REVISED DIPLOMA CURRICULUM OF AUTOMOBILE ENGINEERING
(PART II)

For the State of Meghalaya
(2024-2025)

National Institute of Technical Teachers' Training & Research
Block – FC, Sector – III, Salt Lake City, Kolkata – 700 106

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Programme Name: Automobile Engineering

SEMESTER – III

Sl. No	Category of Courses	Code No	Course Title	Study Scheme				Evaluation Scheme							Total Marks	Credit
				Pre-requisite	Contact Hour/Week			Theory				Practical				
					L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
									Class Test	Assignment	Attendance		Sessional	Viva		
1	Program Core	AEPC 201	Strength of Materials	-	3	0	0	60	20	15	5	0	0	0	100	3
2		AEPC 203	Heat Power Engineering.	-	2	0	0	60	20	15	5	0	0	0	100	2
3		AEPC 205	Automobile Engines I	-	2	0	0	60	20	15	5	0	0	0	100	2
4		AEPC 207	Theory of Machines	-	3	0	0	60	20	15	5	0	0	0	100	3
5		AEPC 209	Manufacturing Technology	-	3	0	0	60	20	15	5	0	0	0	100	3
6		AEPC 211	Automobile Drawing	-	0	0	4	-	-	-	-	40	40	20	100	2
7		AEPC 213	Automobile Engines I Lab	-	0	0	2	-	-	-	-	40	40	20	100	1
8		AEPC 215	Automobile Machine Shop		0	0	4	-	-	-	-	40	40	20	100	2
9	Internship	I-201	Internship I	-	0	0	4	0	0	0	0	40	40	20	100	2
TOTAL					**13**	**0**	**14**	**300**	**100**	**75**	**25**	**160**	**160**	**80**	**900**	**20**

Programme Name: Automobile Engineering

SEMESTER – IV

Sl. No	Category of Courses	Code No	Course Title	Study Scheme				Evaluation Scheme							Total Marks	Credit
				Pre-requisite	Contact Hour/Week			Theory				Practical				
					L	T	P	End Exam	Progressive Assessment			End Exam	Progressive Assessment			
									Class Test	Assignment	Attendance		Sessional	Viva		
1	Program Core	AEPC202	Fluid Power Engineering	-	3	0	0	60	20	15	5	0	0	0	100	3
2		AEPC204	Automobile Engine- II	-	2	0	0	60	20	15	5	0	0	0	100	2
3		AEPC206	Automobile Power Train	-	3	0	0	60	20	15	5	0	0	0	100	3
4		AEPC208	Motor Vehicle Act	-	2	0	0	60	20	15	5	0	0	0	100	2
5		AEPC210	Machine Design	-	3	0	0	60	20	15	5	0	0	0	100	3
6		AEPC212	Fluid Power Engineering Lab	-	0	0	2	0	0	0	0	40	40	20	100	1
7		AEPC214	Automobile Engine-II Lab	-	0	0	2	0	0	0	0	40	40	20	100	1
8		AEPC216	Automobile Power Train Lab	-	0	0	2	0	0	0	0	40	40	20	100	1
9		AEPC218	Automobile Workshop	-	0	0	4	0	0	0	0	40	40	20	100	2
10	Minor Project	PR202	Minor Project	-	0	0	4	0	0	0	0	40	40	20	100	2
11	Mandatory	AU202	Essence of Indian Knowledge & Tradition	-	2	0	0	0	0	0	0	0	0	0	0	0
TOTAL					**15**	**0**	**14**	**300**	**100**	**75**	**25**	**200**	**200**	**100**	**1000**	**20**

SEMESTER - III

STRENGTH OF MATERIALS

L	T	P		Course Code No.: AEPC201
3	0	0		
Total Contact hrs.: 45 **Total Credit: 3**			**Total Marks: 100**	**Theory:** **End Term Exam: 60** **P.A.: 40**

RATIONALE:

Machine parts are subjected to various types of loads resulting in development of stresses and strains. If, these stresses and strains are allowed to develop beyond the safe limit, the concerned part may fail. As a technician, it becomes very essential to understand the effects of loads on any part. Reduction in size with superior material strength are the main considerations of the present day manufacturing world. All these factors are focusing the attention of the technicians and engineers for need based designs by studying the effects of loads, stresses and strains in the parts and find necessary solutions.

COURSE OUTCOME:

On successful completion of the course, students will be able to:

CO1 –Identify various engineering materials and the stress strain relationship
CO2 – Explain the effect of stress and bending in beams
CO3- State the principle of defection of beams
CO4 – Explain the concept of torsion with applications
CO5 – Differentiate various types of welded joints and the stresses in welded joints

COURSE CONTENT

TOPIC/SUB-TOPIC	HRS.	TOTAL HRS.
INTRODUCTION :		**3**
1.1 Scope of the subject Use of the structures, importance of knowledge of – stress strain and deformation in a structure, permissible stresses in a materials, safety and economic. Contents and importance of the subject.		
1.2 Engineering Materials : Elastic Materials, linearly elastic materials, ductile materials brittle materials, composite materials, isotropic materials, orthotropic materials (Definition), examples and application. - Identify different engineering materials in specific application.		
STRESS AND STRAIN:		**10**
2.1 Introduction: Definition of stress; Type of stress:-tensile, compressive and shear.		
2.2 Stress strain Relation: Hook's law, Young's Modulus of rigidity,		

Poisson's ratio, generalize Hook's law for two dimensional stresses, relation among the elastic constant for an isotropic materials.

- Distinguish among different elastic constant for a material.

2.3 Stresses, strain and deformation of axially loaded member:-Bars of varying section, taper rope, bars of composite section, rod and tube connected by boiled joint, temperature stresses and shuttering of axially loaded members

- Solving Simple problems on determination of stresses and shortening of axially loaded members.

TRESSES IN BEAM: **10**

3.1 Beam: definition, types of beams – simple supported and container beams, propped container, fixed – ended and continuous beams.

- Identify deferent types of beams and loading condition.
- Determine the support reactions and draw the free body diagram of determinate beams.

3.2 Sharing force and bending moment in beams; sign convention and relationship among load, sharing force and B.M.

3.3 Shear force and B,M. diagrams: contravener beam with concentrated and Uniformly distributed load, simply supported beam with uniformly distributed and verging load.

- Draw the shear force and bending moment diagrams of beam with given load on it.

SIMPLE BENDING OF BEAM. **6**

4.1 Centroid of an area, moment of inertia of beam cross- section, parallel axis theorem, principal moments of inertia.

4.2 Assumptions in simple bending, neutral surface, neutral axis determination of bending stresses in beams with simple cross sections and standard sections used in industry.

- Determine the moment of inertia, section modulus and moment of resistance of beam cross- section.
- Determine the bending stresses in a beam under pure bending.

DEFLECTION OF BEAMS: **6**

5.1 Member bending into a circular are slope, deflection and radius of curvature.

5.2 Derivation of formula for slope and deflection, cantilever propped cantilever beam.

5.3 Mohr's Theorem, relation between maximum bending stress and maximum deflection, beams of varying section, strain energy store due to bending, law of reciprocal deflection.

