cycle**
7. **Properties of Steam**

1.Fundamental Concepts

•Thermodynamic state and system, boundary, surrounding, universe, Thermodynamic systems – closed, open, isolated, adiabatic, homogeneous and heterogeneous, macroscopic and microscopic, properties of system – intensive and extensive, thermodynamic equilibrium, quasi – static process, reversible and irreversible processes, definition of properties like pressure, volume, temperature, enthalpy, internal energy.

2. Laws of Perfect Gases

- Definition of gases, explanation of perfect gas laws – Boyle’s law, Charle’s law, Avagadro’s law, Universal gas constant, Characteristic gas constants, derivation Specific heat at constant pressure, specific heat at constant volume of gas, derivation of an expression for specific heats with characteristics, simple problems on gas equation

3. Thermodynamic Processes on Gases

- Types of thermodynamic processes – isochoric, isobaric, isothermal, hyperbolic, isentropic, polytropic and throttling processes, equations representing the Processes, Derivation of work done, change in internal energy, change in entropy, rate of heat transfer for the above processes

4. Laws of Thermodynamics

- Laws of conservation of energy, first law of thermodynamics (Joule's experiment), Application of first law of thermodynamics to non-flow systems –Constant volume, constant pressure, Adiabatic and polytropic processes, steady flow energy equation, Application of steady flow energy to equation, turbines, pump, boilers, compressors, nozzles, condenser, limitations. Heat source and heat sinks, statement of second laws of thermodynamics: Kelvin Planck's statement, Classius statement, equivalence of statements, Perpetual motion Machine of first kind, second kind, Carnot engine, Introduction of third law of thermodynamics, concept of irreversibility, entropy.

5. Ideal and Real Gases

- Concept of ideal gas, enthalpy and specific heat capacities of an ideal gas, P – V – T surface of an ideal gas, triple point, real gases

6. Air Standard Power Cycle

- Carnot cycle, air standard Otto cycle, diesel cycle, Joule cycle and Rankine cycle, comparison of air standard cycles with Carnot cycle.

7. Properties of Steam

- Formation of steam and related terms, thermodynamics properties of steam, steamtables, internal latent heat, internal energy of stream, entropy of water, entropy of steam, T- S diagrams), Hyperbolic, reversible adiabatic and throttling processes Quality of steam (dryness fraction), finding dryness fraction using separating and throttling calorimeter, Rankine cycle

REFERENCE

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④ Rogers and Mayhew, (1995) Thermodynamics and Transport Properties of Fluids, 5th Edition Basic Black well Publishers,

⑤ Mayhew and Rogers, (1992) Engineering Thermodynamics Work and Heat Transfer, 5th Edition, Longman Publishers, London

⑥ Wayne Smith (2013) Turbine Operator - Steam Plant Operations Book 2, LSA

⑦ Holman J. P., (1988) “Thermodynamics”, McGraw Hill.

⑧ Nag P. K., (1995) “Engineering Thermodynamics”, Tata McGraw Hill,

⑨ Pandya N. C & Shah C. S., 1986 “Elements of Heat Engines”, Charoter Pulishers,

⑩ Rajput R K, (2001) “Thermal Engineering”, Lakshmi Publications

⑪ Ballaney P L, (1986) “Thermal Engineering”, Khanna Publishers,