

4052 - THERMAL ENGINEERING										
Teaching Schedule Per Week			Progressive Assessment		Examination Schedule (Marks)					
Lectures	Practical	Credits			Theory		Practical Ex.		Total	
3	1	4	25	25	3Hrs.	100	-		150	
Pre-requisite		Source	Semester	Theory	Test	Total	TW	PR	Gr Total	
Nil		RAC		75	25	100	25	-	125	

Rationale: During this course of study a diploma holder in these programmes will be required to know the basic concepts of heat transfer, gas laws and Thermodynamic processes, etc which will form the base the students studies. Also a diploma holder requires knowledge of steam generation alongwith working of condensers and heat exchangers, which have been comprehensively included.

COURSE CONTENTS		Hrs	Mks
<b>1. BOILER AND BOILER MOUNTINGS</b>		12	20
Principles of steam generation in steam power plant.			
Boiler- Classification of boilers; Operation of fire tube and water; Sketch and names of Principal parts of locomotive, bab-cok and wilcox boilers.			
Evaporation of a boiler. Equivalent evaporation. Thermal efficiency of a boiler. Simple problems.			
Boiler mounting and accessories: Pressure gauge. Safety valves, water level indicator, feed check valve, blow off cock, fusible plug, etc. Feed water pump injector, economiser, superheater, Air preheater, etc; Boiler draughts; Natural and Artificial; Forced and included.			
<b>2. PROPERTIES OF STEAM</b>		8	12
Perfect gas and vapour; Evaporation of steam; Wet, dry and heated steam; Sensible heat; Latent heat; Enthalpy; Internal Energy of steam; Entropy of water and steam; Dryness fraction; Determination of quality of steam by different calorimeter; Use of steam tables and Mollier charts.			
<b>3. STEAM POWER</b>		3	8
Elementary principles and working performance of a steam turbine, its parts and their functions. Efficiency of a steam turbine.			

<b>4. INTERNAL COMBUSTION ENGINE</b>	10	15
Properties of gases and gas laws; General construction and working principles of a internal combustion engine; Fuels generally used; Four stroke and two stroke cycle engine principles; IHP and BHP calculations; Mechanical and thermal efficiency; Methods of ignition; Otto cycle; Diesel – cycle; Composite cycle or dual combustion cycle; Indicator diagrams; Isothermal and adiabatic operations.		
<b>5. AIR COMPRESSORS</b>	5	8
General description and working principles of an Air Compressor; Reciprocating Air Compressors; Single and Multi stage compressors; Indicator diagrams; H.P. of compressor; Efficiency of compressors; Uses of compressed air.		
<b>6. HEAT TRANSFER</b>	8	12
Conduction: Thermal conductivity, conduction through plane homogeneous and composite walls, conduction through hollow cylinder, concept of thermal resistance. Conduction through pipes: Heat transfer coefficients, overall heat transfer coefficient, empirical correlations. Heat transfer with boiling liquids. Convection: free and forced. Radiation: Stefan Boltzman law, emissivity and absorptivity. Log – mean temperature difference, concept, and heat exchanger.		
<b>7. STEAM CONDENSERS</b>	8	12
Introduction to steam power plant. The function of a condenser in steam power plant. Vacuum and its measurements. Dalton's Law of Partial Pressure and related Problems. Types of Condensers: Surface condenser; Jet condenser; Comparison of Jet and Surface condenser. Vacuum efficiency. Condenser efficiency. Effect of air leakage on working of Condenser. Air extraction pumps: Edward's air pump; Steam jet air ejector; Water jet air ejector. Cooling towers – types and functions.		
<b>8. A - FOR AUTOMOBILE ENGG. ONLY</b>		
<b>AIR CONDITIONING AND REFRIGERATION</b>	10	13
Elementary principles; Refrigeration cycles; Typical systems; Refrigerants; Simple calculations of load.		
<b>OR</b>		
<b>8.B - FOR REFRIGERATION &amp; AIR CONDITIONING ONLY</b>	10	13
<b>PRODUCTION OF LOW TEMPERATURE</b>		
Reversible adiabatic expansion of Real gas. Irreversible adiabatic expansion of real gas. Expansion of liquid with flashing. Thermoelectric cooling		
<b>Total</b>	<b>64</b>	<b>100</b>

**REFERENCE BOOKS:**

1. Thermal Engineering by P.L. Ballaney.
2. Thermal Engineering Vol. I & II by H. R. Kapoor.
3. Elements of Heat Engines Vol. I & II by Patel and Karamchandani.
4. Heat Engines by Pandya and Shah.
5. Basic Engineering Thermodynamics by Hayner Joel.(SI units)
6. Refrigeration & Air-Conditioning by C. P. Arora.
7. Heat and Mass Transfer by Domkundwar.
8. Thermal Engineering – I by S. K. Wagholikar.
9. I.C. Engines by Gill & Smith.

