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FOURTH SEMESTER

Col. No.	Subject Code	Subject	Hours Per Week			
			Theory	Drawing	Practical	Total
1	4021410	Heat Power Engineering	5	-	-	5
2	4021420	Vehicle Body Engineering	5	-	-	5
3	4021430	Automotive Electrical and Electronics Systems	5	-	-	5
4	4021440	Automotive Engines	5	-	-	5
5	4020350	Machine Drawing and CAD Practical *	-	2	2	4
6	4021460	Automotive Electrical and Electronics Systems Practical	-	-	4	4
7	4021470	Automotive Engines Practical	-	-	4	4
			20	2	10	32
Extra / Co-Curricular activities		Physical Education	-	-	-	2
		Library	-	-	-	1
Total						35

* Common with Mechanical Engineering

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1021 Diploma in Automobile Engineering
Subject Code : 4021410
Semester : IV
Subject Title : Heat Power Engineering

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4021410 Heat Power Engineering	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

UNIT	TOPIC	TIME
I	Steam Generators and Steam Boiler	15
II	Steam Engine, Steam Turbine and Steam Condenser	15
III	Air Compressors Gas Turbines and Jet Propulsion	15
IV	Refrigeration and Air-Conditioning	14
V	Thermal Power Plant and Nuclear Power Plant	14
Test & Revision		7
Total		80

RATIONALE:

This subject is one of the core subjects. Diploma engineers have to work with various power producing and power absorbing devices. This subject will enable students to establish foundation required to design, operate and maintain the devices. This subject emphasizes on steam boilers and allied components that are used in industrial sectors. Thermal power plants are still contributing major share in electricity production in India. The students will be able to calculate various parameters required to determine the performance of these devices.

OBJECTIVES

- Explain the concepts and applications of steam
- Learn the construction and working of steam boilers, steam engines, steam turbines and steam condensers.
- Explain the concepts and applications of air compressor, gas turbines and jet propulsion
- Explain the concepts and applications of Refrigeration and Air-conditioning.
- Explain the concepts and applications of thermal and nuclear power plants.

4021410 HEAT POWER ENGINEERING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**STEAM GENERATORS AND STEAM BOILER** **1.1: Steam Generators** Properties of steam - Formation of steam – dryness fraction – wetness fraction – types of steam – dry steam, wet steam and superheated steam - compare - advantages of superheated steam - enthalpy – entropy – specific volume – simple problems.	**5**
	1.2: Steam Boiler Introduction – Classifications – Essentials of good steam boiler – selection of a steam boiler – Compare water tube boiler and fire tube boiler – Working principle of BHEL boiler. Boiler act. Boiler Mountings: water level indicator - stop valve – feed check valve – blow of cock. Steam safety valves: Spring loaded safety vale – High steam and Low water safety valve. Boiler accessories: feed pump – injector – economizer – air preheater – super heater – steam separator. Performance of boilers: Evaporative capacity – Equivalent evaporation – Factor of evaporation – Boiler efficiency – Heat losses in a power plant – simple problems.	**7** **3**
II	**STEAM ENGINE, STEAM TURBINE AND STEAM CONDENSER** **2.1: Steam Engine** Introduction - Classification – Reciprocating steam engine parts and their description – working principle – theoretical indicator diagram – actual indicator diagram – mean effective pressure – Indicated power – brake power. Efficiency: mechanical, relative and overall. Description only.	**7**
	2.2: Steam Turbine Introduction – classification – advantages – types – compounding: velocity, pressure and pressure velocity. Bleeding – energy losses - Description only.	**3**

	2.3: Steam Condenser Introduction – classification – Jet condenser: Principles of parallel flow, counter flow and ejector. Surface condenser: Principles of down flow, central flow and evaporative. Compare jet condenser and surface condenser.	**5**
III	**AIR COMPRESSORS AND GAS TURBINES** **3.1: Air compressors** Introduction – classification – working of single stage reciprocating air compressor – p-V and T-s diagram – isothermal efficiency, work done: without and with clearance volume – volumetric efficiency – simple problems. Principles of multi-stage reciprocating compressor. Rotary compressor: construction and working of roots blower – vane type blower – centrifugal compressor - axial flow compressor. Compressed air motors: principles of reciprocating type and rotary type air motor. **3.2: Gas Turbines** Introduction – classifications – advantages and disadvantages of gas turbines – constant pressure gas turbine - gas turbine with regenerator – intercooler – reheater – effects – closed cycle gas turbines –merits and demerits of open and closed cycle gas turbine. **3.3: Jet Propulsion** Turbo jet engines – merits and demerits – turbo propeller engines – merits and demerits – ramjet - comparison of aircraft and industrial gas turbines.	**8** **4** **3**
IV	**REFRIGERATION AND AIR-CONDITIONING** **4.1: Refrigeration** Refrigeration - refrigerators and heat pumps - types and applications of refrigeration – vapour compression refrigeration system – vapour absorption system – comparison – refrigerating effect – capacity of refrigerating unit - C.O.P – actual C.O.P – power required – mass of ice produced – problems. Refrigerants – desirable properties - classification of refrigerants. **4.2: Air-Conditioning** Introduction - psychrometric properties – dry air - moist air – water	**7** **7**