- Determine the deformation produced by a bending moment.
- Calculation the deflection under the load and draw bending moment diagrams.

TORSION: **5**

6.1 Basic assumption for pure torsion of circular shafts (hollow and solid, no proof)- Polar moment of inertia, torsion shearing stress, angle of twist; Tensional rigidity.

- Deter the maximum shear stress and angle of position shaft transmitting given tongues.

6.2 Applications: Hose power transmitted by a shaft moment transmitted by a key, horse power Transmitted by a flange

coupling with bolts, stiffness of closed coil helical spring (no proof).

- Apply the tension formula in determination of (a) safe power transmitted by a flange coupling (b) stiffness of helical spring.

WELDED CONNECTIONS: **5**

7.1 Process of welding, Advantages and disadvantages of welding connection.

7.2 Types welds – minimum sizes of weld, effective length, minimum length, fillet welds applied to the adzes of a plate.

7.3 Angle between fusion faces, throat thickness.

7.4 Intermitted fillet welds lop joints and fillet welds in slots or hours.

- Bending about a single fillet, permissible stresses in welds.
- Determine the load in the welds and greatest resistance offered by the weld in length.
- To find the stresses in the welds.

REFERENCE BOOKS:

1. S. P. Timoshenko, D. H. Young; Elements of Strength of materials - Affiliated East – West Press Private Limited.
2. R. K. Bansal; Engineering Mechanics and Strength of materials - Laxmi Publications, New Delhi
3. Surendra Singh; Strength of Materials - Vikas Publishing House Pvt. Ltd.
4. Ferdinand L. Singer; Strength of materials - Harper & Row and John Weatherbill.
5. William A. Nash; Theory and Problems of Strength of Materials - Shaum's outline of - Shaum's Outline Series, McGraw Hill. Inc.
6. Egor P. Popov; Engineering Mechanics of Solids - Prentice Hall of India Private Limited, New Delhi.
7. R.S. Khurmi, Strength of Materials - S. Chand & Company Ltd., New Delhi.
8. Dr. Sadhu Singh; Strength of Materials - Khanna Publishers, Delhi-110 006.
9. S. Ramamrutham; Engineering Mechanics & Strength of Materials - Dhanpat Rai Publishing Co., Delhi – 110 006.
10. A. C. Ugural; Mechanics of Materials - McGraw Hill. Inc
11. D.R. Malhotra and H.C. Gupta; Strength of Materials - Satya Prakashan, New Delhi – 110 005.
12. B. K. Sarkar; Strength of Materials Through Problems - Allied Publishers Limited, New Delhi – 110 002.

HEAT POWER ENGINEERING

L 2	T 0	P 0		Course Code No.: AEPC203
Total Contact hrs.: 30 Total Credit: 2			Total Marks: 100	Theory: End Term Exam: 60 P.A.: 40

RATIONALE:

Thermodynamics is the field of applied science which deals with the energy possessed by heated gases and vapours and the laws which govern the conversion of this energy into mechanical energy and vice versa. This is the fundamental subject for understanding the process of producing vast amount of mechanical energy from heat energy and therefore necessary to be learned by the engineering students. Understanding the working principles and features of the various machines and plants in which either such heated gas/vapours are produced or conversion of heat to mechanical energy takes place is of great importance.

COURSE OUTCOME:

On successful completion of the course, the students will be able to:
CO1: Identify the fundamental concepts of thermodynamics
CO2: State properties of gas and laws of thermodynamics
CO3: Explain thermodynamic processes of perfect gases and thermodynamic air cycles
CO4: Describe the functions of internal combustion (IC) engines
CO5: List out the classifications and functions of air compressors

COURSE CONTENT

UNIT	TOPIC/SUB-TOPIC	HRS.	TOTAL HRS.
1.0	**INTRODUCION** Importance of conversion of heat energy into mechanical energy and electrical energy; definition of Thermodynamics; concept of heat engines		**1**
2.0	**FUNDAMENTALS OF THERMODYNAMICS:** **2.1** Definition and understanding of terms: Energy, work, power, law of conservation of energy, heat, units of heat, temperature, absolute temperature, pressure, absolute and gauge pressure, specific heat.		**3**

2.2 Thermodynamic system; closed, open and isolated systems; system boundary; properties of a thermodynamic system; concept of work and heat energy transfer to and from a system

- State relationship between : work and power, Centigrade and Fahrenheit scale of temperature, work and heat energy
- Distinguish between absolute pressure and gauge pressure
- Understand a thermodynamic system
- Differentiate between closed, open and isolated system

3.0 PROPERTIES OF GASES **3**

3.1 Gas as the working substance in a thermodynamic system; definition of gas and perfect (or ideal) gas; laws of perfect gases—Boyle's law, Charle's law and Gay-Lussac law with corresponding gas equations; characteristic gas equation pv = mRT; problems.

3.2 Specific heat of gas; specific heat at constant volume and at constant pressure; work done by gas during expansion; internal energy; relation between two specific heats ($C_p - C_v = R/J$; $Cp/Cv = 1 + R/JCv$); simple problems.

- Define an ideal (or perfect) gas
- State three laws of perfect gases
- Write mathematical expression for the three gas laws
- Deduce characteristic equation of gas from the gas laws
- Solve problems on gas laws
- Explain why Cp>Cv
- Prove Cp-Cv = R/J and Cp/Cv = 1 + R/JCv
- Solve problems on specific heats of gas

4.0 LAWS OF THERMODYNAMICS : **5**

Thermal equilibrium; statement of Zeroth law; first law of thermodynamics; mechanical equivalent of heat; non flow energy equation (heat added = work done + rise in internal energy); second law of thermodynamics-statements; physical significance of second law.

- Understand meaning of first and second law of thermodynamics
- Justify that second law does not contradict first law

5.0 THERMODYNAMIC PROCESSES OF PERFECT GASES **5**

5.1 Definition of thermodynamic (or non-flow) process; P-V diagram; constant volume, constant pressure, isothermal, adiabatic, polytropic and throttling processes

5.2 Representing above processes in p-v diagram; estimation of

pressure, volume, temperature, heat absorbed, work done, change of internal energy during above thermodynamic processes; simple problems

- Understand meaning of thermodynamic process
- Draw p-v diagrams for different thermodynamic processes
- Deduce formulae for work done by gas in (i) Constant pressure, (ii) isothermal expansion, (iii) adiabatic expansion.
- Solve simple problems on thermodynamic processes

6.0 THERMODYNAMIC AIR CYCLES : **4**

Definition of thermodynamic cycle; representation of a cycle in P-V diagram; work done in the cycle; reversible and irreversible cycle; working of an ideal engine; efficiency of a cycle; Carnot cycle in P-V; expressions for work done and efficiency; simple problems on air cycles.

- Explain thermodynamic cycle
- Represent a cycle in the p-v diagram and identify the work done per cycle
- Draw a Carnot cycle in P-V diagram
- Solve problems on air cycles.

