

**Development of Life Skill II- Common as other branch**

### Heat Power Engineering –II (AE)

Name of the Course: <b>Diploma in Automobile Engineering</b>			
Course Code: A.E.	Semester :	Forth	
Duration: 17 Weeks	Maximum Marks :	50	
Teaching Scheme	Examination Scheme :	Theoretical	
Theory: 2 hrs / week	Internal Examination :	10 Marks	
Tutorial: Nil	TA (Attendance, Assignment, Interaction etc.):	05 Marks	
Practical: Nil	End Semester Exam :	35 Marks	
Credit : 2			
<b>Aim:</b>			
<ul style="list-style-type: none"> <li>• to understand the basic law that governs principle of working of Gas turbine.</li> <li>• to understand the various sources of energy and the concept of non conventional energy sources.</li> <li>• to understand the thermodynamic principle of working of refrigeration and air conditioning.</li> </ul>			
<b>Objectives:</b>			
<ul style="list-style-type: none"> <li>➤ Know applications of thermodynamic principles and processes of gas turbine.</li> <li>➤ To understand the working of refrigeration system.</li> <li>➤ To understand the working of Air conditioning system.</li> </ul>			
<b>Pre-Requisite:</b> Fundamental concept of Thermodynamics.			
<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
01	<b>Gas Turbines:</b> 1.1 Classification of gas turbines and Field of application. 1.2 Brayton or Joule cycle -P-V diagram and thermal efficiency. Construction and working of gas turbine- i] Open cycle ii] Closed cycle gas turbine, simple circuit, Comparison, P-V & T-S diagram. 1.3 Turbojet and Turboprop engine. Application.	06	
02	<b>Sources of Energy, Fuels &amp; Combustion :</b> 2.1 Classification of various energy sources [conventional and non-conventional]. 2.2 Classification of fuels – solid fuels – liquid fuels – gaseous fuels – Applications and comparisons, characteristics of good fuel – Heating value of fuels – Higher Heating Value – Lower Heating Value, function of Bomb calorimeter. 2.3 Combustion of fuels – combustion chemistry of carbon, Hydrogen, Iso Octane and methane. Concept of A/F ratio, Mass of air required for complete combustion of fuel, excess air. Simple problem.	07	
03	<b>Refrigeration:</b> 3.1 Definition – Refrigeration, heat pump, C.O.P, E.P.R & unit of refrigeration. 3.2 Refrigerant – properties required, common commercial refrigerants & their suitability of use, Environment friendly refrigerants. 3.3 Air refrigeration, Bell Coleman cycle (reversed Joule cycle). 3.4 Working principle of Vapour Compression Refrigeration Cycle. (schematic layout, p-h diagram, function & working of each components in the circuit) Simple Problems.	07	

04	<b>Air Conditioning:</b> 4.1 Air conditioning - psychometric properties - dry air - moist air –Water vapour. 4.2 Saturated air – dry bulb temperature - wet bulb temperature – dew point temperature -humidity - specific and relative humidity. 4.3 Psychometric chart and its uses – psychometric processes – sensible heating and cooling – humidification –dehumidification. 4.4 Air conditioning – Its meaning & factors of control ( temp. of surroundings air, humidity, purity of air & motion of air). 4.5 Classification of air conditioning systems, Principle of a) Winter air conditioning b) Summer air conditioning. c) Comfort air conditioning. Simple Problems.			12	
<b>Total</b>				<b>32Hrs.</b>	<b>35 Marks</b>
<b>Total Classes</b>				17 weeks [34 lecture hrs].	
<b>Learning Resources :</b>					
<b>Text Books :</b>					
<b>Author</b>	<b>Title</b>			<b>Publisher</b>	
Mahesh M Rathore	Thermal Engineering			Tata McGraw Hill Publication	
A R Basu	Thermal Engineering Heat Power			Dhanpat Rai and Co.(P)Ltd, New Delhi	
R. S. Khurmi and J. K. Gupta	A Text book of Thermal Engineering			S. Chand and Co. Ltd.	
P K Nag	Basic and applied thermodynamics			Tata McGraw Hill Publication	
Mahesh M Rathore	Thermal Engineering			McGraw Hill	
E, Rathakrishnan	Fundamentals of Engineering Thermodynamics			Prentice Hall India	
Dr. D. S. Kumar	Thermal Science And Engineering			S.K.Kataria & Sons	
<b>Learning Resources :</b>					
<b>Examination Scheme:</b>					
<b>Group</b>	<b>Chapter</b>	<b>Objective Questions</b>			<b>Total Marks</b>
		<b>To be Set</b>	<b>To be Answered</b>	<b>Marks per Question</b>	
A	01 & 02	4	Any Twenty	01	10 x 1 = 10
B	03 & 04	6			
<b>Group</b>	<b>Chapter</b>	<b>Subjective Questions</b>			<b>Total Marks</b>
		<b>To be Set</b>	<b>To be Answered</b>	<b>Marks per Question</b>	
A	01 & 02	3	Any five	05	05 x 5 = 25
B	03 & 04	5			

## Advanced Automobile Engines

Name of the Course : <b>Diploma in Automobile Engineering</b>					
Course Code: AE		Semester :		Forth	
Duration: 17 Weeks		Maximum Marks :		150 Marks	
Teaching Scheme :		Examination Scheme : Theoretical			
Theory: 3 hrs / week		Internal Examination :		20 Marks	
Tutorial: Nil		TA (Attendance, Assignment, Interaction etc.) :			
				10 Marks	
Practical: 3 hrs / week		End Semester Exam :		70 Marks	
Credit : 4					
<b>Aim:</b>					
<ul style="list-style-type: none"> <li>• To impart knowledge on advanced engine technologies.</li> <li>• To impart knowledge on the alternative energy sources and fuels of future.</li> <li>• To impart knowledge on certain features like MPFI, CRDI and hybrid drives.</li> <li>• To impart knowledge on to diagnose engine condition including on-board diagnosis and stand-alone diagnosis.</li> </ul>					
<b>Objectives:</b>					
Students will be able to :					
<ul style="list-style-type: none"> <li>➤ Compare the properties of SI and CI engines fuel.</li> <li>➤ Understand, describe and draw the stages of combustion in SI and CI engines.</li> <li>➤ Understand and describe the pollutants emitted from S.I. and C.I. engines,</li> <li>➤ Understand least emission norms and describe the methods of pollution control.</li> <li>➤ Understand the drive cycle for measurement of pollutants.</li> </ul>					
<b>Pre-requisite :-</b>					
<ul style="list-style-type: none"> <li>✓ Fundamental concept of working of engine and different essential systems for it's working.</li> <li>✓ Fundamental concept of fuel feed system both for S.I &amp; C.I engine.</li> </ul>					
<b>Examination Scheme:</b>					
Group	Chapter	Objective Questions			Total Marks
		To be Set	To be Answered	Marks per Question	
A	01,02,03 & 04	10	20	01	20 x 1 = 20
B	05	06			
C	06	04			
Group	Chapter	Subjective Questions			Total Marks
		To be Set	To be Answered	Marks per Question	
A	01,02,03 & 04	05	Any five	10	10 x 5 = 50
B	05	03			
C	06	02			
<b>Content [Theory] :</b>					
Chapter	Name of the Topic			Hours	Marks
	<b>Fuels and Alternative Energy Options for Auto Engines:</b>				