	vapour – saturated air – dry bulb temperature – wet bulb depression – dew point depression - dew point temperature – humidity –specific and relative humidity. Psychrometric chart – psychometric processes - sensible heating and cooling – humidification – dehumidification. Applications of air conditioning system – room air conditioning – central air conditioning – differences between comfort and industrial air conditioning. Factors to be considered in air conditioning - loads encountered in air-conditioning systems.	
V	**THERMAL POWER PLANT AND NUCLEAR POWER PLANT** **5.1: Thermal Power Plant** 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. **5.2: Nuclear Power Plant** Nuclear fission and fusion – chain reaction – radioactivity - layout of nuclear power plant - merits and demerits - Nuclear reactors – classification – components of nuclear reactor – reactor core – moderators – control rods – coolant – reflectors - biological shield – pressurized water reactor – boiling water reactor – Candu type reactor – fast breeder reactor – effect of nuclear radiation – disposal of nuclear wastes - comparison of nuclear power plants with thermal power plants.	**6** **8**

Reference Book

1. Applied Thermodynamics, P.K. Nag, TATA McGraw- Hill Publishing Co.
2. Thermal Engineering, R.S. Khurmi and J.K. Gupta, 18th Edition, Chand & Co.
3. Thermal Engineering, P.L Ballaney, Khanna Publishers.
4. Thermal Engineering, Er.R.K.Rajput, Lakshmi Publications (P) Ltd.
5. Applied Thermodynamics, Domkundwar and C.P Kothandaraman, Khanna publishers.
6. Refrigeration and Air conditioning, P. L. Ballaney, Khanna Publishers.

7. Power Plant Engineering Thermodynamics, Domkundwar and C.P.Kothandaraman, Khanna Publishers.
8. Power Plant Engineering, G.R. Nagpal, KhannaPublishers.

Reference Web Link / Video

Topic	Website	Link
Thermal and Automobile Engineering	Dote E-Lecture	https://www.youtube.com/watch?v=85K4_4PfRpQ&list=PL1b9Ht9ISqIG_szHgF6Fie9fdDpf8WOE0
Heat Power Engineering	Dote E-Lecture	https://www.youtube.com/watch?v=NpII017XBMI&list=PL1b9Ht9ISqIGJgqTGxcqmSEwLa_WWI83e
Basic Thermodynamics	NPTEL	https://nptel.ac.in/courses/112/105/112105123/
Applied Thermodynamics for engineers	NPTEL	https://nptel.ac.in/courses/112/103/112103275/
Power Plant Engineering	NPTEL	https://nptel.ac.in/courses/112/107/112107291/
Refrigeration and air Conditioning	NPTEL	https://nptel.ac.in/courses/112/105/112105129/

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1021 Diploma in Automobile Engineering
Subject Code : 4021420
Semester : IV
Subject Title : Vehicle Body Engineering

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4021420 Vehicle Body Engineering	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

UNIT	TOPIC	TIME
I	Automotive Aerodynamics	15
II	Car Bodies	15
III	Bus Bodies	15
IV	Commercial Vehicle Bodies and Body Materials	14
V	Vehicle Body Repair Works and Painting	14
Test & Revision		7
Total		80

RATIONALE:

To impart knowledge to the students about constructional details of different types of vehicle bodies and about vehicle body repair works and painting.

OBJECTIVES:

- To impart knowledge in automotive aerodynamics.
- To understand the construction of car body, design criteria, types of car and safety aspects of car.
- To understand the construction of bus body and dimensions of bus body and safety aspects.
- To understand the types of commercial vehicles; design of cab and in aerodynamic testing, forces and moments.
- To understand the vehicle body repair works and painting.

