DIRECTORATE OF TECHNICAL EDUCATION

DIPLOMA IN MECHANICAL ENGINEERING

M SCHEME

2015 -2016 onwards

III YEAR

V SEMESTER

32052 – THERMAL AND AUTOMOBILE ENGINEERING

CURRICULUM DEVELOPMENT CENTRE

M-SCHEME

(Implements from the Academic year 2015-2016 onwards)

Course Name : DIPLOMA IN MECHANICAL ENGINEERING

Course Code : 1020

Subject Code : 32052

Semester : V

Subject Title : THERMAL AND AUTOMOBILE ENGINEERING

TEACHING AND SCHEME OF EXAMINATIONS:

No. of Weeks per Semester: 15 Weeks

Subject	Instructions		Examination			
	Hours/ Week	Hours/ Semester	Marks			Duration
Thermal and Automobile Engineering	6	90	Internal Assessment	Board Examination	Total	3 Hrs
			25	75	100	

Topics and Allocation of Hours:

Unit	Topics	Hours
I	THERMAL POWER PLANT, STEAM TURBINES & CONDENSERS, REFRIGERATION AND AIR CONDITIONING	17
II	IC ENGINES AND ITS COMPONENTS	17
III	AUTOMOBILE COOLING SYSTEMS, LUBRICATION SYSTEM & FUEL FEED SYSTEMS	17
IV	AUTOMOBILE TRANSMISSION AND POWER TRAINS & CHASSIS	16
V	AUTOMOBILE BRAKE SYSTEM, ELECTRICAL EQUIPMENT AND POLLUTION CONTROL	16
	REVISION AND TEST	7
	Total	90

RATIONALE:

Study of thermal power plant, turbines and condensers are required to know about the generation of electric power. The study about the Refrigeration and Air-conditioning are required. Automobile is one of the key areas of development in India facilitated by Multinational Companies. As Automobile is the Major sources of employing man power a thorough knowledge on Automobile Engine construction and its functioning is required with due consideration on pollution control.

OBJECTIVES:

- Explain the fundamental of thermal power plant and steam turbines and condensers..
- Explain the refrigeration and air conditioning.
- Explain the components of IC engines.
- Explain the performance tests on IC engines.
- Compare the modes of heat transfer and evaluate the heat transfer by various modes.
- Explain the cooling system and lubrication system of the IC engines.
- Explain the fuel feed system.
- Explain the transmission systems and power trains of automobile.
- Study about the Brake systems and electrical components
- Study the pollution and its standards.

THERMAL AND AUTOMOBILE ENGINEERING
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topic	Hours
I	**THERMAL POWER PLANT, STEAM TURBINES & CONDENSERS, REFRIGERATION AND AIR CONDITIONING,** Layout of thermal power plant - merits and demerits of thermal power plant – pollutants - effects and control – cyclone separator – wet scrubber – electrostatic precipitator – control of No_2 and SO_2. - fluidised bed combustion.	17

Basic steam power cycles – Carnot, Rankine and modified Rankine cycles – classification of steam turbine - Impulse and reaction turbines - Difference – necessity of compounding – Methods of compounding.

Steam condensers – elements of condensing plant – classification of condensers – jet condenser – surface condensers – Comparison of jet and surface condensers – sources of air in condenser – condenser vacuum – vacuum efficiency – condenser efficiency - mass of cooling water required – mass of air present – number of tubes – simple problems.

Refrigeration – Definition – COP – Unit of refrigeration - Vapour Compression system – Absorption system – Refrigerant – properties. Air-conditioning – Definition – Centralised air conditioning.

II IC ENGINES AND ITS COMPONENTS 17

Internal combustion engines

Classifications of I.C Engines – four stroke cycle petrol and diesel engines – two stroke cycle petrol and diesel engines - comparison of four stroke and two stroke engines.

Basic Engine Components:– Functions, types, materials and construction of – Cylinder block – Crankcase – Cylinder head – cylinder liners – Comparison of liners – Piston – piston rings – types of compression rings and oil control rings – piston pin – Connecting rod - Crankshaft – flywheel – Cam shaft –Valve and Valve mechanism – Types.

Performance of IC Engines: Thermodynamic and commercial tests – indicated power – brake power – friction power – efficiencies of I.C. engines – indicated thermal, brake thermal, mechanical and relative efficiencies – Specific fuel consumption – Morse test – procedure – heat balance sheet – simple problems**.**

III AUTOMOBILE COOLING SYSTEMS, LUBRICATION SYSTEM & FUEL FEED SYSTEMS 17

Cooling systems – purpose – types – air and water cooling systems

– thermo siphon system - pump assisted water cooling systems – merits and demerits – troubles in cooling system.

Lubrication systems – purpose – types of lubricants – additives – Service rating of oil – types of lubricating systems - Full pressure system – oil pumps - oil filters – full flow and bypass filter systems - Troubles in lubrication system – causes and remedies..