01	1.1 Different types of fuels and their comparative calorific value. 1.2 Properties of S.I. Engine fuel and C.I. Engine fuel. Octane number & Cetane number. 1.3 Fuel additives and their effects. 1.4 Gaseous fuels- LPG, CNG, Alcohol, Bio-Diesel, Hydrogen. 1.5 LPG as SI engine fuel & LPG kit. 1.6 Alcohol and gasoline fuel blend. 1.7 Alcohol as CI engine fuel & it's effect. 1.8 Compressed Natural gas as a Transport (Diesel) fuel & CNG Kit. 1.9 Electric cars and hybrid vehicles.	07	--
02	<b>Scavenging:</b> 2.1 Introduction- Scavenging, Theoretical scavenging process – perfect scavenging, perfect mixing & short circuiting. 2.2 Types of scavenging – uniflow, cross flow and loop or reverse scavenging. Scavenging pumps.	03	
03	<b>Theory of Combustion:</b> 3.1 Ignition limits. 3.2 Combustion theory in S.I. Engine. 3.3 Stages of combustion in SI engine 3.4 Ignition lag and Flame propagation, its' effect on engine variables. 3.5 Abnormal combustion- Detonation, pre-ignition, surface Ignition. 3.6 Effects of detonation on engine performance & it's control. 3.7 SI engine combustion Chambers, types, construction & function. 3.8 Combustion theory in C.I. Engine. 3.9 Stages of combustion in CI engine. 3.10 Air Fuel ratio in Diesel engines 3.11 Delay period [physical delay & chemical delay] – significance and variables affecting delay period. 3.12 Diesel knock and its control. 3.13 Difference between knocking phenomena in S.I. and C.I. Engines. 3.14 Factors that affect the design of CI engine combustion chamber. 3.15 CI engine combustion chambers, types, construction & function.	09	--
04	<b>Supercharging:</b> 4.1 Supercharging, purpose of supercharging, supercharging on S.I. & C.I. Engines. 4.2 Effect of supercharging on power, efficiency and fuel consumption and its limitations on S.I. & C.I. engine. 4.3 Advantages of supercharging on C.I. engines over S.I. engines. 4.4 Types & Methods of Supercharging, Turbo charging & its' use.	04	

05	<b>Part-I 5.1</b>	<b>Computer Controlled Fuel-Injection System [petrol engine]:</b> 5.1.1 Necessity of petrol injection system, types of petrol injection System. 5.1.2 Throttle body injection (TBI) system/ Multi-Point fuel Injection system (MPFI) comparison with Carbureted engine fuel supply system. 5.1.3 Multi-Point fuel Injection system (MPFI)/ Port fuel injection (PFI) system. Types of injection sequential, grouped and simultaneous injections. Comparison of MPFI and TBI systems. 5.1.4 Electronic control module (ECM) control functions. 5.1.5 Inputs and outputs of electronic control module (ECM). 5.1.6 Output control functions- Fuel Injection control, Spark advance control, Idle speed control, Exhaust gas recirculation control and other controls.	<b>08</b>	--
	<b>Part-II 5.2</b>	<b>Computer Controlled Fuel-Injection System [Diesel engine]:</b> 5.2.1 Construction and working of electronic fuel Injector and in-tank fuel pump. 5.2.2 Diesel Engine Glow plugs Construction and circuit. Electronic injection advance. 5.2.3 Common rail direct injection [CRDI] system. Features of CRDI system. Block diagram of CRDI system. 5.2.4 Major Components- Fuel injector, EDC Electronic diesel control unit, High pressure fuel pump, High pressure accumulator and input from sensors (Camshaft position, coolant temp., Intake air temperature, crankshaft speed, Boost pressure, Rail pressure sensor, Air Mass meter)-function & identification. 5.2.4 CRDI System operation and advantages.	<b>08</b>	--
06		<b>Fuel Economy, Air pollution and Emission Control :</b> 6.1 Fuel economy standards and methods of improving fuel economy. 6.2 Sources of engine emissions. 6.3 Emissions from Petrol engines. 6.4 Factors that affect the Petrol engine emissions. 6.5 Effect of engine maintenance on exhaust emission. 6.6 Emissions from Diesel engines. 6.7 Factors that affect the Diesel engine emissions. 6.8 Comparison of diesel and gasoline emissions. 6.9 Emission control system for S.I. and C.I. engines – Catalytic Converter, Positive Crankcase Ventilation (PCV), Evaporation loss control device ( ELCD ) by charcoal canister, Exhaust Gas Re-circulation ( EGR ) method, Exhaust gas analyser – Smoke meter, Diesel smoke, Blue and Black smokes, Odour & Particulates and control. 6.10 Effects of emissions [Unburnt hydrocarbon, carbon monoxide, Nitric oxide, Lead particulate, Diesel Particulate Matter, Photo chemical Smog & Poly nuclear aromatic hydrocarbon etc.] on environment and human beings. 6.11 Euro Norms and Bharat stage Norms on engine emissions.	<b>09</b>	--
<b>Total</b>			<b>48 hrs.</b>	<b>70 marks</b>

<b>Total Classes</b>		17 weeks [51 lecture hrs]
<b>Practical :</b>		
<b>Sl. No.</b>	<b>Skills to be developed</b>	
<b>01</b>	<b>Intellectual Skills:</b> <ul style="list-style-type: none"> <li>▪ Identify types of combustion chamber.</li> <li>▪ Locate faults in MPFI system.</li> <li>▪ Identify components of electronic fuel injection system (EFI).</li> <li>▪ Diagnose EFI system.</li> <li>▪ Diagnose engine condition from exhaust gas analysis. To interpret results.</li> </ul>	
<b>02</b>	<b>Motor Skills:</b> <ul style="list-style-type: none"> <li>○ Observe &amp; Sketch combustion chamber.</li> <li>○ Observe EFI system components &amp; their locations.</li> <li>○ Use diagnostic tester for Electronics fuel injection system diagnosis.</li> <li>○ Set carburetor for proper / reduced exhaust emission.</li> <li>○ Set valve clearance by adopting proper procedure.</li> <li>○ Draw valve-timing diagram.</li> </ul>	
<b>Examination Scheme : Practical</b>		<b>Maximum Marks : 50</b>
<ul style="list-style-type: none"> <li>• <b>Continuous Internal Assessment:</b> - 25 marks.</li> </ul> I) Attending classes, practicing problems & submitting respective assignment in time = 20 marks. II) Viva-Voce = 05 marks III) Total (I + II) = 25 Marks. <ul style="list-style-type: none"> <li>• <b>External Assessment:</b> - 25 marks.</li> </ul> <b>Examiner :</b> External Teacher.		
<b>List of Practicals:</b>		<b>Total periods: 48 hrs.</b>
<b>Skills to be developed :</b> <ol style="list-style-type: none"> <li><b>1. Study of Cylinder Head and Combustion Chamber Identification:</b> [Using one 4-S (both Petrol &amp; Diesel) engine and one 2-S engine]           <ol style="list-style-type: none"> <li>a) Removal of cylinder head of an engine. Observation of combustion chamber, location of valves, spark plug or Injector.</li> <li>b) Procedure to Decarbonise, cleaning of combustion chamber and refit.</li> <li>c) Interpret the type of combustion chamber. Sketch them and describe the construction. State the characteristics of the combustion chamber.</li> <li>d) Check the valve-valve seats for leakage. Check the condition of Spark Plug or fuel injector. Check the glow plug operation.</li> </ol> </li> <li><b>02 Valve Clearance Adjustment and Valve Timing Investigation:</b> <ol style="list-style-type: none"> <li>a) Perform Tappet setting of a single cylinder four-stroke engine.</li> <li>b) Perform Tappet setting of a multi cylinder four-stroke engine.</li> <li>c) Construct the Port timing diagram of a two- stroke engine.</li> <li>d) Construct the Valve timing diagram of a four-stroke engine.</li> </ol> </li> <li><b>03 Electronic Fuel Injection System troubleshooting /diagnosis: [with visit to a modern service station].</b>            Diagnose Electronic fuel Injection system with diagnostic tester/ engine scanner.           <ol style="list-style-type: none"> <li>a) Perform On-Board diagnosis.</li> <li>b) Use Engine scanning tool for diagnosis.</li> <li>c) Locate various Components of Electronic fuel injection system.</li> <li>d) Identify components of EFI system.</li> <li>e) Perform stand –alone diagnosis using a Multi-meter and test lamp.</li> </ol> </li> </ol>		

**04. Exhaust Gas Analysis:**

- a) Perform Exhaust gas analysis of an engine exhaust.
- b) Diagnose engine condition from exhaust gas analysis.