4021420 VEHICLE BODY ENGINEERING

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Automotive Aerodynamics** Objectives, Vehicle Drag - Definition, Types and Effects. Forces and Moments Acting on Vehicle Body - Types and Effects. Various Body Optimization Techniques and Aerodynamic Aids for Optimization of Drag. Drag Reducing Devices in Commercial Vehicles. Wind Tunnel Testing – Concept and Types, Flow Visualization Techniques, Scale Model Testing, Component Balance to Measure Forces and Moments.	8 7
II	**Car Bodies** Car Body-Purpose, Requirements and Types - Saloon, Convertibles, Limousine, Estate Van, Racing and Sports Car. Car Body Construction - Components of Car Body and Purpose of Each Component. Safety Equipments for Car - Seat Belts and Air Bags. Dimensional and Visibility Regulations. Drivers Visibility, Tests for Visibility, Methods for Improving Visibility and Space in Cars. Crash Test and Roll Over Test.	8 7
III	**Bus Bodies** Bus Body – Types - Mini Bus, Single Decker, Double Decker, Two Level, Split Level and Articulated Bus. Bus Body Layout - Floor Height - Engine Location - Entrance and Exit Location - Seating Dimensions. Constructional Details - Frame Construction - Types of Metal Section Used, Double Skin Construction, Conventional and Integral Type Construction. Automatic Door System – Twin Glider Door, Single Glider Door, Folding Door, Sliding Plug Door and Swing Plug Door.	11 4
IV	**Commercial Vehicle Bodies and Body Materials** Types of Commercial Vehicle Body - Light Commercial Vehicle Body Types, Flat Platform, Drop Side, Fixed Side, Tipper Body, Tanker Body - Baffled and Un-Baffled Tanks, Drivers Cab Design - Forward Control Cab	9

	and Normal Control Cab. Vehicle Body Materials - Steel, Light Alloys, Plastics, Crp, Grp, Textiles, Glass, Wood, Aluminium Materials, Adhesives and their Properties.	5
V	**Vehicle Body Repair Works and Painting** Hand Tool, Power Tool and Equipments for Body Repair Works. Body Repair Methods - Paintless Dent Removal, Body Filler, Hammer & Dolly Method and Patching. Refinishing Process - Paint Removal, Preparing Bare Metal, Prime Coat Selection, Final Sanding, Masking, Surface Cleaning. Painting - Objectives, Elements of Paint. Painting Methods – Spray Painting and Immersion Painting. Vacuum Coating, Electrostatic Painting. New Vehicle Painting Process.	6 8

Reference Books

1. Vehicle Body Engineering, Powloski, J., Business Books Ltd, 1989.
2. Body Repair Technology for 4-Wheelers, James E Duffy, Cengage Learning.
3. Body construction and design, Giles, G.J., Illiffe Books Butterworth & Co.
4. The Repair of vehicle bodies, Andrew Livesey and A Robinson, Routledge.
5. John Fenton, “Handbook of Automotive Body and Systems Design”, John Wiley & Sons, 2013.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1021 Diploma in Automobile Engineering

Subject Code : 4021430

Semester : IV

Subject Title : Automobile Electrical and Electronics Systems

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4021430 Automobile Electrical and Electronics Systems	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Topics and Allocation of Hours

UNIT	TOPIC	TIME
I	Basic Electrical and Electronic Principles	15
II	Electromagnetic Induction Machines, Starter Motors, Alternators	15
III	Lighting and Auxiliary System	15
IV	Electronic Spark Ignition & Diesel Ignition and Engine Management Systems	14
V	Control of Automotive Systems through Electronic Management Systems	14
	Test & Revision	7
Total		80

RATIONALE:

Diploma engineers have to deal with electrical and electronics engineering principles and applications in industrial processes of different fields. It is therefore necessary for them to apply the principles of electrical and electronics engineering. This subject make them conversant with electrical and electronic engineering aspects of manufacturing, production, fabrication, automobile and mechanical based processes in industries,

OBJECTIVES:

- To learn the basics in Automotive Electrical, Electromagnetic & Electronic principles
- To know the basic symbols of Electrical & Electronic Components, Wire & Cable Color Codes & Sizes and using those symbols to draw simple Circuit Diagrams
- To learn all about components applying the principles of Electromagnetic & Electromagnetic Induction in an Automobile like Starting Motors, Alternators, Solenoids, Relays, Transformers, Inductors etc. & Lighting, Auxiliary & Sensors Systems in an Automotive Vehicle.
- To study about the evolution of Automotive Spark Ignition Systems and their working
- To study about Electronic Management of Automotive Systems through use of ECMs & Transducers.

4021430 AUTOMOBILE ELECTRICAL AND ELECTRONICS SYSTEMS
DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**Basic Electrical and Electronic Principles** Introduction - Definitions – Charge, Current, Electromotive Force, Potential Difference, Theory of Electron Flow and Conventional Flow. Properties of Conductors, Insulators and Semiconductors. Definitions of Electrical Laws - Ohm's Law, Kirchhoff's Laws, Definitions of Resistance & Resistivity, Inductance and Capacitance. Definitions of Magnetism, Electromagnetism & Electromagnetic Induction, Mutual Induction. Electromagnetic Terms & Definitions, Faraday's Laws, Fleming's Rules, Maxwell's Corkscrew Rules, Lenz's Law and their application in Automobiles. Single Pole & Double Pole Wiring, Electrical Safeties and the benefits of "Earthing To Chassis" in Automotive Wiring, Electrical Symbols, Wire Sizes & Colour Codes, their importance in an Electrical Circuits. Introduction - Basic Principles of Semiconductors. Semiconductor Devices – LED- Seven segment LED - Zener Diodes, Transistors & SCRs. Rectifier – Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier & Applications of Semiconductor Devices in various Automotive Systems.	12 3
II	**Electromagnetic Machines, Starter Motors & Alternators** Solenoid Actuator, Relays and types of Relays and their automotive usage. Electromagnetic & Thermal Relays Requirements of The Charging System. Charging System Principles. Alternators – Construction, Generation of Electricity, Rectification of AC to DC, Regulation of Output Voltage - Need for the Regulator, Regulators, Charging Circuits. Advantages of Alternator over Dynamo. Trouble Shooting in the Alternator. Requirements of Starter Motor. Starting Motor – Working Principle - Construction. Starting System Circuit. Starter Drive Mechanisms - Bendix Drive Mechanism, Over Running Clutch Type Drive Mechanism and Coaxial Drive Mechanism in the Heavy Vehicles. Starter Switches and Solenoids. Stepper Motors & Servo Motors,	3 7 5

