Course Type	Course Code	Name of Course	L	T	P	Credit
DSC 3	NMEC103	Thermodynamics	3	0	0	3

Course Objective

The course will give a brief overview of the basic concepts of Thermodynamics followed by applications of the Laws of Thermodynamics for understanding the different Thermodynamic cycles. The course will also focus on Air standard cycles, Steam power cycles, gas power cycles, and Refrigeration cycles.

Learning Outcomes

Upon successful completion of this course, students will:

- understand the basics and laws of Thermodynamics
- learn the different types of Steam generators, I C Engines, Steam Turbine and Gas Turbine
- be able to develop an in-depth understanding of Combustion of fuel

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	**Basic Thermodynamics:** Definition of Thermodynamics, thermodynamic system, open system, closed system and isolated system, surroundings, control volume, state point, properties, extensive and intensive properties, thermodynamic processes and cycles, thermodynamic equilibrium, Quasi-static process, concept of continuum.	6	Understanding the basics of Thermo-dynamics
2.	**Laws of Thermodynamics:** Zeroth law of thermodynamics and its significance, First law of thermodynamics for a closed system and open system, Internal energy and enthalpy, General expression of first law of thermodynamics. Second law of thermodynamics – statements, Clausius inequality, Carnot's theorem, Irreversibilities.	8	Understanding laws of thermodynamics and their applications
3.	**Entropy:** Definition, entropy principle for a process, Entropy transfer and entropy generation, entropy balance equations for closed and open systems, Available energy and irreversibility.	4	Learning the concept of entropy and its applications
4.	**Properties of a pure substance:** p-v, p-T, T-s and h-s diagrams, Dryness fraction, steam tables.	6	Learning properties and change of properties of pure substances
5.	**Air standard cycles:** Carnot cycle, Otto cycle, Diesel cycle, Dual cycles, Stirling and Ericsson cycles, and their comparison.	4	Learning cycles with air as the working fluid
6.	**Vapour Power Cycles:** Carnot cycle, Rankine cycle, Reheat and Regenerative cycles, work, power, efficiency	5	Learning cycles for steam power plant
7.	**Gas power cycles:** Open cycle and closed cycle gas turbine cycle, Effects of intercooling, reheating and regeneration.	4	Learning cycles for gas turbine power plant

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8.	**Refrigeration cycles:** Reversed Carnot cycle, Vapour compression refrigeration cycle, Vapour absorption refrigeration cycle.	5	Learning cycles used for refrigeration

Text Books

1. Fundamentals of Thermodynamics: Sonntag, B and Van Wylen, Wiley
2. Engineering Thermodynamics: P. K. Nag, McGraw Hill
3. Thermodynamics-An Engineering Approach: Y A Cengel and M A Boles, Mc-Graw Hill

Reference Books:

1. Fundamentals of Thermodynamics: Claus Borgnakke, Richard E. Sonntag, Wiley
2. Engineering Thermodynamics : C. P. Arora, Tata Mc Graw Hill