**Notes:** All the practical / testing should be performed by the students in batches.

**Learning Resources :****Text Books :**

<b>Author</b>	<b>Title</b>	<b>Publisher</b>
Dr. Kirpal Singh	Automobile Engg. Vol.-2	Standard Publishers
R.B. Gupta	Automobile Engineering	Satya Prakashan
Crouse & Angline	Automotive Mechanics	Tata McGraw Hill
M.L Mathur & R.P.Sharma	A Course in Internal Combustion engine	Dhanpat Rai Publication
Joseph Heitner	Automotive Mechanics	East West Press, New Delhi
John B. Heywood	Internal Combustion Engine Fundamentals	McGraw-Hill International Edition
Identified Experts	Santro & Accent Basic training Book	Hyundai Motors India Ltd.
Identified Experts	Service Manuals of all Euro –II Vehicles.	Maruti motors India Ltd.



### Automobile Transmission System

<b>Name of the Course : Diploma in Automobile Engineering</b>			
Course Code: AE	Semester :		Forth
Duration: 17 Weeks	Maximum Marks :		150 Marks
Teaching Scheme :		Examination Scheme : Theoretical	
Theory: 3 hrs / week	Internal Examination :		20 Marks
Tutorial: Nil	Attendance, Assignment & Interaction : 10 Marks		
Practical: 2 hrs / week	End Semester Exam :		70 Marks
Credit : 4			
<b>Aims :</b>			
<ul style="list-style-type: none"> <li>• To impart knowledge of various components of the transmission train.</li> <li>• To impart knowledge concerned to the power transmission phenomenon and improving the performance of vehicles.</li> </ul>			
<b>Objectives:</b>			
Students will be able to:			
1. Know the principle, construction and working of elements of transmission system.			
2. Understand construction and working of various types of clutches.			
3. Understand construction and principle of working of various types of Gear Boxes.			
4. Understand working of final drive and differential action.			
Pre-requisite :-			
<b>Content [Theory] :</b>			
Chapter	Name of the Topic	Hours	Marks
01	<b>Automobile Clutches:</b> 1.1 Introduction, necessity, function and requirements of automotive Clutch. 1.2 Types of Automotive Clutch. - Friction and Non friction type Clutches. 1.3 Construction and Operation of Different type of clutches : 1.3.1 Construction and Operation of a single plate (coil and Diaphragm) dry disc clutch, multi plate, wet clutch. 1.3.2 Centrifugal and Semi-Centrifugal Clutch. 1.4 Construction details of Clutch plate. Clutch lining materials, Pressure Springs, Torsional Springs. 1.5 Clutch Linkage, Clutch Adjustments. Self Adjusting Clutch & Clutch Free Pedal Play. 1.6 Clutch operating mechanisms- Mechanical, Hydraulic & Vacuum. 1.7 Fluid Coupling – Principle, Construction and Working. 1.8 Common faults and remedies.	12	--

02	Part-I 2.1	<b>Transmissions and Transaxles [Manual]:</b> 2.1.1 Manual Transmissions and Transaxles, its'difference. 2.1.2 Purpose of the Transmission / Transaxle, Gear ratio and Torque. 2.1.3 Function and types of [Transmission] Gear Boxes - Sliding Mesh, Constant Mesh, Synchromesh gear box - Construction, operation of each type, Power flow diagram and comparison among them. 2.1.4 Forward and Reverse Gear Ratio of different vehicles. 2.1.5 Gear selector mechanism with gear lever on top of gear box. 2.1.6 Transfer case, function, construction & power flow layout. 2.1.7 Lubrication of gear box. 2.1.8 Common faults and remedies.	08	--
	Part-II 2.2	<b>Transmissions and Transaxles [Automatic]:</b> 2.2.1 Elements of Automatic Transmission. 2.2.2 Principle of Epi-cyclic Gearing. 2.2.3 Function, Construction & Working of Three member Epi-cyclic Gear box. 2.2.4 Torque Converter- Construction and working and application. 2.2.5 Freewheel Mechanism (Overrunning Clutch),Overdrive Mechanism. 2.2.6 Semi-Automatic Transmission, Control System. 2.2.7 Comparison with Conventional Transition System.	07	--
03		<b>Universal Joints and Propeller shaft:</b> 3.1 Necessity of Universal Joints. 3.2 Functions of universal joint and slip joint. 3.3 Types of Universal Joints, Constructional details of Universal Joint, Limitation of Universal Joint. 3.4 Constant Velocity Rezappa and Tripod Joint. 3.5 Necessity of Propeller shaft. 3.6 Function and constructional features of Propeller Shaft. 3.7 Whirling of shaft, Two-piece Propeller Shaft. 3.8 Common faults and remedies.	07	--
04		<b>Final Drive and Differential :</b> 4.1 Necessity of Final Drive. 4.2 Types of Gears used for Final Drive & their comparison. 4.3 Final Drive Ratio & Overall Gear Ratio. Final drive ratio of different types of vehicles. 4.4 Differential - Necessity of Differential. 4.5 Construction and working of differential. 4.6 Differential lock & Differential Slip. 4.7 Common troubles and remedies.	06	--

05	<b>Rear Axle &amp; Rear Axle Drive:</b> 5.1 Necessity of Rear Axle. 5.2 Loads acting on the rear axles. 5.3 Types of rear axles [construction & working]- Semi floating, Three quarter floating and Full floating type. 5.4 Rear axle casing- split and banjo type, double reduction axles. 5.5 Rear Axle Drive –Types, construction and working principle of Hotchkiss Drive & Torque Tube Drive, its' use.	08	
<b>Total</b>		<b>48 hrs</b>	<b>70 Marks</b>
<b>Total Classes</b>		17 weeks [51 lecture hrs]	
<b>Practical :</b>			
<b>SL. No.</b>	<b>Skills to be developed</b>		
01	<b>Intellectual Skills:</b> <ul style="list-style-type: none"> <li>● Select hand tools and special tools.</li> <li>● Identify parts like clutch, gear box, universal joints, propeller shaft, final drive. Understand the Construction and working of Clutch, Gear Box, Propeller Shaft and Differential.</li> </ul>		
02	<b>Motor Skills:</b> Students will be able to: <ul style="list-style-type: none"> <li>✓ Sketch the different components of transmission system.</li> <li>✓ Use of hand tools, equipments, instruments.</li> <li>✓ Dismantle and assemble various transmission systems.</li> </ul>		
<b>Examination Scheme : Practical</b>		<b>Maximum Marks : 50</b>	
<ul style="list-style-type: none"> <li>● <b>Continuous Internal Assessment:</b> - 25 marks.</li> </ul> I) Attending classes, doing practicals & submitting respective practical report in time = 20 marks. II) Viva-Voce = 05 marks III) Total (I + II) = 25 Marks. <ul style="list-style-type: none"> <li>● <b>External Assessment:</b> – 25 marks.</li> </ul> <b>Examiner :</b> External Teacher.			
<b>List of Practicals:</b>		<b>Total Periods: 32 hrs.</b>	
<b>Skills to be developed :</b>			
<ol style="list-style-type: none"> <li>1. Understand the layout, of “Vehicle Layout and Automobile Transmission System laboratory” and make use of various tools and measuring devices, write their specifications, application and care to be taken while using the same.</li> <li>2. Observe and draw vehicle transmission layout of the following types:               <ul style="list-style-type: none"> <li>● Two wheeler</li> <li>● Three wheeler</li> <li>● Four wheeler</li> </ul> </li> <li>3. Dismantle and assemble a single plate dry type clutch assembly, to understand it's construction and working. Sketch and label the components.</li> <li>4. Dismantle and assemble a Multi-plate clutch assembly used in Two Wheelers, to understand its construction and working. Observe the operating linkages and sketch the system.</li> <li>5. Dismantle and assemble a Synchronesh gear box, to understand its construction and</li> </ol>			