III	**Lighting and Auxiliary System** Lighting – Purposes & the needs of Traffic Indicators, Sidelights, Rear Lights, Brake Lights, Reversing Lights, Day Running Lights, Rear Fog Lights, Front Spot, Fog Lights, Park Lamp, Rear Number Plate Lamp, Beam Indicator, Door Lamp, Pillar Lamp, Roof Lamp and Panel Lamps. Dip Switch and Lighting Circuits. Headlight Leveling, Headlight Beam Setting. Wiper and Washer Systems - Construction and Working, Electric Horns - Construction and Working. Window Glass Panel Operating System, Gauges - Fuel Gauge, Oil Pressure Gauge, Coiling Water Temperature Gauge and Ammeter Charging Indicator.	8 7
IV	**Electronic Spark Ignition & Diesel Ignition and Engine Management Systems** Evolution of SI Engine Ignition Systems-from Magneto Ignition System to Electronic Distributer-less Ignition System, the needs for development & benefits gained at each stage. Brief Study of each of the System, Spark Plug types, needs & Usage. Electrical Circuitry Outline of Electronic Engine Controls for MPFI & CRDI Systems-Difference between Electronically Managed Engines & Mechanically Managed Engines with Inherent Merits & Demerits-Description, Working & Testing of various Sensors, Engine Controller & Actuators used in MPFI & CRDI Systems, On-Board-Diagnostic Systems & Instrument Panel. Types of Sensors – Thermistor Sensor, Pressure Sensor, Inductive Sensor, Knock Sensor, Fuel Flow Sensor, Oxygen Sensor and Vehicle Speed Sensor.	5 6 3
V	**Control of Automotive Systems through Electronic Management Systems** Electronic Control Unit - Working Principle. Sub-Units in Microprocessor Control Systems. Microprocessor And Microcomputer Controlled Devices In Automobiles - Travel Information System and Keyless Entry System. On-Board-Diagnostics and their functions, Identification of different	6 8

	types of Connectors in the circuits of Microprocessor Controlled Systems – Electrical motor control system - Electrical safety standard in Vehicle – MCB, ELCB – Role Electric Vehicle Technology - Impact of Automobile Industry	

Reference Books:

1. Automobile Electrical and Electronics Systems, Tom Denton, London.
2. Automotive Electrical and Electronics, Barry Holembeak, USA.
3. Automotive Computers and Digital Instrumentation, Robert N Brady, New Jersey.
4. Automotive Electronics and Electrical Equipment, William H. Crouse and DL. Anglin, McGraw Hill company.
5. Automobile Electrical Equipment, William. H. Crouse., McGraw Hill Book Co. Inc., New York.
6. Automobile Engineering, RB Gupta, Satya Prakashan, New Delhi.

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STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1021 Diploma in Automobile Engineering
Subject Code : 4021440
Semester : IV
Subject Title : Automotive Engines

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4021440 Automotive Engines	5	80	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

TOPICS AND ALLOCATION OF HOURS

UNIT	TOPIC	TIME
I	Thermodynamics, Air Cycles	15
II	Fundamentals of IC Engines, Testing of IC engines:	15
III	Fuel supply system, Fuel Injection Systems	15
IV	Ignition Systems	14
V	Cooling system, Lubrication System, Super charging, Turbo Charging	14
Test and Revision		7
TOTAL		80

RATIONALE:

This is the core technology subject. All automotive vehicles are powered by IC engines. Hence the fundamental knowledge of automobile engine is most essential for the auto technicians. This subject will help in understanding the procedure of inspection, diagnosis and testing of engines and other systems. This subject deals with all systems in the automobile engines.

OBJECTIVES

- Explain the basics of systems, laws of thermodynamics and thermodynamic processes.
- Learn the construction and working fundamentals of IC Engines.
- Performance of petrol and diesel engines and its components.
- Explain the concept and applications of IC engines and its performance
- Learn the working principle of fuel feed system of petrol and diesel engines.
- Explain the concept of fuel Injection system of petrol and diesel engines.
- Learn the working principle of Ignition systems.
- Acquire the knowledge on the lubrication and cooling systems of engines.

