

4037 POWER ENGINEERING I									
Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)				
Lectures	Practical	Credits			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
Nil		MEC		75	25	100	25	-	125

RATIONALE: - Heat power is used in Industries to a large scale. Hence it is necessary to study thermal properties, processes, basic thermodynamic laws & heat engines concerned with generation of power. Energy & its conversion from one form to another is also important; hence study of different forms of energy & its conversion is essential. Diploma pass-outs working in thermal power plants or industries require the knowledge of steam generation along with working of prime movers and other auxiliary equipment.

COURSE CONTENTS	Hrs	Mks
1. UNITS & DIMENSIONS	2	0
1. Units of pressure, volume & temperature.		
2. Units of work, power, energy.		
2. SOURCES OF ENERGY:	2	6
1 Energy and its forms		
2 Brief description of different forms of energy. a) Fossil, b) Hydraulic, c) Wind, d) Solar, e) Geothermal, f) Bio-gas.		
3. FUELS & FUEL COMBUSTION:	4	8
1. Classification of fuels, 2. Calorific values of fuel. 3. Calculation of Air requirement, Air fuel ratio. 4. Bomb & Boy's gas calorimeter. Orsat apparatus for flue gas analysis. Volumetric & Gravimetric analysis. Conversion from volumetric to gravimetric and vice versa		
4. GAS LAWS & THERMODYNAMICS	8	18
1. Gas Laws- Boy's laws, Charles law, Gay-Lussac, law and Avogadro's law, Laws of Thermodynamics. Zeroth law of Thermodynamics. First law of Thermodynamics; Second law of Thermodynamics; Characteristic gas equation		
2. Universal gas constant, Specific heat, internal energy., Thermodynamic processes		
3. Representation of processes on P-V and T-S diagram, Calculation of work done, heat transferred, change in internal energy, P,V,T, relationship.		
5. PROPERTIES OF STEAM	4	14
Formation of steam, Sensible heat, Latent heat., Enthalpy, Internal energy, Dryness fraction or quality of steam. Steam calorimeter, Study of steam tables, use of steam tables.		
6. VAPOUR PROCESSES	6	12
1. Definition of Entropy, .2. Entropy of water and steam, 3 Temp-entropy and enthalpy-entropy chart (Mollier diagram) .4 Vapour cycles. 5. Carnot cycle. 6. Rankine cycle. c) Modified Rankine cycle. Calculation of work done & efficiency of the above cycle		
7. BOILERS, MOUNTINGS & ACCESSORIES	12	24
1. Principles of Steam Generation, 2. Classification of Boilers. 3. Study of medium pressure Boilers (construction, working & application): a) Cochran Boiler, b) Babcock & Wilcox Boiler, c) Lancashire Boiler, d) Locomotive Boiler.		
4. Study of high pressure Boilers (construction, working and application) a) La Mont Boiler, b) Loeffler Boiler, c) Velox-Boiler, d) Benson Boiler, e) Marcet Boiler.		
5 Study of Boiler draughts, classification of draughts.		
6. Study of Boiler mountings (construction & working): a) Safety valves, b) water level Indicator, c) Pressure gauge, d) Feed check valve, e) Blow off Cock, f) Fusible plug, g) Steam stop valve.		
7. Study of Boiler Accessories (construction and working) a) Feed water pumps, b) Steam injector, c) Economiser, d) Super-heater, e) Air pre-heater.		

8. AIR COMPRESSORS,

1. Uses of compressed Air, 2. Classification of Compressors.
3. Reciprocating Air Compressors (no derivation of formula), Single acting & double acting compressors, Single stage & multi-stage compressors. Inter-cooling & after cooling, Conditions for maximum efficiency, Volumetric efficiency
4. Effect of clearance volume, Free air delivered (no derivation of formulae)
5. Construction and working principles of Rotary Air Compressors. Centrifugal compressors, Axial flow compressor, Vane type compressor.
6. Applications of Compressed air viz. pneumatic tools – vibrator, rock drill, chipping hammer etc, Compressed Air motor (no analytical treatment), Fans & Blowers.

Total

48

100

TERM WORK:-

The term work shall consist of the following:-

1. Study of fire tube Boiler.
2. Study of water tube Boiler.
3. Study of boiler mountings
4. Study of boiler accessories.
5. Study of Bomb calorimeter.
6. Study of Boy's gas calorimeter.
7. Study of Orsat apparatus
8. Study of steam calorimeter
9. Study of non-conventional power plant (wind, hydraulic, geothermal tidal etc.)
10. Trial on Air compressors.

REFERENCE BOOKS

1. Elements of Heat Engines Vol. I & II by Patel & Karamchandani.
2. Elements of Heat Engines by Pandya and Shah.
3. Thermal Engineering by P. L. Ballaney
4. Heat Engines by R. S. Khurmi
5. Thermodynamics & Heat Engines Vol. I by R. Yadav.
6. Heat Engines by Wasandar & Patil.