7.0 INTERNAL COMBUSTION (IC) ENGINE **6**

7.1 Function and use of IC engines

7.2 Classification of IC engines; working principle of 2 stroke and 4 stroke cycles IC engines; SI engine and CI engine; Ott cycle; Diesel cycle, Dual cycle etc.
Solving simple problems on I.C. engine performance

8.0 AIR COMPRESSOR **3**

8.1 Types of Air Compressor

8.2 Working principle of positive displacement Air Compressors

8.3 PV Diagram

8.4 Power absorbed in compressor

8.5 Other types of compressor
- Screw Compressor
- Centrifugal Compressor

8.6 Valves in reciprocating compressor

8.7 Maintenance aspects of air compressors.

REFERENCE BOOKS:

1. V. P. Vasandani & D. S. Kumar: Heat Engineering - Metropolitan Book Co. (P) Ltd.
2. R. S. Khurmi : A text book of Engineering Thermodynamics – S. Chand & Co. Ltd.
3. B. K. Sarker : Thermal Engineering – TMH
4. P. L. Ballaney : Thermal Engineering – Khanna Publishers
5. K. C. Pal : Heat Power – Orient Longman
6. Pandya & Shah : Elements of Heat Engines – Charotar Publishing House
7. S. L. Somasundaram : Thermal Engineering – New Age International (P) Ltd.
8. S.R. Majumdar: Pneumatic Systems - Principles and Maintenance-Tata McGraw Hill

AUTOMOBILE ENGINES – I

L 2	T 0	P 0		Course Code No.: AEPC205
Total Contact hrs.: 30 Credit: 2			Total Marks: 100	Theory: End Term Exam: 60 P.A.: 40

RATIONALE:

Automotive industry is one of the major industrial sectors in the country. A large number of people are employed in engine maintenance and repair. The automotive industry needs technically qualified people. Each year, improvements on the new models of automobiles make their repair or adjustment more complex and difficult but also more interesting and rewarding to the trained men. Tremendous research and development programs, public demand, and competition among car manufactures have produced automobiles with more power, comfort and economy. In these circumstances the study of automotive engines is a must for the diplomats in automobile engineering.

COURSE OUTCOME:

On successful completion of the course, students will be able to:

CO1: Discuss various types of automobiles and specifications
CO2: State various types and classifications of I.C. engines
CO3: Explain the working principle of IC engine
CO4: Describe the cooling system of the engine
CO5: Recognize the uses of engine lubrication system

COURSE CONTENT

UNIT 1 TOPIC/SUB-TOPIC **TOTAL HRS.**

1.0 INTRODUCTION **4**

1.1 Definition of automobile

1.2 Classification of automobiles with regard to the following:
a) Purpose : passenger, goods
b) Fuel used : petrol, diesel, CNG etc.
c) Number of wheels : six-wheeler, four-wheeler, three-wheeler, two wheeler
d) Drive : six wheel, four wheel, two wheel
e) Construction: single unit, articulated vehicles and tractors.

1.3 Parts of an automobile :
a) Basic structure : frame, suspension system, axles, wheels and tyres
b) Engine
c) Transmission system : clutch, gear box, propeller shaft, rear axle, differential gear
d) Auxiliaries – electrical systems
e) Controls – steering system and brakes

f) Superstructure – body.

1.4 Factors in describing an automobile: types capacity, drive, make, model.

1.5 Technical specification of an automobile: engine, power transmission, chassis, weights, driving performances.

- Classify automobiles according to different criteria
- Write technical specification of an automobile
- List the main parts of an automobile

2.0 ENGINE **6**

2.1 Construction and functions of different parts of conventional internal combustion engine.

– Cylinder block, crank case, cylinder head, oil pan or sump, manifolds, gaskets, cylinder liners, pistons, piston rings, connecting rods, piston pins, crankshaft, main bearings, valves, valve actuating mechanisms, mufflers.

2.2 Classification of engines according to different criteria as following : -

2.2.1 Cylinder arrangements: four cylinder in- line engines, eight-cylinder in-line engines, V-8 engines, twelve and sixteen-cylinder engines, radial engine.
2.2.2 Valve arrangements :
L-head engine, I-head engine, F-head engine, V-8 valve arrangements
2.2.3 Cooling : air cooled and liquid cooled
2.2.4 Cycles : two stroke cycle, four strokecycle
2.2.5 Fuel: petrol, diesel, liquefied petroleumgas.

- Describe the construction of different parts of an I.C. engine
- Explain the functions of the main parts of an I.C. engine
- Classify the engines according to different criteria.

3.0 WORKING PRINCIPLE OF I.C. ENGINE **10**

3.2 Processes : suction of air fuel mixture, compression of air fuel mixture, ignition of fuel remove, air mixture, power development, exhaust of used gases
3.3 Cycle of operation of 4-stroke petrol engine – suction stroke, compression stroke, power stroke, exhaust stroke
3.4 Cycle of operation for two stroke petrol engine
- first stroke (induction and compression), second stroke (power, transference and exhaust)
3.5 Cycle of operation for four-stroke diesel engine – suction stroke, compression stroke, injection, power stroke, exhaust stroke.
3.6 Cycle of operation for two-stroke diesel engine – first stroke (compression and injection), second stroke (power, exhaust and induction).
3.7 Scavenging in two stroke engine

- blow down period, lead in exhaust opening, lag in closing, cross scavenging, loop scavenging

3.8 Functions of different components related to intake and exhaust of gases in petrol engine: carburetor, induction manifold, intake port, intake valve, exhaust valve, exhaust port, exhaust manifold (exhaust pipe, muffler, tail pipe)

3.9 Functions of different components related to intake and exhaust of gases in diesel engine: air cleaner, induction manifold, intake port, intake valve, exhaust valve, exhaust port, exhaust manifold, silencer.

3.10 Factors affecting power output of engine: piston displacement, quantity of fuel air mixture, throttle valve, opening, engine speed, atmospheric pressure, compression ratio, opening of valves, ignition timing, type of fuel, engine friction, moisture present in the air.

- Describe the working principle of an I.C. engine
- List the main parts related to intake and exhaust system
- Describe the functions of different parts of intake and exhaust systems.

4.0 ENGINE COOLING SYSTEM **6**

4.1 Introduction : Definition; function of cooling system; types of cooling system : air cooling system; water cooling system

4.2 Air cooling system

4.3 Liquid cooling system

4.3.1 Thermosiphon system

4.3.2 Pump circulation system –

Radiator: tubular, grilled tube, honey comb; radiator cap; overflow tank; fan; water pump; Thermostat valve: bellows type, sleeve type, butterfly type; temperature indictor or gauge: vapour pressure type, electric type.

4.4 Antifreeze solutions - definition, characteristics, examples.

- Describe different types of cooling system
- Explain the use of antifreeze solutions.