4021440 AUTOMOTIVE ENGINES

DETAILED SYLLABUS

Contents: Theory

Unit	Name of the Topics	Hours
I	**THERMODYNAMICS AND AIR CYCLES**	
	1.1: Thermodynamics	7
	Definitions and units of mass, weight, volume, density, specific weight, specific gravity and specific volume – pressure – units of pressure – temperature - absolute temperature – S.T.P and N.T.P conditions – heat – specific heat capacity at constant volume and at constant pressure – work – power – energy – law of conservation of energy – thermodynamic system – thermodynamic equilibrium - properties of systems – intensive and extensive properties – State of system – process – cycle – point and path functions - Zeroth, First and Second laws of thermodynamics. Description only.	
	1.2: Thermodynamic Processes	3
	Constant Volume – Constant Pressure – Constant temperature – Isentropic – Polytropic - P-V and T-S diagrams. Free expansion – Throttling process. Description only.	
	1.3: Air Cycles	5
	Carnot Cycle – Otto cycle – Diesel Cycle – Dual cycle – Efficiency – Brayton cycle - Stirling cycle. Description only.	
II	**FUNDAMENTALS OF IC ENGINES AND TESTING OF IC ENGINES**	
	2.1: Fundamentals of IC Engines	
	Introduction – Development of IC engines – Classification – IC Engine and Its Components – Working of Four Stroke Cycle Petrol Engine – Working of Four Stroke Cycle Diesel Engine – Valve timing diagram - Working of Two stroke petrol engines – Working of Two stroke diesel engines – Port timing diagram - Applications of IC engines.	6
	2.2: Testing of IC engines	
	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	9

	efficiencies – Specific fuel consumption – Morse test – procedure – heat balance sheet – simple problems.	
III	**FUEL SUPPLY SYSTEM AND FUEL INJECTION SYSTEMS** **3.1: Fuel supply System** SI Engines fuel supply system - General arrangement - Construction and working principle of Mechanical fuel pump, Electrical fuel pump. Air-Fuel mixtures and its requirement – Working principle of Simple carburetor – Working principle of Solex carburetor, SU carburetor. **3.2: SI Engines fuel injection systems** Types – port injection system, throttle injection system - MPFI – advantages and disadvantages of petrol injection system – Electronic Petrol Injection system – D-MPFI System – L-MPFI system – Group Injection System – Cold start injector. **3.3: CI Engines fuel injection system** Requirement of ideal injection - Construction and working principle of Fuel pump – types of nozzles – Working principle of Electronically controlled diesel injection system - Working principle of common rail injection system. Fuel filters.	**5** **5** **5**
IV	**IGNITION SYSTEMS** **4.1: Battery ignition system** Requirement – Principle of battery ignition system for multi cylinder engines – Components of battery ignition system – Construction of Distributor - Spark plug - types. **4.2: Magneto ignition system** Magneto ignition system – working principle – Advantages and disadvantages. Distributor less ignition system – Coil on plug ignition system. Ignition advance – Advancing mechanisms – Factors affecting the angle of advance and its effects. **4.3: Electronic ignition systems** Electronic ignition systems – Transistorised Coil Ignition – Capacitive Discharge Ignition – Computer controlled coil ignition systems. Firing orders. Importance of ignition timing and ignition advance.	 **4** **5** **5**

V	**COOLING SYSTEM, LUBRICATION SYSTEM, SUPER CHARGING, TURBO CHARGING**	
	5.1: Cooling system	**5**
	Introduction - effects of overheating – areas of heat flow. Air cooling system – Water cooling system - natural and forced circulation. Engine radiators. Hot and cold weather precautions – use of antifreeze solution.	
	5.2: Lubrication System	**5**
	Source of friction losses – Effect of frictional losses. Functions of lubrication – Required properties of lubricant – Additives and their function – Grades of lubricating oils. Lubricating system: Splash lubrication, Pressure feed lubrication – wet sump and dry sump – working principles. Oil filters - Crankcase ventilation.	
	5.3: Super charging and Turbo charging	**4**
	Introduction – thermodynamic cycle with super charging – Types of super chargers – Arrangement of super chargers. Turbo charging: Functions – Types - Construction and working of Turbo charging of a single cylinder engine - advantages and disadvantages	