working. Observe gear shifting (synchronizing action), draw power flow diagrams, and calculate gear ratios.

6. Dismantle and assemble a Propeller shaft, Slip joint and Universal Joint, to understand their construction and working. Sketch the same.
7. Dismantle and assemble the Differential and Rear axle, to understand its construction and working. Sketch the unit showing the exact location of the bearings. Find the gear ratio of final drive and identify the type of dismantled Rear axle.
8. Dismantle and assemble various-drive. Observe its' construction and working. List the components dismantled and draw its' sketches.

**Notes:**

- 1) Each practical should be conducted with a small group of batch of students.
- 2) A number of practicals may be conducted simultaneously.

**Examination Scheme: Theoretical**

Group	Chapter	Objective Questions			Total Marks
		To be Set	To be Answered	Marks per Question	
A	01	04	Any twenty	01	20 x 1 = 20
B	02	06			
C	03, 04 & 05	10			

Group	Chapter	Subjective Questions			Total Marks
		To be Set	To be Answered	Marks per Question	
A	01	2	Any five	10	10 x 5 = 50
B	02	3			
C	03, 04 & 05	5			

**Learning Resources :**

**Text Books :**

Author	Title	Publisher
Dr. Kirpal Singh	Automobile Engg. Vol.-1	Standard Publishers
R.B. Gupta	Automobile Engineering	Satya Prakashan
Crouse & Angline	Automotive Mechanics	Tata McGraw Hill
Joseph Heitner	Automotive Mechanics	East West Press, New Delhi
John B. Heywood	Internal Combustion Engine Fundamentals	McGraw-Hill International Edition
Automotive Mechanics	N.K. Giri vol-2	Khanna Publishers, New Delhi
K.K. Ramlingam	Automobile Engineering	Scitech Publications
Newton & Steed	Motor Vehicle	Butterwork Publication
Auther W. Judge	Modern Transmission System	Chapman & Hall Ltd. London
Auther W. Judge	Motor Manuals, Vol I to VI	Rober Bently Inc, Cambridge
P.M. Heldt	The Automotive Chassis	Chilton Company, New York



## Automobile Manufacturing Process

<b>Name of the Course : Diploma in Automobile Engineering</b>			
Course Code: AE	Semester : Forth		
Duration: 17 Weeks	Maximum Marks : 150 Marks		
Teaching Scheme :	Examination Scheme : Theoretical		
Theory: 3 hrs / week	Internal Examination :		20 Marks
Tutorial: Nil	TA (Attendance, Assignment, Interaction etc.):		10 Marks
Practical: 2 hrs / week	End Semester Exam :		70 Marks
Credit : 4			
<b>Aims :</b>			
<ul style="list-style-type: none"> <li>• To impart knowledge to various manufacturing process relevant to Auto industries.</li> <li>• To impart knowledge of CNC machine &amp; to apply CNC programs in product manufacturing.</li> </ul>			
<b>Objectives:</b>			
Students will be able to:			
1. Know the forging process and it's use in manufacturing automobile parts.			
2. Know the different press tools and their operations.			
3 Understand different welding processes used in industry.			
4. Selection and applications of different surface cleaning and coating processes.			
5. Know the different methods of surface finishing.			
6. Know about sub-systems of CNC machines.			
Pre-requisite :-			
<b>Content [Theory] :</b>			
<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hours</b>	<b>Marks</b>
01	<b>Forging and Rolling:</b> 1.1 Introduction. Forgeable materials and forgeability. 1.2 Classification of Forging process. 1.3 Advantages and limitation of forging process. 1.4 Forging by open and closed dies. 1.5 Forging sequences for Auto components - Connecting rod, Crankshaft, camshaft, spanner and gears. 1.6 Principles of rolling. Hot and cold rolling. 1.7 Types of rolling mills & Methods of rolling. 1.8 Rolled metal used in automobiles components.	<b>07</b>	
02	<b>Press and press work:</b> 2.1 Introduction. 2.2 Materials used in press work for automobile applications. 2.3 Classification of presses and terminology used in presses. 2.4 Major parts of mechanical press and their functions. 2.5 Press tools: Parts of standard die set. 2.6 Die accessories- Pilots, Stops, Strippers, Pressure pads and Knock	<b>10</b>	

	<p>outs.</p> <p>2.7 Types and construction of dies—Simple, progressive, compound and combination die.</p> <p>2.8 Press Operations : Punching, piercing, blanking, forming, drawing.</p> <p>2.9 Pressed components used in automobiles.</p>		
03	<p><b>Welding processes:</b></p> <p>3.1 Introduction. Classification and selection of welding process.</p> <p>3.2 Working principle of gas welding and types of flames.</p> <p>3.3 Oxy and acetylene cutting – Arc cutting.</p> <p>3.4 Arc welding process [principle, Equipment, Applications]: Metal Arc, TIG and MIG.</p> <p>3.5 Resistance welding: Spot, Projection, Seam and Butt welding.</p> <p>3.6 Aluminium and cast iron welding.</p> <p>3.7 Brazing and Soldering.</p> <p>3.8 Introduction to Plasma arc welding, specific application pertaining to auto industry. Safety practices in welding.</p> <p>3.9 Types of welded joints– merits and demerits of welded joints.</p> <p>3.10 Defects, Inspection and testing of welded joints – Destructive and Non destructive types of tests, Magnetic particle test, Radiographic and ultrasonic test.</p>	12	--
04	<p><b>Surface Treatment and finishing process:-</b></p> <p>4.1 Selection and use of surface treatment and finishing operations.</p> <p>4.2 Surface cleaning process: Blasting, Tumbling, Alkaline, Acid and Electrolytic cleaning.</p> <p>4.3 Metal surface coating : Electroplating, Galvanizing and Metal spraying,</p> <p>4.4 Surface finishing process: Lapping, Honing, Super finishing, Buffing, Burnishing.</p> <p>4.5 Applications (in auto industry), advantages and limitations.</p>	07	
05	<p><b>Powder Metallurgy :</b></p> <p>5.1 Introduction.</p> <p>5.2 Methods of manufacturing metal powders – Atomization, Reduction and electrolysis deposition – compacting – sintering –sizing –Infiltration.</p> <p>5.3 Rules of the powder metallurgy process.</p> <p>5.4 Mechanical properties of parts made by powder metallurgy.</p> <p>5.5 Applications in Auto industry.</p>	04	
06	<p><b>Introduction to CNC machines:-</b></p> <p>6.1 NC and CNC machines.</p> <p>6.2 Difference between conventional machines and CNCs.</p> <p>6.2 Classifications of CNC machines.</p> <p>6.3 Advantages and Disadvantages of CNC machines.</p> <p>6.4 Working principle of CNC machines.</p> <p>6.5 Principle of Computer aided part programming.</p> <p>6.6 Simple part programming on CNC machine for operations like Turning, Drilling and Milling.</p>	08	
<b>Total</b>		<b>48 hrs</b>	<b>70 Marks</b>

