

4041 - POWER ENGINEERING - II ✓										
Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)					
Lectures	Practical	Credit			Theory		Practical Ex.	Total		
3	2	5	25	25	3 Hrs.	100	25 oral	175		
Pre-requisite		Source	Semester		Theory	Test	Total	TW	PR	Gr Total
4037		MEC			75	25	100	25	50	175

Rationale:- Steam power has a wide range of application like in thermal power plants, process industries like chemical, textile & sugar etc. Hence the study of components of thermal power plants like turbines, condensers etc are necessary. Also, internal combustion engines, have wider applications in power generation units, locomotives, automobile engine, rocket engines etc. and hence the exposure to IC engine is also necessary for diploma pass outs of mechanical engineering. The relevant topics covering basic principles, properties of steam, boilers & air compressors are already covered in power engineering -I

COURSE CONTENT	Hrs.	Mks
<b>1. STEAM NOZZLES</b>	4	8
Definition, Types of steam nozzles, Continuity equation Critical pressure ratio (No derivation of formulae) Calculation of area of cross section of throat and exit for maximum discharge.	10	20
<b>2. STEAM TURBINES</b>		
1. Principle of operation. 2. Classification of steam turbines. a) Impulse b) Reaction c) Impulse reaction 3. Compounding of steam turbines. 4 Velocity diagrams of simple impulse & reaction turbines. 5 Parson's reaction turbine. 6 Calculation of power & efficiency of turbines 7 Definition & concepts of: Stage efficiency, Diagram factor, and Diagram efficiency. 8 Methods of governing of steam turbine. Throttle governing, Nozzle control governing, By-pass governing. 9 Regenerative & reheat cycle (Only theoretical treatment), Erosion of Blades.	8	16
<b>3. STEAM CONDENSERS</b>		
1 Introduction, 2 Function of a condenser in a steam power plant, 3 Vacuum & its measurement. 4 Dalton's law of partial pressure. 5 Types of condensers. a) Surface condenser., b) Jet condenser. 6 Comparison of jet and surface condenser, 7 Concept of Vacuum efficiency, Condenser efficiency, Effect of air leakage on working of a condenser. Types and functions of cooling towers. a) Forced Air (b) Induced Air.	12	32
<b>4. INTERNAL COMBUSTION ENGINES</b>		
1. Introduction to IC engines 2. Classification of IC engines. 3. Study of engine components.. 4. 4 Comparison of SI & CI. engines 5. Air standard efficiencies of Otto cycle, Diesel cycle, Dual combustion /semi diesel cycle, 6. Construction and working of Petrol engine (two stroke & four stroke), Diesel engine ( two stroke & four stroke) 7. Valve timing diagrams for above engines. 8. Systems of I. C. engines: Fuel systems (Petrol & diesel engines), Cooling systems, Starting systems, d) Ignition system. e) Lubrication system.		

9. Methods of governing of IC engines.
- 10 Calculations of MEP, IP, BP, mechanical & thermal efficiencies. Fuel consumption /specific fuel consumption., Engine performance testing, Heat balance sheet
- 11 Super-charging and Turbo-charging.

**5. INTRODUCTION TO REFRIGERATION & AIR- CONDITIONING**

6 12

1. Refrigeration:- definitions and units & performance, Air refrigeration system. Carnot cycle & Bell Coleman cycle. Vapour compression refrigeration cycle.
2. Representation of cycle on T-s, & P-h diagrams (including superheating and sub-cooling). No numerical problems.
3. Vapour absorption refrigeration cycle:- Simple & actual vapour absorption refrigeration system, Refrigerants and their desirable properties, Applications of refrigeration :- Ice plant, Cold storage, Introduction to Air - conditioning definition.
4. Psychrometric properties of moist Air (No numerical problems), Psychrometric chart
5. Air conditioning processes: cooling, heating, humidification, dehumidification, & mixing of steam. Representation of processes on Psychrometric charts.
6. Cooling load estimation & sources of heat load (descriptive treatment only)

**6. GAS TURBINES**

8 12

- 1 Introduction, 2 Comparison of gas turbine and steam turbine. 3 Comparison of gas turbine and IC engine. 4 Classification of gas turbines. 5 Open-cycle gas turbine.
- 6 Closed cycle gas turbine. 7 Comparison of open cycle & closed cycle gas turbine.
8. Applications of gas turbines in: a) Power generation, b) Aircraft engines, (No numerical problems to be covered.)

Total	48	100
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**TERM WORK**

1. Study of steam turbines.
2. Study of steam condensers.
3. Study of two stroke & four stroke petrol engines.
4. Study of two stroke & four stroke diesel engines.
1. Dismantling & assembling of I. C. engines.
2. Study of different systems of I. C. engines (any two )
3. Trial on I.C engines with heat balance sheet.
4. Study of Ice plant.
5. Study of window A. C.
6. Study of a conventional power plant (any one type)

**REFERENCE BOOKS**

1. Elements of Heat engines Vol. II & III by Patel & Karamchadani
2. Heat engines - by Pandya & Shah.
3. Thermal engineering - by P. L. Ballaney.
4. A Text Book of Mechanical Technology (Thermal Engineering) - by R. S. Khurmi.
5. A course in internal combustion engines - by M. L. Mathur & R. P. Sharma
6. Internal combustion engines - by Ganeshan.
7. Refrigeration & Air - conditioning - by Domkundwar & Arora.
8. Refrigeration & Air - conditioning - by C. P. Arora.
9. Refrigeration & Air - conditioning - by M. Prasad.