Reference Books

1. Thermal Engg, R.K.Rajput, 8th Edition, Laxmi publications Pvt Ltd.
2. Applied Thermodynamics, P.K. Nag, 2nd Edition, TATA McGraw - Hill Publishing Co.
3. Thermal Engineering, R.S.Khurmi and J.K.Gupta,18th Edition, S.Chand& Co.
4. Automobile engineering vol-1, vol–2, Kirpalsingh, Standard publishers.
5. Automobile Engineering, G.B.S.Narang, Khanna Publishers.
6. Automotive Mechanics, William H.Crouse and Donald L Anglin, Tata McGraw – Hill Publishing Company Ltd.
7. The Automobile, Harbans Singh Reyat, S.Chand& Co Ltd.
8. Thermal Engineering, P.L.Ballaney, 24th Edition, Khanna Publishers.
9. Applied Thermodynamics, Domkundwar and C.P Kothandaraman, 2nd Edition, Khanna publishers.
10. Vehicle and Engine technology. Vol.-I, Heinz Heisler, ELBS
11. Automotive Mechanics, Joseph Heitner, East–west Press (P) Ltd.
12. Internal Combustion engines, M.L.Mathur & R.P.Sharma, Dhanpat Rai & Sons,

Reference Web Link / Video

Topic	Website	Link
Thermal and Automobile Engineering	Dote E-Lecture	https://www.youtube.com/watch?v=85K4_4PfRpQ&list=PL1b9Ht9ISqIG_szHgF6Fie9fdDpf8WOE0
Heat Power Engineering	Dote E-Lecture	https://www.youtube.com/watch?v=NpII017XBMI&list=PL1b9Ht9ISqIGJgqTGxcqmSEwLa_WWI83e
Fundamentals of automotive system	NPTEL	https://nptel.ac.in/courses/107/106/107106088/

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N - SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1020 Diploma in Mechanical Engineering
Subject Code : 4020350
Semester : III
Subject Title : Machine Drawing and CAD Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4020350 Machine Drawing and CAD Practical	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

RATIONALE:

Mechanical Engineering Diploma Engineer is expected to possess a thorough understanding of drawing, which includes clear visualization and proficiency in reading and interpreting a wide variety of production drawing. Manufacturing of various parts start from the basic drawing of components. The assembly of components is also carried out from the drawing. So drawing is an important subject to be studied by the students to carry and complete the production and assembly process successfully.

OBJECTIVES:

- To learn the parts and assembly of the machine components.
- To appreciate the need for sectional view and types of sections.
- To draw sectional views.
- To practice manual drawing
- To use Computer Aided Drafting.

- To prepare geometrical model of various machine elements.
- To draw the different views of machine elements.
- To interpret the drawing in engineering field and illustrate three dimensional objects.

4020350 MACHINE DRAWING AND CAD PRACTICAL

DETAILED SYLLABUS

Contents: Practical

PART–A: MANUAL DRAWING PRACTICE

Sectioning - sectional views – representation of sectional plane – hatching – inclination – spacing – hatching large areas – hatching adjacent parts - full section – half section – types of half sections – conventional representation of materials in section – Dimensioning.

Detailed drawings of the machine parts are given to students to assemble and draw any two views of the machine elements in the Drawing Sheet with dimensions. Front View /Full Section / Half SectionFront Viewand Top View / Left Side View / Right Side View.

PART–B: COMPUTER AIDED DRAFTING (CAD)

CAD applications – Hardware requirement – Software requirement – CAD screen interface – menus – Toolbars – types of co-ordinate system – Creating 2D objects – Using draw commands – Creating text – Drawing with precision – Osnap options – drafting settings – drawing aids – Fill, Snap, Grid, Ortho lines – Function keys – Editing and modify commands – Object selection methods – Erasing object – Oops – Cancelling and undoing a command – Copy – Move – Array – Offset – Scale – Rotate – Mirror – Break – Trim – Extend – Explode. Divide – Measure – stretch – Lengthen – Changing properties – Color – line types – LTscale – Matching properties – Editing with grips – Pedit – Ddedit – Mledit - Basic dimensioning – Editing dimensions – Dimension styles – Dimension system variables. Machine drawing with CAD. Creation of blocks – Wblock – inserting a block – Block attributes – Hatching – Pattern types – Boundary hatch – working with layers – Controlling the drawing display – Blipmode – View group commands – Zoom, redraw, regen, regenauto, pan, viewers – Realtime zoom. Inquiry groups – calculating area – Distance – Time – Status ofdrawing – Using calculator. Plot

Detailed drawings of the machine parts are given to students to assemble and create two views of the machine elements in the CAD package with dimensions. Front View / Sectional Front View (Full Section / Half Section) and Top View / Left Side View / Right Side View.

EXERCISE:

Draw the Front View / Sectional Front View (Full Section / Half Section) and Top View / Left Side View / Right Side View for the following given part drawing of the components after assemble in the drawing sheet and CAD package.

1. Sleeve & Cotter joint
2. Screw jack
3. Plummer Block
4. Simple Eccentric
5. Machine Vice
6. Protected type flanged coupling

Reference Books:

1. A Textbook of Machine Drawing, Pritam Singh Gill, S.K.Kataria & Sons.
2. Machine Drawing, N.D.Bhatt, V.M.Panchal, Charoter Publishing House.
3. Introducing Autocad 2010 and Autocad LT 2010, George Omura, Wiley India Pvt. Ltd.
4. A Textbook of Engineering Drawing, R.B.Gupta, Satya Prakasan, Technical India Publications.
5. Engineering Drawing, D.N. Ghose, Dhanpat Rai &Sons, Delhi

Internal Mark Allocation

Note:

All the students should maintain the observation cum record note book / manual as per the regulation. The printout of the actual CAD output created by the student during practice should be pasted for every exercise in the observation cum record note work.