<b>Total Classes</b>					<b>17 weeks</b> <b>[51 lecture hrs]</b>	
<b>Practical :</b>						
<b>SL. No.</b>	<b>Skills to be developed</b>					
01	<b>Intellectual Skills:</b> <ul style="list-style-type: none"> <li>• Understand the different types of press and welding components.</li> <li>• Know the different types of programming codes.</li> </ul>					
02	<b>Motor Skills:</b> Students will be able to: <ul style="list-style-type: none"> <li>✓ prepare given job on milling machine.</li> <li>✓ use press machine to produce various auto components.</li> <li>✓ prepare job by welding process.</li> <li>✓ To select &amp; identify the welding / casting defects by non-destructive testing.</li> <li>✓ produce a job on CNC turning center.</li> </ul>					
<b>Examination Scheme : Practical</b>					<b>Maximum Marks : 50</b>	
<ul style="list-style-type: none"> <li>• <b>Continuous Internal Assessment:</b> - 25 marks.</li> </ul> I) Attending classes, doing practicals & submitting respective practical report in time = 20 marks. II) Viva-Voce = 05 marks III) Total (I + II) = 25 Marks. <ul style="list-style-type: none"> <li>• <b>External Assessment:</b> - 25 marks.</li> </ul> <b>Examiner :</b> External Teacher.						
<b>List of Practicals:</b>					<b>Total Periods : 32 hrs.</b>	
<b>Skills to be developed :</b>						
<ol style="list-style-type: none"> <li>1. One job involving different milling operations such as key way cutting, gear cutting by indexing in a batch.</li> <li>2. Study, sketch and measurement by Micrometer, Vernier Caliper, Vernier Height Gauge, Bore Dial Gauge &amp; Dial Indicator.</li> <li>3. One welding job (Arc/TIG/MIG/Resistance) to show the working principle of welding.</li> <li>4. One simple part programming job on CNC machine. One job on CNC lathe having plain turning, taper turning, step turning, threading, boring and grooving.</li> <li>5. Nondestructive testing of one or two defective casting / welding product- select &amp; identify the types of testing procedure needed.</li> </ol>						
<b>Note:</b> All practical should be done in batches.						
<b>Examination Scheme:</b>						
Group	Chapter	Objective Questions			Total Marks	
		To be Set	To be Answered	Marks per Question		
A	01 & 02	08	Any twenty	01	20 x 1 = 20	
B	03 & 04	08				
C	05 & 06	04				
Group	Chapter	Subjective Questions			Total Marks	
		To be Set	To be Answered	Marks per Question		
A	01 & 02	4				



<b>B</b>	<b>03 &amp; 04</b>	<b>4</b>	<b>Any five</b>	<b>10</b>	<b>10 x 5 = 50</b>
<b>C</b>	<b>05 &amp; 06</b>	<b>2</b>			

**Learning Resources :**

**Text Books :**

<b>Author</b>	<b>Title</b>	<b>Publisher</b>
S. K. Hajra choudhury.	Elements of Workshop Technology, Vol. - I and II	Media Promoters and Publishers Pvt. Ltd.
R. K. Jain	Production Technology	Khanna Publishers. Delhi.
P.N.Rao	CAD/CAM Principles and applications	Tata McGraw-Hill Publishing Co. Ltd. New Delhi.
N.K. Chougule	CAD/CAM/CAE	Scietech
P.N.Rao	Manufacturing Technology, Vol-I & II	The McGraw Hill companies
B.S. Raghuwanshi	Workshop Technology	Danpat Rai & Co.
N.V.Raghavendra L. Krishnamurty	Engineering Metrology And Measurements	Oxford
Ref: DeGarmo, Black & Kohser	Materials And Processes in Manufacturing	Collier Macmillan

## Theory of Machine & Mechanism(AE)

<b>Name of the Course : Diploma in Automobile Engineering</b>			
Course Code: AE	Semester : Sixth		
Duration: 17 Weeks	Maximum Marks : 125 Marks		
Teaching Scheme :		Examination Scheme : Theoretical	
Theory: 3 hrs / week	Internal Examination :		20 Marks
Tutorial: 1 hr / week	Attendance, Assignment & Interaction : 10 Marks		
Practical: Nil	End Semester Exam :		70 Marks
Credit : 3	Term Work:		25 Marks
<b>Aims :</b>			
<ul style="list-style-type: none"> <li>• To impart knowledge of fundamentals of machine and mechanism.</li> <li>• To impart knowledge to understand the mechanisms from operational point of view in a better way.</li> <li>▪ To impart knowledge to identify and interpret various elements of machines in day to day life.</li> </ul>			
<b>Objectives:</b>			
Students will be able to:			
<ol style="list-style-type: none"> <li>1. Understand different machine elements and mechanisms.</li> <li>2. Understand Kinematics and Dynamics of different machines and mechanisms.</li> <li>3. Draw cam profile suitable to various displacement diagram.</li> <li>4. Select Suitable Drives and Mechanisms for a particular application</li> <li>5. Understand the function, operation and application of flywheel and governor.</li> <li>6. Understand the function, operation and application of brake, dynamometer, clutch and bearing</li> </ol>			
<b>Pre-requisite:-</b>			
Knowledge of fundamentals of mechanics.			
<b>Content [Theory] :</b>			
Chapter	Name of the Topic	Hours	Marks
<b>01</b>	<b>Fundamentals and type of Mechanisms:</b> 1.1 Kinematics of Machines:- Definition of Kinematics, Dynamics, statics, Kinetics, Kinematic link, Kinematic pair and its types, constrained motion and its types, Kinematic chain and its types, Mechanism, inversion, machine and structure. 1.2 Inversion of Kinematic Chain: Inversion of four bar chain mechanism, coupled wheels of Locomotive & Pantograph. 1.3 Inversion of single slider Crank chain –Slider Crank Mechanism, hand pump, Rotary I.C. Engine mechanism, Whitworth quick return mechanism. Crank and slotted link mechanism of shaper. 1.4 Inversion of Double Slider Crank Chain- Double Slider Crank Mechanism, Scotch Yoke Mechanism, and Oldham’s coupling.	<b>09</b>	<b>--</b>