5.0 ENGINE LUBRICATION SYSTEM **4**

5.1 Objectives and functions of lubricating system,

5.2 Lubricants: Types, properties, SAE rating etc.

5.3 Types of Lubrication System,

5.4 Troubleshooting of Lubrication system.

REFERENCE BOOKS:

1. Dr. Kirpal Singh, Automobile Engineering - Vol. I and II, Standard Publishers Distributors
2. Harbans Singh Reyat – The Automobile: S. Chand & Company Ltd.
3. William H. Crouse and Donald L. Anglin - Automotive Mechanics:Tata McGraw Hill Publishing Company Ltd., New Delhi
4. Shyam K. Agrawal - Internal combustion Engines : New Age International (P) Limited,Publishers
5. K. Newton, W. Steeols, T. K. Garrett - The Motor Vehicle: Butterworth Heinemann. 6.Joseph Heitner – Automotive Mechanics: Principles & Practices, CBS Publishers & Distributors.
6. Dr. Amitosh De “Automobile Engineering” Galgotia Publication, New D

THEORY OF MACHINES

L **3**	**T** **0**	**P** **0**		**Course Code No.: AEPC207**
Total Contact Hrs.: 45 **Credit: 3**			**Total Marks: 100**	**Theory:** End Term Exam: 60 P.A.: 40

RATIONALE:

Mechanical Engineering is primarily related with design, manufacture & use of various types of machines, which receives input energy in some available form and converts it to do a particular kind of useful work at the output. Each machine consists of a large number of static parts and connected moving parts or subassemblies called mechanisms. There exist a large number of different kinds of mechanisms. Each of these mechanisms can generate a particular type of output motion with some other kind of input motion. Theory of Machines is basically study of such different types of mechanisms. Any machine utilizes one or many such mechanisms to obtain desired kind of motions in different parts of that machine. It is, therefore, necessary to study and understand functions of different types of mechanisms for design manufacture and use of various machines.

COURSE OUTCOME:

On successful completion of the course, students will be able to:

CO1: Identify various types of mechanisms and types of links
CO2: Summarize various types of belt, rope and chain drives
CO3: State the classifications of gear drive with applications
CO4: Describe the functioning of flywheel and governor
CO5: Discuss the types and functions of cams, brakes and clutches

COURSE CONTENT

UNIT	**TOPIC/SUB-TOPIC**	**TOTAL HRS.**
1.0	**MECHANISM:** Definition of machine, mechanism and kinematics; types of motions; link; kinematic pair; kinematic chain; inversion; four-bar linkage; slider crank mechanism; crank and slotted lever quick return mechanism.	**6**
2.0	**BELT, ROPE AND CHAIN DRIVE** **2.1** Flat belt & pulley drive; velocity ratio; effect of belt thickness and slip on velocity ratio; length of belt for open or crossed belt condition; power transmission by belt drive; belt material and safe strength; belt creep and tensioning; idler pulley; belts connecting non parallel shafts; applications. **2.2** V-belts and pulleys – advantages and disadvantages; specification	**9**

of a V-belt; applications.

2.3 Use of wire ropes; construction of wire ropes.

2.4 Chain & sprocket drive; advantage and specific uses of chain drives; constructional features of roller chain and sprocket; simplex and duplex chain & sprocket; applications.

3.0 GEAR DRIVE **12**

Classifications of gears with respect to relative disposition of their axes (spur, helical, herringbone, rack & pinion, bevel, worm & wheel); leading terms and definitions pertaining to a gear tooth; velocity ratio and center distance for simple or compound gear trains; epicyclic gear train; concept of gear box; selection of a gear box from manufacturers' catalogue; applications.

4.0 FLYWHEEL AND GOVERNOR **4**

Fluctuation of turning moment and energy of a prime-mover; function of a flywheel; calculation of size of a flywheel; simple problems; hoop stress in a rotating flywheel.

Functions of a governor; Watts, Porter and Hartwell governors – description and functions

- Explain the function of a flywheel
- Deduce the expression for moment of Inertia of a fly wheel in terms of maximum fluctuation of energy and speed
- Deduce the expression of hoof stress in a rotating flywheel
- Solve simple problems on flywheel
- Understand functions of a governor.

5.0 BALANCING **3**

Effect of imbalance in a rotary shaft; static balancing and dynamic balancing; balancing of one or several revolving masses in a shaft.

- Explain effects of imbalance in a rotating body
- Differentiate between static and dynamic balancing
- Understand method of balancing several masses revolving in different planes
- Solve simple problems of balancing.

6.0 CAMS

5

Types of cams and cam followers; time displacement diagram for follower motion; drawing a rotating cam profile from a given displacement diagram for knife edge, flat and roller type follower**;** applications.

- Understand function of a cam and cam follower
- List different types of cams and cam followers
- Identify working of cams in different machines
- Design a plate cam to displace a roller cam-follower as per a given time-displacement diagram for the follower motion. Effect cam profile correction for the roller follower.

7.0 BRAKES, CLUTCHES AND DYNAMOMETER **6**

Functions of brakes; types – block or shoe, band; calculation of braking torque; simple problems; brake shoe materials; applications.

Function of clutches; types – friction (plate, conical), toothed; estimation of friction torque (formula only no derivation); applications.

Function of dynamometers; absorption dynamometers: pony brake & rope brake type.

REFERENCE BOOKS:

1. Thomas Bevan: The Theory of Machines – CBS Publishers & Distributors
2. A. Shariff and N. A. Shariff : Theory of Machines – Dhanpat Rai & Sons
3. Jagdish Lal : Theory of Machines and Mechanism
4. P. L. Ballany : Theory of Machines – Khanna Publishers.
5. J. S. Rao, R. V. Dukkipati, Mechanism and Machine Theory
6. Dr. R. K. Bansal, A Text Book of Theory of Machines (S. I. Units)
7. J. S. Brar and R. K. Bansal, A Text Book of Theory of Machines Firewall Media.

MANUFACTURING TECHNOLOGY

L 3	T 0	P 0		Course Code No.: AEPC209
Total Contact hrs.: 45 Total Credit: 3			Total Marks: 100	Theory: End Term Exam: 60 P.A.: 40

RATIONALE:

Manufacturing is the backbone of any industrial nation. The level of manufacturing activity is directly related to the economic health of a country. Generally, the higher the level of manufacturing activity in a country, the higher is the standard of living of it's people. Manufacturing is generally a complex activity, involving people who have a broad range of knowledge and skills of wide variety of machinery, equipment, and tooling with various levels of automation, including computers, robots, and material handling equipment.

Work of a practicing engineer of any discipline is directly or indirectly connected with manufacturing of goods or services. Therefore, this subject is of vital importance in the curriculum of mechanical and automobile engineering.

COURSE OUTCOME:

On successful completion of the course, students will be able to:

CO1: Discuss various types of fabrication processes
CO2: Explain the principles of brazing, braze welding and soldering
CO3: Describe various types of welding and metal forming processes
CO4: Recognize the types, principle of operations and defects in casting
CO5: Explain the principles and processes in the heat treatment of steel

COURSE CONTENT

UNIT	TOPIC/SUB-TOPIC	TOTAL HRS.
1.0	**GENERAL INTRODUCTION**	**2**
	Examples of manufactured products, selection of manufacturing processes, selection of materials.	
2.0	**INTRODUCTION TO FABRICATION PROCESSES**	**3**
	2.1 Mechanical joining: bolts, screws and rivets **2.2 Adhesive bonding: epoxy resins** **2.3 Welding, brazing and soldering** • Identify the factors that affects the choosing of a particular method of fabrication.	