For every exercise, manual drawing sheet (Two views) should be submitted and evaluated for 50 Marks. (Front view – 30 Marks and Top view/Side view – 20 Marks). The average of the six exercises should be converted to 10 Marks.

Drawing Sheet (Six Exercise Average)	-	10 Mark
Observation and Record work	-	10 Mark
Attendance	-	05 Marks
Total	**-**	**25 Marks**

BOARD EXAMINATION

Note: All the exercises should be completed by Manual and CAD. All the exercise should be given for examination, the students are permitted to select by lot or the question paper from DOTE should be followed. Observation cum Record note book should be submitted during examination along with the drawing file. Part A and Part B should be completed for the examination.

PART A: Manual Drawing in the Drawing sheet

Draw the assemble Front View / Sectional Front View (Full Section / Half Section) for the given part drawing of the components in the drawing sheet.

PART B: Computer Aided Drafting in the CAD package

Create the assemble Front View / Sectional Front View (Full Section / Half Section) and Top View / Left Side View / Right Side View for the given part drawing of the components in any one of the CAD package.

DETAILLED ALLOCATION OF MARKS

Manual Drawing in Drawing sheet		**: 30 marks**
Assemble Front view	30	
Computer Aided Drafting		**: 60 marks**
Drafting	20	
Assembly	20	
Dimensioning	20	
Viva-voce		**: 10 marks**
Total		**: 100 marks**

LISTOF EQUIPMENT (For 30 students)

1. Personal computer – 30 Nos.
2. Printer – 1 No.
3. Required Software's: CAD Package – Sufficient to the strength.

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1021 Diploma in Automobile Engineering
Subject Code : 4021460
Semester : IV
Subject Title : Automobile Electrical and Electronics Systems Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4021460 Automobile Electrical and Electronics Systems Practical	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

OBJECTIVES:

- Evaluating the parts of an Alternator and testing an assembled alternator same on a test bench for proper operation.
- Evaluating the parts of a Starter Motor and testing an assembled Starter Motor on a Test Bench for proper operation.
- Understanding the need for setting of proper ignition timing..
- To understand the Working Principle of Auxiliary Systems
- To understand the Use of Sensors and to test them in an Automobile.
- To construct Electrical Circuits in Automobile and make simple electrical circuits with proper Electrical Symbols, Cable Sizes &Colour Codes.

4021460 AUTOMOBILE ELECTRICAL AND ELECTRONICS SYSTEMS PRACTICAL

Experiments

Part – A

1. Testing of Alternator Parts such as Stator, Rotor and Rectifier for Resistance, Continuity for Insulation Effectiveness using Multifunction Tester.
2. Testing of Starter Motor Parts such as Test Field Windings, Brush Holders, Armature and Solenoid Switch for Continuity Using Multifunction Tester
3. Testing of Electronics fuel Ignition system
4. Servicing of the Wiper Motor and Horns – Tuning.
5. Identifying and testing of the various terminals of 4-Point, 5-Point, 6-Point & 8-Point Relays through their markings using Multifunction Tester
6. Testing of Stepper motor drive

Part – B

1. Construction and Testing of Half Wave Rectifier, Full Wave Bridge Rectifier without Filters.
2. Identification and testing of display devices- LED, 7 segment LED
3. Testing of various Sensors using Multifunction Tester
4. Construction and Testing of Fuel and Temperature Gauges Circuit.
5. Construction and Testing of Head Lights, Parking Lights and Direction Indicators Circuit.
6. Connection and Testing of MCB, ELCB

BOARD EXAMINATION

Note:

- All the exercises/experiments in both sections should be completed. Two exercises/experiments will be given for examination by selecting one from PART A and one from PART B.
- All the exercises/experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machineries / equipments before commencement of the board practical examination.

DETAILLED ALLOCATION OF MARKS

Sl. No.	Description	Max. Marks
Part- A		
1	Circuit Diagram	10
2	Connection/Reading	20
3	Calculation/Graph	15
Part- B		
4	Circuit Diagram	10
5	Connection/Reading	20
6	Calculation/Graph	15
7	**Viva-voce**	10
Total		100

LIST OF EQUIPMENT / TOOLS/MACHINERY'S REQUIRED

(for a batch of 30 students)