<b>02</b>	<b>Velocity of a point in Mechanism:</b> 2.1 Concept of relative velocity of a point on a link, Relation between linear and angular velocity. 2.2 Determination of velocity of a point in 4-bar link mechanism & slider crank mechanism by relative velocity method and Instantaneous centre method (use graphical method only).	07	
<b>03</b>	<b>Cams and Followers:</b> 3.1 Concept, definition and applications of Cams and Followers. 3.2 Cam Terminology. Classification of Cams and Followers. 3.3 Different follower motions and their displacement diagrams – Uniform velocity, Simple harmonic motion, uniform Acceleration and Retardation. 3.4 Drawing of profile of radial cam with knife-edge and roller follower with and without offset with reciprocating motion (graphical method only)	08	
<b>04</b>	<b>Power Transmission:</b> 4.1 Types of Drives: Belt, Chain, Rope, Gear drives & their comparison. 4.2 Belt Drives- flat belt, V-belt & its applications, material for flat and V-belt, selection of belts. 4.3 Flat belt: angle of lap, length of belt, Slip and creep. 4.3.1 Determination of velocity ratio of tight side and slack side tension, centrifugal tension and initial tension, condition for maximum power transmission (Simple numerical on flat belt). 4.4 Chain Drives- Types of chains and sprockets, velocity ratio. 4.5 Advantages & Disadvantages of chain drive over other drives, Selection of Chain & Sprocket wheels, methods of lubrication. 4.6 Gear Drives – Classification of gears, Law of gearing, Spur gear terminology. 4.7 Gear Trains, Types of gear trains, their selection for different applications, methods of lubrication. 4.8 Train value & velocity ratio for simple, compound, reverted and simple epicyclic gear trains, Power transmitted by gears.	12	
<b>05</b>	<b>Flywheel and Governors:</b> 5.1 Flywheel –Concept, function and application of flywheel with the help of turning moment diagram for single cylinder 4-S I.C Engine. Coefficient of fluctuation of energy, coefficient of fluctuation of speed and its significance.(simple problems using crank effort diagram) 5.3 Governors- Types, concept, function and application & Terminology of Governors (simple problems on watt & Porter governor) 5.4 Comparison between Flywheel and Governor.	08	
<b>06</b>	<b>Brakes:</b> 6.1 Type of brakes, Function of brakes. 6.2 Construction and working i) shoe brake, ii) Band brake iii) Internal expanding shoe brake. 6.3 Numerical problems to find braking force and braking torque	05	

	and power for shoe and band brake.		
<b>07</b>	<b>Clutches and Bearings:</b> 7.1 Clutches- Uniform pressure and Uniform Wear theories. 7.2 Function of Clutch and its application, Types of clutch, Simple numericals on single and Multiplate clutches. 7.3 Bearings- i) Simple Pivot, ii) Collar Bearing iii) conical pivot. 7.4 Torque and power lost in friction. (w.o derivation, Simple numericals)	07	
<b>08</b>	<b>Balancing &amp; Vibrations:</b> 8.1 Concept of balancing. Static and Dynamic balance, Balancing of single rotating mass. Graphical methods for balancing of several masses revolving in same plane & different planes. 8.2 Introductory concept of balancing of reciprocating masses. 8.3 Concept and terminology used in Vibration, causes of vibrations in machines & their harmful effects and remedies.	08	
<b>Total</b>		<b>64 hrs</b>	<b>70 Marks</b>
<b>Total Classes</b>		17 weeks [51 lecture hrs]	
<b>Term Work:</b>		<b>Total Marks =25</b>	
<b>Examination scheme:</b> Continuous internal Sessional assessment. I) Attending classes, practicing problems & submitting assignments in time = 20 Marks. II) End sem. viva-voce = 05 Marks. III) Total (I+II) = 25 Marks.			
<b>List of Assignment:</b>			
<ol style="list-style-type: none"> <li>1) Sketch and describe the working of the following mechanisms with its application, <ol style="list-style-type: none"> <li>a) Bicycle free wheel sprocket mechanism.</li> <li>b) Ackerman's steering gear mechanism.</li> </ol> </li> <li>2) Determination of velocity at a point of various links of the given mechanism, by relative velocity method (at least two problems graphically).</li> <li>3) Determination of velocity at a point by instantaneous centre method in an I. C. engine's slider crank mechanism. (at least two problems)</li> <li>4) Draw the profile of a radial cam with knife edge and roller follower with &amp; without offset with reciprocating motion.(two problems)</li> <li>5) Draw a schematic diagram of centrifugal governor (porter) and describe its working. Draw a graph between radius of rotation versus speed of governor to understand its function.</li> <li>6) Determine graphically balancing of several masses rotating in a single plane &amp; in several planes. (graphically)</li> <li>7) Determine mass of flywheel using crank effort diagram.</li> <li>8) Numerical problems to find braking force and braking torque for shoes &amp; band brake.(two problems)</li> <li>9) Simple numericals on single and Multiplate clutches. (two problems)</li> <li>10) Determine Torque and power lost in friction for- i) Simple Pivot, ii) Collar Bearing iii) conical pivot.</li> <li>11) Numerical on power transmitted by flat belt drive by a pulley.</li> </ol>			
Notes:			
✓ All the above assignments will be given to the students time to time by the class teacher to			

- ✓ solve, prepare a note book and submit it in time for continuous evolution.  
 ✓ At the end of the semester one final oral assessment will be conducted.

**Examination Scheme: Theoretical**

Group	Chapter	Objective Questions			Total Marks
		To be Set	To be Answered	Marks per Question	
A	01, 02 & 03	06	Any twenty	01	20 x 1 = 20
B	04 & 05	06			
C	06, 07 & 08	06			

Group	Chapter	Subjective Questions			Total Marks
		To be Set	To be Answered	Marks per Question	
A	01, 02 & 03	03	Any five	10	10 x 5 = 50
B	04 & 05	03			
C	06, 07 & 08	03			

**Learning Resources :**

**Text Books :**

Author	Title	Publisher
Khurmi Gupta	Theory of Machines	Eurasia publishing House Pvt. Ltd. 2006 edition
S.S. Rattan	Theory of Machines	McGraw Hill companies, II Edition
P.L. Ballaney	Theory of Machines	Khanna Publication
Jagdishlal	Theory of Machines	Bombay metro-politan book limited
Sadhu Singh	Theory of Machines	Pearson
Ghosh – Mallik	Theory of Machines	Affiliated East west press
Thomas Bevan	Theory of Machines	Pearson
J.E. Shigley	Theory of Machines	Oxford
	Theory of Machines	

## Heat Power Engineering Laboratory

<b>Name of the Course: Diploma in Automobile Engineering</b>	
Course Code: AE	Semester: Forth
Duration: 17weeks	Maximum Marks: 50 [Practical]
Teaching Scheme :	Examination Scheme : [Practical]
Theory: Nil	Continuous Internal Examination : 25 Marks
Tutorial: Nil	End Semester External Exam.: 25 Marks
Practical: 2 hrs./week	End Semester Exam. [Theory]: Nil
Credit: 1	
<b>Skills to be developed [Practical] :</b>	
<b>Intellectual Skills:</b>	
<ul style="list-style-type: none"> <li>• Describe the locations of components.</li> <li>• Analyse the functioning of systems and respective components.</li> <li>• Describe the direction flow of fluids and work.</li> <li>• Analyse the parameters affecting safety and efficiency of devices.</li> </ul>	
<b>Motor Skills:</b>	
<ul style="list-style-type: none"> <li>➤ Proper use of tools.</li> <li>➤ Practice of safe working procedures.</li> <li>➤ Variations in parameters affecting efficiency.</li> </ul>	
<b>Examination Scheme : Practical</b>	
<b>Total Marks : 50</b>	
<ul style="list-style-type: none"> <li>• <b>Continuous Internal Assessment:</b> - 25 marks.</li> </ul> <p>I) Attending classes, doing practicals &amp; submitting respective practical note book in time = 20 marks.            II) End Sem. viva-voce = 05 marks            III) Total (I + II) = 25 Marks.</p> <ul style="list-style-type: none"> <li>• <b>External Assessment:</b> - 25 marks.</li> </ul> <p><b>Examiner :</b> External Teacher (Lect.)</p>	
<b>List of Practicals :</b>	
<b>Total Periods : 32 Hrs.</b>	
<b>Sl. No.</b>	<b>Name of the Experiments/ Study</b>
01	Study of Boiler & Boiler parts (Both Fire Tube & Water Tube). [2 hrs.]
02	Study of Pr. Gauge, Vacuum gauge & their construction. [2 hrs.]
03	Study of valve setting diagram of Petrol engine / Diesel engine. [4 hrs.]
04	Calculation of thermal conductivity of a solid metallic rod. [2 hrs.]
05	Dismantling and assembling of one reciprocating and one rotary compressor. [6 hrs.]
06	Study and compare various heat exchangers such as radiators, evaporators, condensers, plate heat exchangers etc. [4 hrs.]
07	Determination of calorific value of solid or liquid fuel using Bomb calorimeter. [2 hrs.]
08	Study of system components of gas turbines used in turbocharger with reference to direction of flow of air and flue gas, shape of vanes, blades also describe maintenance schedule of gas turbine. [2 hrs.]
09	Trial on Refrigeration Test Rig for calculation of C.O.P, power required & refrigerating effect. [4hrs.]
10	Study of Refrigeration plant. [2 hrs.]
11	Study of Air Conditioning Unit. [2 hrs.]
<b>Notes :</b>	
<ul style="list-style-type: none"> <li>➤ Study of boiler, mountings, accessories, air compressor, gas turbine, refrigeration plant &amp; air</li> </ul>	