3.0 BRAZING, BRAZE WELDING AND SOLDERING **5**

3.1 Brazing: definition, fluxes used in brazing, properties of filler metal.
3.2 **Braze welding: definition, necessity, design of joint**
3.3 Soldering: definition, joint design, types of fluxes, filler metals

- **State the difference between brazing and welding**
- Identify the filler materials used in brazing
- Explain silver brazing
- Define braze welding
- Compare brazing and braze welding
- State the typical applications of soldering
- Differentiate between brazing and soldering.

4.0 WELDING **8**

4.1 Overview of welding processes
4.2 Types of gas welding, oxy-acetylene welding, principle of operation, process, and equipment
4.3 Principle of arc welding, types of arc welding, brief discussion on manual metal arc welding, carbon arc welding, tungsten inert gas welding, submerged arc welding.

- State the operational sequence of oxy-acetylene processes
- State different types of applications of oxy-acetylene welding
- Distinguish between arc and gas welding processes from the point of view of heat concentration, temperature, operation and running cost
- Explain reasons for choosing TIG for welding aluminium.

5.0 METAL FORMING PROCESSES **12**

Fundamentals of metal forming processes, nature of plastic deformation, hot working and cold working.

5.1 Hot working processes: rolling principle, rolling stand arrangement, roll passes, breakdown passes, roll pass sequences.
Forging: forging operation, smith forging, drop forging, press forging, machine forging, forging design, drop forging die design.
5.2 Cold working processes: squeezing processes, bending, shearing operations, drawing and sheet metal forming processes, press working and classification of different types of presses and their uses

- Distinguish between cold rolling and hot rolling in terms of process and product
- Explain the principle of rolling with a sketch

- Distinguish between open and closed die forging processes
- List the advantages of forging of metals
- Explain the operations that are normally employed in forging
- List a few products made by press working.

6.0 CASTING **6**

Introduction, specific use of cast products in automobile engineering

6.1 Melting of metal and types of furnaces
6.2 Casting processes: sand casting, pressure die casting, centrifugal casting
6.3 Fettling and cleaning of casting
6.4 Defects in casting and their remedies; non-destructive testing: visual, sound, ultra sound, X-ray, magnetization, and liquid penetration.
6.5 Safety precautions required in casting.

- State specific use of casting
- State the different procedural steps in casting
- Identify the defects in casting

7.0 HEAT TREATMENT OF STEEL **9**

Introduction, definition, importance of heat treatment process related to manufacturing, examples of heat treated parts

Different heat treatment processes of carbon steel, methods and specific use; description of the processes with the help of phase diagram: annealing, normalising, hardening and tempering

Case hardening process: application and principle of carburising, nitriding and cyaniding processes

- Define heat treatment of steel
- Explain the importance of heat treatment processes in manufacturing
- Define annealing, normalizing, hardening and tempering.
- Describe annealing, normalizing, hardening and tempering processes and their specific applications
- Define carburising, nitriding and cyaniding
- Describe carburising, nitriding, and cyaniding processes and their specific uses.

REFERENCE BOOKS:

1. R. K. Jain : Manufacturing Technology – Khanna Publishers
2. L. Doyle: Manufacturing Process and Materials for Engineers – Prentice Hall, New Jersy
3. E. P. Degarmo : Materials and Process in Manufacturing - Prentice Hall of India
4. B. H. Amstead, Phillipe. F. Ostwald & Myron L. Begeman : Manufacturing Process – John Wiley & Sons
5. J. S. Campbell: Principles of Manufacturing Materials and Processes Tata McGraw Hill Publishing Company
6. George E. Dieter: Mechanical Metallurgy – McGraw Hill International Book Company
7. Donal S. Clark and Wilbur R. Varney: Physical Metallurgy for Engineers Affiliated East – West Press Private Limited
8. B. S. Raghuwanshi: A Course in Workshop Technology Vol. I and II Dhanpat Rai & Sons
9. John A. Schey: Introduction to Manufacturing Process: McGraw Hill Book Company
10. P. N. Rao: Manufacturing Technology: Foundry, Forming and Welding
    - Tata Mc. Graw - Hill Publishing Company Limited
11. Serope Kalpakjian : Manufacturing Engineering and Technology - Addison Wesley Publishing Company.

AUTOMOBILE DRAWING

L 0	T 0	P 4		Course Code No.: AEPC211
Total Contact Hrs.: 60 Credit: 2			Total Marks: 100	Practical: End Term Exam: 40 P.A: 60

RATIONALE:

The importance of drawings in the communication of technical information is demonstrated by their use in numerous manuals and leaflets issued by car and component manufacturers. The automobile engineering students should use this medium to a greater extent in their own work. This subject is very useful to the students because through this student develop ability to interpret engineering drawings and produce intelligible free hand sketches.

COURSE OUTCOME:

On successful completion of the course, students will be able to:
CO1: Label assembly and detailed drawings of engine components
CO2: Demonstrate assembly and detailed drawings of transmission line
CO3: Identify the assembly and details of steering and suspension
CO4: Discuss the assembly and detailed drawings of mechanical and hydraulic braking
CO5: Describe the drawings of pulleys and the techniques of computer aided drafting

COURSE CONTENT

UNIT 2 TOPIC/SUB-TOPIC **TOTAL HRS.**

1.0 ASSEMBLY AND DETAILED DRAWINGS OF ENGINE COMPONENTS (ANY TWO) **4**

- **1.1** Piston
- **1.2** Connecting rod
- **1.3** Crank shafts
- **1.4** Valves and valve gear.

2.0 ASSEMBLY AND DETAILED DRAWINGS OF TRANSMISSION LINE (ANY TWO) **4**

- **2.1** Transmission gear box
- **2.2** Universal joints
- **2.3** Clutches
- **2.4** Propeller shaft
- **2.5** Rear axle
- Draw the principal and sectional views of major components of transmission line.

3.0 ASSEMBLY AND DETAILED STEERING AND SUSPENSION (ANY ONE) **6**

3.1 Steering arm
3.2 Track rod end
3.3 Front suspension
3.4 Spring

4.0 ASSEMBLY AND DETAILED DRAWING OF MECHANICAL AND HYDRAULIC BRAKING (ANY TWO) **8**

4.1 Brake linkage
4.2 Wheel units
4.3 Master cylinder
4.4 Wheel cylinder
4.5 Disc Brake

5.0 PULLEY **4**

5.1 Assembly of Fast and Loose pulley
5.2 Cone Pulley : (a) Front view-full in section

(b) Side view-half in section from the left.

- Draw the principal views of pulley (with local section if necessary).

6.0 COMPUTER AIDED DRAFTING **4**

Use of AutoCAD or any other drafting package to make simple engineering drawings. The use of commands will enable the student to do the following activities.

i) Making of simple drawing

ii) Editing of existing drawing

iii) Dimensioning, drawing section lines and hatched sections.

iv) Writing text on drawings

v) Display of drawings

vi) Making different settings of drawings related to scale, units, co-ordinate system.