Sl. No.	Machinery's / Equipment / Tools	Quantity
1.	Alternator	2 No's
2.	Starter Motor	2 No's
3.	Wiper Motor	2 No's
4.	Horn	2 No's
5.	Relay (4 point, 5 point, 6 point,8 point)	Each 1 No
6.	Stepper motor drive kit	1 No
7.	Engine crankshaft angular position sensor	2 No's
8.	Speed sensor	2 No's
9.	Pressure sensor	2 No's
10.	Fuel gauge	1 No
11.	Knock sensor	1 No
12.	Oxygen sensor	1 No
13.	Temperature gauge	1 No
14.	Head Light	1 No
15	Parking Light	1 No
16	Direction Indicator	1 Set
17.	Electronic fuel Ignition Systems kit	1 No
18.	ELCB	1 No
19.	MCB	1 No
20.	Transformer (230 V/ 6 V)	2 No's
21.	Transformer (230 V/ 6 V – 0 V- 6 V)	2 No's
22.	Diode 1N4007	10 No's
23.	Bread Board	2 No's
24.	Digital Multimeter	1 No
25.	Analog Multimeter	1 No

STATE BOARD OF TECHNICAL EDUCATION &TRAINING, TAMILNADU

DIPLOMA IN ENGINEERING / TECHNOLOGY SYLLABUS

N-SCHEME

(To be implemented for the students admitted from the year 2020 - 2021 onwards)

Course Name : 1021 Diploma in Automobile Engineering
Subject Code : 4021470
Semester : IV
Subject Title : Automotive Engines Practical

TEACHING AND SCHEME OF EXAMINATION

No of weeks per semester: 16 weeks

Subject	Instructions		Examination			
			Marks			Duration
	Hours / Week	Hours / Semester	Internal Assessment	Board Examinations	Total	
4021470 Automotive Engines Practical	4	64	25	100*	100	3 Hrs.

* Examinations will be conducted for 100 marks and it will be reduced to 75 marks for result.

Objectives

- To Study the Flash and the Fire Point of a Fuel
- To Gain the Practical Exposure on Engine Port and Valve Timings
- To find the Viscosity of Lubricants.
- To find the COP of a refrigerator
- To study the various parts of an Engine
- To get an exposure on assembly and functioning of various pumps and injector.
- To study about MPFI and CRDI systems

4021470 AUTOMOTIVE ENGINES PRACTICAL

Experiments

PART A

1. Find Flash and Fire point of fuel using open cup and closed cup apparatus and compare the value for the given sample.
2. Find Viscosity of lubricating oil using Saybolt viscometer.
3. Find Viscosity of lubricating oil using Red wood viscometer.
4. Draw the Port timing diagram of a single cylinder two stroke diesel engine or petrol engine
5. Draw the Valve timing diagram of a single cylinder four stroke diesel engine or petrol engine.
6. Determine the COP of the vapour compression refrigerator system.

PARTB

1. Dismantle and assemble camshaft, timing gear and valves. Adjust the valve Clearance.
2. Dismantle and assemble oil pump and water pump after inspection and service.
3. Dismantle and assemble the fuel pump in a petrol engine after inspection and service.
4. Dismantle and assemble the distributor pump and injector after inspection and service.
5. Identify the components of the MPFI system in the kit.
6. Identify the components of the CRDI system in the kit.

BOARD EXAMINATION

Note:

- All the exercises/experiments in both sections should be completed. Two exercises/experiments will be given for examination by selecting one from PART A and one from PART B.
- All the exercises/experiments should be given in the question paper and students are allowed to select by a lot or Question paper issued from the DOTE should be followed.
- All regular students appearing for first attempt should submit record notebook for the examination.
- The external examiner should verify the availability of the facility for the batch strength before commencement of practical examination.
- The external examiner should verify the working condition of machineries / equipments before commencement of the board practical examination.

DETAILLED ALLOCATION OF MARKS

Sl. No.	Description	Max. Marks
Part- A		
1	Procedure	10
2	Tabular Column / Formulae	10
3	Observation / Calculation / Diagram	25
4	Result / Graph	5
Part- B		
5	Procedure / Explanation	10
6	Observation / Dismantling	15
7	Result / Assemble	15
	Viva-voce	10
Total		100

LIST OF EQUIPMENT / TOOLS/MACHINERY'S REQUIRED

(for a batch of 30 students)

Sl. No.	Machinery's / Equipment / Tools	Quantity
1	Open cup apparatus	1 No.
2	Closed cup apparatus	1 No.
3	Saybolt viscometer	1 No.
4	Redwood viscometer	1 No.
5	Two stroke diesel or petrol engine cut section	1 No.
6	Four stroke diesel or petrol engine cut section	1 No.
7	Refrigerator test rig	1 No
8	Four stroke diesel engine cut section model	1 No
9	Cam shaft	1 No
10	Timing gear	1 No
11	Oil & water pump	1 No (each)
12	Fuel pump	1 No
13	Distributor pump	1 No
14	Injector	1 No
15	MPFI Kit	1 No
16	CRDI Kit	1 No
17	Basic and special tools	sufficient quantity
18	Service tools	sufficient quantity
19	Consumables	sufficient quantity