

SYLLABUS NR21 B.Tech. Mechanical Engg

SYLLABUS

THERMAL ENGINEERING 1

Course Code	Category	Hours/Week			Credits	Maximum Marks		
		L	T	P		CIA	SEE	TOTAL
ME2203PC	Core				4			
		3	1	0		30	70	100
Contact Classes: 48	Tutorial Classes: 16	Practical Classes: Nil			Total Classes:64			

Prerequisites: thermodynamics

ME2203PC: THERMAL ENGINEERING – I

Pre-requisite: Thermodynamics

Course Objective: To apply the laws of Thermodynamics to analyze air standard cycles and to understand and evaluate the perform analysis of the major components and systems of IC engines, refrigeration cycles and their applications.

Course Outcomes: At the end of the course, the student should be able to evaluate the performance of IC engines and compressors under the given operating conditions. Apply the laws of Thermodynamics to evaluate the performance of Refrigeration and air-conditioning cycles. Understand the functionality of the major components of the IC Engines and effects of operating conditions on their performance

UNIT – I

I.C. Engines: Classification - Working principles of Four & Two stroke engine, SI & CI engines, Valve and Port Timing Diagrams, Air – Standard, air-fuel and actual cycles - Engine systems –Carburetor and Fuel Injection Systems for SI engines, Fuel injection systems for CI engines, Ignition, Cooling and Lubrication system, Fuel properties and Combustion Stoichiometry.

UNIT – II

Normal Combustion and abnormal combustion in SI engines – Importance of flame speed and effect of engine variables – Abnormal combustion, pre-ignition and knocking in SI Engines – Fuel requirements and fuel rating, anti-knock additives – combustion chamber – requirements, types of SI engines. Four stages of combustion in CI engines – Delay period and its importance

Effect of engine variables– Diesel Knock– Need for air movement, suction, compression and Combustion induced turbulence in Diesel engine – open and divided combustion chambers and fuel

injection– Diesel fuel requirements and fuel rating

UNIT - III

Testing and Performance: Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power –Determination of frictional losses and indicated power – Performance test – Heat balance sheet and chart Classification of compressors – Fans, blowers and compressors – positive displacement and dynamic types – reciprocating and rotary types. Reciprocating Compressors: Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance volume, stagedcompression, under cooling, saving of work, minimum work condition for stagedcompre

UNIT – IV

Rotary Compressor (Positive displacement type): Roots Blower, vane sealed compressor, Lysol compressor – mechanical details and principle of working– efficiency considerations. Dynamic Compressors: Centrifugal compressors: Mechanical details and principle of operation – velocity and pressure variation. Energy transfer-impeller blade shape-losses, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams – power. Axial Flow Compressors: Mechanical details and principle of operation –velocity triangles and energy transfer per stage degree of reaction, work done factor - isentropic efficiency- pressure rise calculations – Polytrophic efficiency.

UNIT – V

Gas Turbines: Simple Gas Turbine Plant – Ideal Cycle – Closed Cycle and Open Cycle for Gas Turbines, Constant Pressure Cycle, Constant Volume Cycle, Efficiency – Work Ratio and OptimumPressure Ration for Simple Gas Turbine Cycle. Parameters of Performance, Actual Cycle, Regeneration, Intercooling and Reheating – Closed and Semi-Closed Cycle

TEXT BOOKS:

1. I.C. Engines / V. Ganesan / Mc Graw Hill
2. Thermal Engineering / Mahesh M Rathore / Mc Graw Hill

REFERENCE BOOKS:

1. Applied Thermodynamics for Engineering Technologists / Eastop / Pearson
2. Fundamentals of Classical Thermodynamics / Vanwylen G.J., Sonntag R.E. / Wiley Eastern
3. Internal Combustion Engines Fundamentals – John B. Heywood – McGrawHill Ed.