REFERENCE BOOKS AND STANDARDS:

1. Thomas E. French, Charles J. Vireck, Robert J. Foster:
   Engineering Drawing and Graphic Technology – Mc Graw Hill Inc.
2. Gerard G. S. Volland : Modern Engineering Graphic & Design
   - CBS Publishers & Distributors.
3. M. Bhattacharyya and S. Pal : Fundamentals of Engineering Drawing
   - CBS Publishers & Distributors, Delhi.
4. Subrata Pal and Madhusudan Bhattacharyya :
   Mechanical Engineering Drawing – Arnold Associates, Calcutta.
5. K. L. Narayana, P. Kannaiah, K. Venkata Reddy : Production Drawing
   - New Age International (P) Ltd., Publishers, New Delhi – 110 002.
6. R. B. Gupta : A Text Book of Engineering Drawing
   – Satya Prakashan, New Delhi – 110 005.
7. R. B. Gupta : A Text Book of Machine Drawing
   – Satya Prakashan, New Delhi – 110 005.
8. N. D. Bhatt and V. M. Panchal :
   Engineering Drawing – Charotar Publishing House, Anand, Gujrat.
9. K. Venugopal : Engineering Drawing and Graphics + Auto CAD – New Age International Publishers

10. K. L. Narayana, P. Kannaiah and K. Venkata Reddy: Machine Drawing - New Age International Publishers
11. V. Lakshminarayan, M. L. Mathur and R. S. Vaishwanar : Machine Drawing – Jain Brothers.
12. N. D. Bhatt: Machine Drawing – Charotar Book Stall
13. R. K. Dhawan: A Text Book of Machine Drawing - S. Chand & Company Ltd.
14. IS: 4897 – 1986 Bureau of Indian Standards.
15. IS: 919 (Part I & II): 1993 Bureau of Indian Standards.
16. IS : 1364 – 1967 Bureau of Indian Standards
17. IS : 3640 - 167 Bureau of Indian Standards
18. IS : 2585 – 1963 Bureau of Indian Standards
19. IS : 2269 – 1967 Bureau of Indian Standards
20. IS : 1365 – 1968 Bureau of Indian Standards
21. IS : 1366 – 1968 Bureau of Indian Standards
22. IS : 1862 – 1975 Bureau of Indian Standards
23. IS : 2232 – 1967 Bureau of Indian Standards
24. IS : 2016 – 1967 Bureau of Indian Standards
25. IS : 2292 – 1974 Bureau of Indian Standards
26. IS : 2327 - 1993 Bureau of Indian Standards
27. IS : 2393 – 1980 Bureau of Indian Standards
28. IS : 6688 – 1972 Bureau of Indian Standards
29. IS : 2155 - 1982 Bureau of Indian Standards
30. IS : 5129 - 1987 Bureau of Indian Standards
31. IS: 919 (Part I and II) Bureau of Indian Standards
32. IS: 813 – 1961 Bureau of Indian Standards.

AUTOMOBILE ENGINES I LAB

L 0	T 0	P 2		Course Code No.: AEPC213
Total Contact Hrs.: 30 Credit: 1			Total Marks: 100	Practical: End Term Exam: 40 P.A: 60

RATIONALE:

Modern automobile is a complex combination of systems, each designed for maximum efficiency and for compatible relationship with others. Each system must be maintained in first class operating condition, or it may affect the operation of the other related systems. The knowledge and skill required for servicing and maintenance of various components of automobiles are very much integral part of curriculum.

COURSE OUTCOME:

On successful completion of the course, students will be able to:

CO1: Discuss the techniques of servicing the cylinder head
CO2: Explain servicing of valves and pistons
CO3: Identify the servicing method of cylinder block, crankshaft and main bearings
CO4: Exemplify the technique of testing of cooling system items and cleaning
CO5: Locate different lubrication systems

COURSE CONTENT

UNIT	TOPIC/SUB-TOPIC	TOTAL HRS. 15
1	Servicing of cylinder head	
2	Servicing of valves and valve mechanism	
3	Servicing of Piston	
4	Study of Cylinder Block (construction, material, crack detection etc.)	
5	Servicing of crankshaft and main bearings (cleaning, inspection dimensions)	
6	Testing of Cooling system items	
7	Cleaning the cooling system	
8	Inspection of lubrication system etc.	

AUTOMOBILE MACHINE SHOP

L 0	T 0	P 4		**Course Code No.: AEPC215**
Total Contact hrs.: 60 **Credit: 2**			**Total Marks: 100**	**Practical:** End Term Exam: 40 P.A : 60

RATIONALE:

Modern automobile is a complex combination of systems, each designed for maximum efficiency and for compatible relationship with others. Each system must be maintained in first class operating condition, or it may affect the operation of the other related systems. Therefore, a good auto machine shop must have tools and equipment to undertake all types of fault finding and servicing jobs. The tools and equipment which are must in the auto machine shop are discussed in this subject. An Automobile engineer must have thorough knowledge and practice of all tools and equipment in an auto machine shop.

COURSE OUTCOME

On successful completion of the course, students will be able to:

CO1: Operate various tools and equipment related to automobile machine shop
CO2: Demonstrate the use of tools and measure of various parameters
CO3: Explain machining of engine valve
CO4: Perform operations and inspections of various automobile components and brake systems
CO5: Indicate the layout of modern auto machine shop

COURSE CONTENT

UNIT	TOPIC/SUB-TOPIC	TOTAL HRS.
1.0	**STUDY AND USE OF THE FOLLOWING TOOLS AND EQUIPMENT** Screw drivers, spanners, wrenches, pliers, hammers, chisels, files, hacksaw, drilling machine, bench vice, grinder, chain pulley block, hydraulic jack and axle stands, tools and equipment for tyres, lubrication equipment, battery testing and charging equipment, hydraulic test or service ramp, tyre remover, brake testing & equipment. High pressure washing equipment, engine analyser, hydraulic press, piston ring compressor, ring remover, piston groove cleaner, cylinder reboring machine, cylinder honing, valve refacing machine, fuel injector tester, air compressor and pressure gauge. Piston rung squeezer.	**4**

MEASURING INSTRUMENTS **6**

2.0

a) Study and use of the following measuring instruments.
   i) Micrometer, dial gauge, vernier caliper, feeler gauge, vernier height gauge, engine compression gauge.

b) Measurement of the following items and parameters
   i) Measurement of crank pins, main journal of the crank shaft, cam shaft
   ii) Checking alignment of connecting rod
   iii) Measurement of the cylinder bore by inside micrometer
   iv) Determine the ovality and taper by using dial gauge
   v) Correct selections of pistons, piston ring groove cleaning & fitting piston rings
   vi) Measurement of valve lift for various angles of crank rotation by using dial gauge
   vii) Measurement of tappet clearance by using feeler gauge and setting of tappet clearance.