Fuel Feed Systems:

Layout of fuel feed system of petrol engine – types of fuel feed systems – A.C. Mechanical fuel pump – S.U. Electrical fuel pump – fuel filter – Air cleaners - types – Carburetion – Classification of Carburetors – Simple carburetor – Solex Carburetor - Construction and operation – petrol injection – merits and demerits – DTSI – VTI – CCVTI – PGMFI – MPFI system description only.

IV AUTOMOBILE TRANSMISSION AND POWER TRAINS & CHASSIS **16**

Transmission And Power Trains:

General arrangement of power transmission system – front engine rear drive – rear engine rear drive – front engine front drive - four wheel drive – applications – clutch – function – components – Types - Single plate , multi plate and diaphragm spring clutch – fluid coupling – Clutch troubles and their causes.

Gear box – purpose – types of gear boxes – sliding mesh, constant mesh and synchromesh – floor shift gear changer – gear box troubles and their causes.

Drive line – propeller shaft – Universal joint – Cross type only – slip joint – final drive – function – types of gear arrangement – Hotch kiss drive – Torque tube drive – radius rod.

Differential – purpose – Construction and operation – Self locking and non slip differential – Differential troubles and their Causes – Semi floating, three quarter floating and full floating rear axles.

Automobile Chassis:

Front axle – Stub axle – Types – Steering system – Ackermann Principle of Steering – Wheel alignment – Factors – Camber ,

Caster , King pin inclination , Toe in and Toe out on turns - Steering linkages – Steering gears – Cam and double roller , recirculating ball type , Rack and Pinion – Steering troubles and causes – power steering – Necessity – types – Layout of any one type – Collapsible Steering system.

Suspension system – Functions – Leaf , coil and Torsion bar – Front suspension systems – independent front suspension – merits and demerits – types – rear end suspension – Air suspension - shock absorber – purpose – telescopic type construction and working.

V AUTOMOBILE BRAKE SYSTEM, ELECTRICAL EQUIPMENT AND POLLUTION CONTROL **16**

Brake system – functions – classification of brakes – drum brakes – leading shoe and trailing shoe – Self energizing action – hydraulic brake – brake bleeding - Air assisted hydraulic brakes – Air brake – layout – disc brakes – construction and working – brake troubles and their causes – anti lock brake system. Wheels – types of wheels.

Battery – lead acid battery – Nickel alkaline battery – construction – battery rating – charging - testing – starting circuit - construction and operation of starter motor – starting motor drives – over running clutch and Bendix drive – construction and operation – solenoid switch - Charging circuit – alternator construction and operation – regulators – Dynamo.

Ignition system – Types – battery coil ignition system –High tension magneto – electronic ignition – Ignition system troubles and remedies.

Lighting system – circuit – Head light – Aiming and adjustment – sealed beam head lights – directional signal circuits – fluorescent lamp - Horn circuits – Wind screen wiper.

Pollution – Pollutants – source of pollutants – pollution control techniques for petrol and diesel engines emissions – controlling crank case emission (PCV) – controlling evaporative emission (VRS , VSS , VVR , ECS and EEC) – Treatment of exhaust gas (Catalytic converter , EGR) – introduction to automobile electronics

– radio interference – suppressors – audio, video systems.

Text Books :

1) Thermal Engg, R.K . Rajput , ,8th Edition, Laxmi publications Pvt Ltd , New Delhi.
2) Applied Thermodynamics ,P.K. Nag, ,2nd Edition, TATA Mcgraw - Hill Publishing Co, New Delhi .
3) Thermal Engineering, R.S. Khurmi and J.K. Gupta, 18th Edition,S.Chand & Co,NewDelhi Automobile engineering vol- 1, vol – 2, Kirpal singh, Standard publishers distributors New Delhi.
4) Automobile Engineering, G.B.S.Narang, Khanna Publishers, New Delhi.
5) Automotive Mechanics, William H.crouse and Donald .L. Anglin, Tata Mc Graw – Hill Publishing Company Ltd, New Delhi.
6) The Automobile, Harbans Singh Reyat, S.Chand & Co Ltd, New Delhi

Reference Books:

1) Thermal Engineering ,P.L Ballaney , 24th Edition ,Khanna Publishers,New Delhi. Thermal Engineering ,B.K. Sarkar , 3rd Edition , Dhanpat Rai & Sons New Delhi .
2) Applied Thermodynamics, Domkundwar and C.PKothandaraman, 2nd Edition, Khanna publishers, New Delhi.
3) Vehicle and Engine technology. Vol. I,Heinz Heisler, , ELBS
4) Automotive Mechanics,Joseph Heitner, East –west Press (P) Ltd, New Delhi
5) Internal Combustion engines, M.L.Mathur & R.P.Sharma, Dhanpat Rai & Sons,