conditioning plant may be conducted by Model, Charts & OHP/AUDIO facilities if the actual testing is not possible.

- At least 08 practicals have to be done.

### Professional Practice –II [AE]

<b>Name of the Course : Diploma in Automobile Engineering</b>	
<b>Course code: A.E.</b>	<b>Semester :</b> Forth
<b>Duration :</b> 17 weeks	<b>Maximum Marks :</b> 50
<b>Teaching Scheme :</b>	<b>Examination Scheme :</b> Practical
<b>Theory :</b> Nil	<b>Continuous Internal Assessment:</b> 25 Marks
<b>Tutorial: --</b> Nil	<b>External Assessment:</b> 25 Marks
<b>Practical :</b> 03 hrs./week	<b>End Semester Exam. [theory]:</b> N.A
<b>Credit:</b> 02	
<b>Aim:</b>	
<ul style="list-style-type: none"> <li>• To develop general confidence, ability to communicate and develop positive attitude, in addition to basic technological concepts through Industrial visits, expert lectures, seminars on technical topics and group discussion.</li> <li>• To help in broadening technology base of students beyond curriculum.</li> <li>• To develop creatively and innovatively and inculcating habit of working with their own hands.</li> </ul>	
<b>Objectives :</b>	
Student will be able to:	
<ul style="list-style-type: none"> <li>➤ Acquire information from different sources.</li> <li>➤ Work in a team and develop team spirit.</li> <li>➤ Present seminar using power projection system.</li> <li>➤ Interact with peers to share thoughts.</li> <li>➤ Prepare a report on industrial visit, expert lecture.</li> </ul>	
<b>Practical :</b>	
<b>Intellectual Skill:</b>	
Student will be able to-	
<ul style="list-style-type: none"> <li>➤ Search information from various resources.</li> <li>➤ Prepare notes on selected topics.</li> <li>➤ Participate in group discussions.</li> </ul>	
<b>Motor Skills:</b>	
<ul style="list-style-type: none"> <li>✓ Observe industrial practices during visits.</li> <li>✓ Prepare slides / charts for presentation in seminar.</li> <li>✓ Develop a model.</li> </ul>	
<b>Content:</b>	
<b>Topic &amp; Content</b>	<b>Hrs</b>
<p><b>1) Information Search –</b></p> <p>Information search be made through manufacturers catalogue, Hand books, magazines journal and websites, and submit a report on <b>any Two Topics</b> in a group of 3 to 4 students, report size shall not be more than 10 pages.</p> <p>Following topics are suggested, any other equivalent topics may be selected.</p> <p>i) Present scenario of electric power generation in West Bengal state /India.</p> <p>ii) Composite materials – Types, properties &amp; application.</p> <p>iii) Material handling equipments commonly used in industries.</p> <p>iv) Advances in Automobile engines.</p>	



<ul style="list-style-type: none"> <li>v) Hydraulic steering systems of Automobile.</li> <li>vi) Mechanisms used to produce straight-line motion.</li> <li>vii) Mechanisms used for generating intermittent motion.</li> <li>viii) Advanced surface coating techniques like chemical vapor deposition, ion implantation, physical vapor deposition.</li> <li>ix) Types of cutting tools- specification, materials and applications.</li> <li>x) Profiles of 2 multinational companies.</li> <li>xi) Engine lubricants, coolants and additives</li> <li>xii) Power steering, power windows.</li> <li>xiii) ABS (anti lock braking systems)</li> <li>xiv) MPFI (multi point fuel injection) system</li> <li>xv) Role of Financial institutions in development of industrial sector.</li> <li>xvi) Solar energy systems – Components and their functions, applications.</li> <li>xvii) Component of project under Small Scale Industries.</li> </ul>	
<p><b>2) Seminars:</b></p> <p>One seminar must be arranged on the topic related to “Information Search” as above Or Topics beyond curriculum of 4<sup>th</sup> semester [Source of information – books, magazine, Journals, Website ,surveys etc.] or topics suggested for guidance as below:</p> <ul style="list-style-type: none"> <li>vii) High pressure boilers.</li> <li>ii) Heat exchangers-Types, working, applications.</li> <li>iii) Hydraulic turbines-Types, working &amp; applications.</li> <li>iv) Hydraulic pumps –Types, working, &amp; applications.</li> <li>v) Sensors –Types, principle, &amp; applications.</li> <li>vi) Super conductor technology – Types, principle, &amp; applications.</li> <li>vii) Semi conductors-. Types, materials, &amp; applications.</li> <li>viii) Industrial breaks- Types, construction, working, &amp; applications.</li> </ul> <p>Batch size and the pages of the report to be submitted are same as that of information search.</p>	
<p><b>3) 3 – D Design:</b></p> <p><b>Isometric and 3D Drawings-</b></p> <p>3.1 <b>3D Edit Commands</b> –Pline, 3Dpoly, pedit, join splinedit commands.</p> <p>3.2 <b>View Commands</b> – View ports, UCS, WCS commands</p> <p>3.3 <b>3D Object and 3D operations</b> –</p> <p>3.3.1 3 D Object – 3D fundamentals, 2D to 3D conversion, Cube, Cylinder, Cone, Sphere, Wedge, file import and export.</p> <p>3.3.2 Generation of 3 D model &amp;3 D operations – Extrude, Revolve, Slice, Section, Mirror, Move, Pan, Rotate, Array, Slice, Sweep, Union, Subtract, intersection etc.</p> <p>Transformation features: Translation, Rotation, Symmetry, Shade etc. Dimensioning of 3D model, Generation of 3D wireframe model and it’s development.</p> <p>3.4 Transformation from 3D model to Front view, Top View, Side view &amp; various sectional</p>	