3.0 MACHINING OF ENGINE VALVE **10**

i) Refacing valve by valve refacing machine
ii) Valve seat cutting (by manual and electric cutters)
iii) Valve lapping and testing of leakage

4.0 OPERATIONS AND INSPECTIONS **6**

i) Crank shaft grinding
ii) Piston ring groove cleaning,
iii) Cylinder reboring and honing
iv) Brake drum turning (by work visit to different organization)
v) Turning of propeller shaft, dismantling universal joints, cleaning, reconditioning & refitting
vi) Inspection of rear axle, differential for proper lubrication
vii) Different types of metal bush turning, reaming & setting
viii Operation of CNC Lathe and Milling Machine

4

5.0 INSPECTION OF BRAKE SYSTEMS

5.1 Brake shoe riveting
5.2 Adjustment and bleeding of hydraulic brakes
5.3 Adjustment of brake and clutch paddle free play

6.0 LAYOUT OF MODERN AUTO MACHINE SHOP

REFERENCE BOOKS:

1. International Labour Office, Geneva : Maintenance and Repair of Motor Vehicles.
2. Ernest Venk and Edward D. Spicer : Automotive Maintenance and Trouble shooting – D. B. Taraporevala Sons & Co. Private Limited
3. K. Singh : Automobile Engineering, Vol. I – Standard Publishers Distributors
4. Frederick E. Bricker : Audels Automobile Guide – D. B. Taraporevala Sons & Co. Private Ltd.

INTERNSHIP I

L 0	T 0	P 4		Course Code No.: I-201
Total Contact hrs.: Credit: 2			Total Marks: 100	Evaluation Scheme: End Term Exam: 40 P.A.: 60

RATIONALE:

Internship provides an in-depth knowledge on engineering students. This internship enables the students to understand and learn the current trend in the job market. Internship provides great opportunity to get real life experience and exposure.

Students will be exposed to structured and practical learning experience that prepares individuals for their future careers, helps them make informed career choices, and equips them to build their profile for their jobs and also for their higher studies.

INTERNSHIP PROTOCOL:

As per AICTE guideline the Institutes have the flexibility to schedule internship/ Project work/ Seminar etc. according to the availability of the opportunities. Students are required to be involved in Inter/ Intra Institutional Activities viz.,

- Training with higher Institutions;
- Soft skill training organized by **Training and Placement Cell of the respective institutions;**
- Contribution at incubation/ innovation /entrepreneurship cell of the institute;
- Participation in conferences/ workshops/ competitions etc.;
- Learning at Departmental Lab/ Idea Lab/ Institutional workshop;
- Working for consultancy/ research project within the institutes and
- Participation in all the activities of Institute's Innovation Council for eg: IPR workshop/Leadership Talks/ Idea/ Design/ Innovation/ Business Completion/ Technical Expos etc.

SEMESTER - IV

FLUID POWER ENGINEERING

L 3	T 0	P 0		Course Code No.: AEPC202
Total Contact hrs.:45 Credit: 3			Total Marks: 100	Theory: End Term Exam: 60 P.A.: 40

RATIONALE:

Fluid power is the technology that deals with the generation, control, and transmission of power using pressurized fluids. It can be said that fluid power is the muscle that moves in industry. This is because fluid power is used to push, pull, regulate or drive virtually all the machines of modern industry.in fact, it is impossible to find a manufactured product that has not been fluid powered in some way at some stage of its production or distribution. Fluid power has tremendous application in automobile industries. For example, fluid power steers and brakes all types of automobiles. An Automobile engineer must have thorough knowledge of fluid powered systems.

COURSE OUTCOME

On successful completion of the course, students will be able to:

CO1: Discuss the classification of fluids and their properties
CO2: Describe the concept of pressure and its measurement
CO3: Classify different types of flows
CO4: Identify the concept of flow through pipe
CO5: Explain the principle of operation of oil hydraulics, hydraulic circuits and pneumatics

COURSE CONTENT

UNIT	TOPIC/SUB-TOPIC	TOTAL HRS.
1.0	**FLUID AND PROPERTIES OF FLUID** Definition and classification of fluid; definition of fluid mechanics and hydraulics; specific weight; density; compressibility; viscosity; surface tension.	**4**
2.0	**PRESSURE AND ITS MESUREMENT** **2.1** Intensity of pressure; pressure head; Pascal's Law; hydraulic press; atmospheric pressure; barometer; absolute pressure and gauge pressure; pressure measuring devices; manometer; pressure gauges - Bourdon tube and diaphragm type. **2.2** Pressure on plane and curved surface one face of which is submerged in liquid; centre of pressure.	**6**
3.0	**FLOW OF FLUID** Types of fluid flow : steady and unsteady, uniform and non-uniform, laminar and turbulent; rate of flow and their units; continuity equation of flow; potential energy of a flowing	**8**

liquid; total head; Bernoulli's theorem (statement and proof)

4.0 FLOW THROUGH PIPES **8**

4.1 Definition of pipe flow, wetted perimeter, hydraulic mean depth, hydraulic gradient; loss of head due to friction; syphons

4.2 Loss of head in pipes due to sudden enlargement, sudden contraction, obstruction on flow path, change of direction and pipe fittings.

5.0 OIL HYDRAULICS **10**

5.1 Definition of oil hydraulic system; principle(Pascal's law), advantages and disadvantages of oil hydraulic system; various components and uses of an oil hydraulic system: pump, storage tank, filter, flow and pressure control valve, direction control valve, hydraulic cylinder, accumulator, pipes & fittings; symbol used for these components

5.2 Principle of operation of rotary positive displacement pumps: gear pump, vane pump variable delivery piston pumps; pressure range of hydraulic systems

5.3 Constructional features of a hydraulic cylinder

5.4 Hydraulic circuit drawing for a few typical applications like holding a job, hydraulic press etc.

6.0 PNEUMATICS **9**

6.1 Properties of air, perfect gas laws, fluid conditioners.

6.2 Definition of pneumatic systems, advantages and disadvantages of pneumatic systems, various components used in pneumatic system, compressor – reciprocating and rotary, various control valves, pneumatic cylinders.

6.3 Symbols of pneumatic components.

6.4 Pneumatic circuits with typical example of multi cylinder circuits.

REFERENCE BOOKS:

1. Jagadish Lal: Hydraulics and Fluid Mechanics
2. A. K. Jain: Fluid Mechanics – Khanna Publishers
3. R. S. Khurmi: Hydraulics, Fluid Mechanics and Fluid Machines
4. Gupta and Gupta: Fluid Mechanics and its Applications - New Age International (P) Ltd.
5. S. K. Likhi: Hydraulics Laboratory Manual - New Age International (P) Ltd.
6. Jagadish Lal: Hydraulic Machines – Metropolitan Book
7. TTTI, Madras: Hydraulics and Hydraulic Machinery - Tata McGraw Hill.
8. S. R. Majumdar: Oil Hydraulics – Tata McGraw Hill.
9. Anthony Esposito 'Fluid Power with Applications' Pneumatic Hall International. Inc.
10. S. R. Majumdar 'Pneumatic System: Principles and Maintenance', Tata McGraw Hil

AUTOMOBILE ENGINES – II

L 2	T 0	P 0		**Course Code No.: AEPC204**
Total Contact hrs.: 30 **Credit: 2**			**Total Marks: 100**	**Theory:** End Term Exam: 60 P.A.: 40

RATIONALE:

Automotive industry is one of the major industrial sector in the country. A large number of people are employed in engine maintenance and repair. The automotive industry needs technically qualified people. Each year, improvements on the new models of automobiles make their repair or adjustment more complex and difficult but also more interesting and rewarding to the trained men. Tremendous research and development programs, public demand, and competition among car manufactures have produced automobiles with more power, comfort and economy. In these circumstances the study of automotive engines is a must for the diploma students in automobile engineering.