views, Dimensioning of respective view; 3.5 Inserting frame, Title Block & making a bill of materials. <b>Practice on the following 3 D drawing : Flange coupling, Knuckle joint &amp; any three Engine components.</b>	
<p><b>4) Govt. or Pvt. Organisation / Industrial Visits:</b> Structured industrial visits should be arranged and report of the same shall be submitted by each student to form a part of the term work. <b>No of visits-</b> At least one <b>Scale of industry-</b> medium scale unit / large scale unit. <b>Group size-</b> Practical batch <b>Report-not exceeding</b> – 7 to 10 pages. Following types of industries / organization may be visited in &amp; around the institute.</p> <ol style="list-style-type: none"> <li>i) Foundry / Foundry cluster.</li> <li>ii) Forging units.</li> <li>iii) Sheet metal processing unit.</li> <li>viii) Machine / Automobile component manufacturing unit.</li> <li>v) Fabrication unit / powder metallurgy component manufacturing unit.</li> <li>vi) Machine tool manufacturing unit.</li> <li>vii) Any processing industry like chemical, textile, sugar, agriculture, fertilizer industries.</li> <li>viii) Auto workshop / four wheeler garage.</li> <li>ix) City water supply pumping station.</li> <li>x) Hydro electric power plant.</li> <li>xi) Wind mills, Solar Park.</li> <li>xii) Tea processing industries.</li> <li>xiii) River irrigation project.</li> <li>xiv) Organisational / operational set up of PWD (Govt. of W.B)</li> </ol>	
<b>Total periods</b>	<b>48 Hrs.</b>
<b>Practical</b>	<b>Total Marks = 50</b>
<p><b>Examination Scheme:</b></p> <ul style="list-style-type: none"> <li>• <b>Continuous internal Sessional assessment = 25 Marks.</b> <ol style="list-style-type: none"> <li>I. Submission of reports on Information search in time = 05 Marks.</li> <li>II. Seminar Presentation in time = 05 Marks.</li> <li>III. Practice of CAD software &amp; submission drawing in time = 10 Marks.</li> <li>IV. Reports on Industrial visit in time = 05 Marks.</li> <li>V. Total = 25 Marks.</li> </ol> </li> <li>• <b>End semester Sessional assessment = 25 Marks.</b></li> <li>• <b>Examiner</b> – External [Lecturer]. <ol style="list-style-type: none"> <li>I. Submission of signed reports = 05 Marks.</li> <li>II. On spot assessment of CAD drawing = 15 Marks.</li> <li>III. Viva-voce = 05 Marks.</li> <li>IV. Total = 25 Marks.</li> </ol> </li> </ul>	
<b>Learning Resources:</b>	
<b>1. Books:</b>	

<b>Author</b>	<b>Title</b>	<b>Publisher</b>
Robert M. Thomas	Advanced AutoCAD	Sybex BPD
R Cheryl	Beginning AutoCAD 2011- Exercise Book (W/2 DVDs)	BPB Publication
Donnie Gladfelter	AutoCAD 2014 and AutoCAD LT 2014	Wiley India Pvt. Ltd.
How things works encyclopedia	DK Publishing	DK Publishing
Trott	Innovation mgmt.& new product development	Pearson Education
<b>2. Web sites</b> <a href="http://www.engineeringforchange.org">www.engineeringforchange.org</a> <a href="http://www.wikipedia.com">www.wikipedia.com</a> <a href="http://www.slideshare.com">www.slideshare.com</a> <a href="http://www.teachertube.com">www.teachertube.com</a>		



## West Bengal State Council of Technical Education

(A Statutory Body under West Bengal Act XXI of 1995)  
Kolkata Karigori Bhavan, 2nd Floor, 110 S. N. Banerjee Road, Kolkata - 700 013.

<b>Name of the Course :</b> Diploma in Automobile Engineering		
<b>Subject Title:</b> Computer Programming		
<b>Course code:</b>	<b>Semester : Fourth</b>	
<b>Duration : 17 weeks</b>	<b>Maximum Marks : 50</b>	
<b>Teaching Scheme:</b>	<b>Examination Scheme</b>	
Theory : 1 hrs/week	Mid Semester Exam: Marks	
Tutorial: hrs/week	Assignment & Quiz: Marks:	
Practical : 2 hrs/week	End Semester Exam: Marks	
Credit: 2	<b>Practical: Internal Sessional continuous evaluation:25 Marks</b>	
	<b>Practical: External Sessional Examination:25 Marks</b>	
<b>Aim :-</b>		
<b>S.No</b>		
1		
<b>Objective :-</b>		
To understand how to give instructions to computers.		
To expose a student to the basic principles of programming through a structured programming language like 'C'.		
To enable the students to learn about any advanced Object Oriented programming Language.		
<b>S No</b>	The student will able to	
1	Break a given task into subtasks.	
2	Enhance logical thinking.	
3	Develop 'C' programs for simple applications.	
<b>Pre-Requisite:-</b>		
<b>S.No</b>		
1	Sound knowledge of computer.	
<b>Contents</b>		
<b>Chapter</b>	<b>Name of the Topic</b>	<b>Hrs/week</b>
		<b>Hours</b>
01	Problem, definition and analysis, algorithm, flow charts, tracing and dry running of algorithms. Introduction to 'C' programming, simple program using Turbo 'C' compiler and execution of 'C' program	<b>02</b>
02	C Fundamentals: Character set, constants, data types, identifiers, key words, variable declarations, Types of Operators – unary, binary, arithmetic, relational, logical, assignment. Hierarchy of operators, expressions, library functions, Use of input/ output functions viz. Printf(), Scanf(), getch(), putch()	<b>03</b>
03	Use of Control Statements:- if-else, if-else-if, switch-case, while loop, do – while loop, for loop, break and continue. Writing, Compiling, Executing and debugging programs	<b>05</b>
04	Introduction to Subscripted variables, arrays, defining and declaring one and two dimensional arrays, reading and writing	<b>03</b>
05	Concept of String, string input / output functions Defining and accessing a user defined functions, Passing of arguments, declaration of function prototypes Storage classes: automatic, external, static variables	<b>03</b>
	<b>Total</b>	<b>16</b>

**Practical:**

Skills to be developed:

Intellectual Skills:

- Prepare and interpret flow chart of a given problem.
- Represent data in various forms.
- Use various control statements and functions

Motor Skills:

- Write program in 'C' language.
- Run and debug 'C' program successfully.

**LIST OF PRACTICALS**

To write simple programme having engineering application involving following statements

1. Use of Sequential structure: atleast **two** problems
2. Use of if-else, if-else-if statements: atleast **three** problems
3. Use of for statement: atleast **five** problems
4. Use of Do-While Statement: atleast **two** problems
5. Use of While statement: atleast **three** problems
6. Use of brake and Continue statement: atleast **one** problems
7. Use of multiple branching Switch statement: atleast **one** problems
8. Use of different format specifiers using Scanf( ) and Printf( ): atleast **two** problems
9. Use of one dimensional array e.g. String, finding standard deviation of a group data: atleast three problems
10. Use of two dimensional array of integers/ reals: atleast **one** problems
11. Defining a function and calling it in the main: atleast **three** problems

**Examination Schedule Internal practical Sessional:**

Attending classes, practicing programs & submitting respective assignment in time		20	
Viva - voce		5	
Total:		25	

**Examination Schedule: External practical Sessional examination**Examiner: **Lecturer**

For submission of assignment in scheduled time		10	
On spot program		10	
viva voce		05	
Total		25	

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<b>Reference books :- Nil</b>	
<b>Suggested List of Laboratory Experiments :- Nil</b>	
<b>Suggested List of Assignments/Tutorial :- as mentioned in list of practical</b>	

**List of Books:**

<b>Author</b>	<b>Title</b>	<b>Publication</b>
Yashwant Kanitkar	Let us 'C'	BPB publications
Balguruswamy	Programming in 'C'	Tata Mc- Graw Hill
Pradip Dey & Manas Ghosh	Programming in 'C'	Oxford Higher Education
Byron Gotfried	Introduction to 'C' programming	Tata McGraw Hill
H.Arolkar	Simplifying c	Dreamtech