COURSE OUTCOME

On successful completion of the course, students will be able to:

CO1: Identify the properties of fuels and combustion
CO2: Discuss fuel and engine lubrication systems
CO3: Explain emission control, performance and testing of engines
CO4: Recognize the use of multicylinder engines and engine balancing

COURSE CONTENT

UNIT •	**TOPIC/SUB-TOPIC**	**TOTAL HRS.**
1.0	**FUELS AND COMBUSTION**	**5**

1.1 Desirable properties of engine fuels:

Knock rating, volatility, calorific value, gum content, sulphur content, aromatic content.

1.2 Composition, advantages and disadvantages of different fuels.

(a) Gasoline : Combustion of gasoline; characteristics of gasoline : volatility, chemicals and gums in fuels, octane rating; gasoline additives : tetraethyl lead, metal deactivators, phosphorous compounds, anti-icers, antioxidant inhibitors
(b) Diesel fuel – grades : 1-D, 2-D and 4-D; volatility, cetane number, specific gravity and viscosity, sulfur content; carbon and ash, water and sediment
(c) Liquefied petroleum gas
(d) Alcohol
(e) Compressed natural gas (CNG)
(f) Benzole.

1.3 Combustion

1.3.1 Combustion chambers : hemispherical type, inverted bath tub

type, flat head type, side valve type

1.3.2 Detonation : Definition; theories of detonation; factors influencing detonation : factors, factors concerning fuel, mixture strength

1.3.3 Fuel rating : highest useful compression, octane number

1.3.4 Pre-ignition, diesel knock, cetane number;

1.3.5 Chemistry of combustion: chemical composition of fuel, stoichiometric equation for complete combustion of fuel, reactants and products of combustion.

2.0 FUEL SYSTEMS 8

2.1 Purpose of fuel system; types of fuel system : carbureted fuel system, fuel injection system

2.2 Construction and operation of the following components of carbureted fuel system: fuel tank, fuel filters and screens, fuel gauges, fuel pumps, electric fuel pumps, air cleaners.

2.3 Carburetors - Limited use of Carburetors in modern car -reason

Carburetors :

2.3.1 Functions of carburetors : atomization, vaporization, mixing of petrol and air

2.3.2 Main parts of carburetor and principle of working of carburetors: float chamber, mixing chamber.

2.3.3 Types of carburetors with regard to following :

a) Draft : down-draft carburetor, up-draft carburetor, side-draft carburetor, semi down draft carburetor

b) Working construction: constant choke carburetors, constant vacuum carburetor.

c) Number of units: single barrel carburetor, multiple barrel carburetor.

2.4 Supercharging: Function and construction of different types of superchargers: Roots type, centrifugal type, vane type.

2.5 Diesel Fuel Injection System

2.5.1 Functions of fuel injection system

2.5.2 Parts of fuel injection system
- fuel tank, fuel filter, fuel feed or transfer pump, fuel injection pump, injector, timing device, governor

2.5.3 Types of fuel injection: air injection, mechanical or solid injection, CR injection, Common Rail Diesel Injection System (CDRI System).

2.5.4 Governors – Functions; Types : centrifugal and pneumatic

2.5.5 Timing device.

2.6 Petrol Injection System :

2.6.1 Function; advantages of petrol injection system

2.6.2 Types of petrol injection system

a) Single point injection : method of operation

b) Multi-point fuel injection (MPFI) : method of operation

2.6.3 Double Turn Spark Engine (DSTI): Construction and working DSTI.

3.0 ENGINE LUBRICATION SYSTEM **5**

3.1 Parts of lubrication system in four stroke engine : oil sump or tank; oil pump : gear type, rotor type, plunger type; oil relief valve; oil filter : by pass filter, full-flow filter; oil dip- stick; oil pressure indicating light; oil pressure gauge : pressure expansion type, electric type

3.2 Crankcase ventilation

- Describe properties of lubricants used in engine
- Describe functions and construction of different parts of lubrication system.

4.0 EMISSION CONTROL **5**

4.1 Pollutants from IC Engine: hydrocarbons (HC), Carbon monoxide (CO), Oxides of nitrogen (NO_X), particulates, sulfur oxides

4.2 Emission controls of automotive systems : positive crankcase ventilation (PCV), evaporative emission control system, heated air system, exhaust gas re-circulation (EGR), air injection system, catalytic converters

4.3 Bharat stage standard norms of emission.

5.0 PERFORMANCE AND TESTING OF ENGINES **4**

5.1 Different ways of measuring performance of engine : bore and stroke, piston displacement, compression ratio, volumetric efficiency, engine power output, brake horse power (BHP) using dynamometer (electric dynamometer, water brake) , indicated horse power (IHP), friction horse power (FHP), relation among BHP, IHP, and FHP, torque, engine efficiency : mechanical efficiency, thermal efficiency; overall efficiency : energy loss in cooling water and oil, loss in exhaust gas, loss in engine friction, energy used for propelling car, (rolling resistance, air resistance, acceleration power). Heat balance engine only. Engine heat balance analysis (Preparation of heat balance chart)

5.2 Engine Testing – measurement of indicated power by : Morse test, William's line method; Measurement of frictional power by motoring test; measurement of brake power by absorption dynamometer; measurement of fuel consumption by volumetric type flow meter, gravimetric measurement; air flow rate measurement by air box method and viscous air flow air meter; measurement of engine speed by mechanical tachometers, stroboscopes, pulse counter.

6.0 MULTICYLINDER ENGINES AND ENGINE BALANCING 3

6.1 Power balance, crank arrangement; fixing order and power flow in various engines, one cylinder, two cylinder engine, four cylinder engine, six cylinder engine, eight cylinder engine, twelve cylinder engine.

6.2 Mechanical balance and torsional vibration: unbalanced centrifugal forces and couples set up by the rotating parts, unbalanced forces and couples set up by inertia effects of rotating parts, primary and secondary inertia forces primary balance, secondary balance.

REFERENCE BOOKS :

1. Dr. Kirpal Singh, Automobile Engineering : Vol. I and II, Standard Publishers Distributors
2. Harbans Singh Reyat – The Automobile : S. Chand & Company Ltd.
3. William H. Crouse and Donald L. Anglin - Automotive Mechanics : Tata McGraw Hill Publishing Company Ltd., New Delhi
4. Shyam K. Agrawal - Internal combustion Engines : New Age International (P) Limited, Publishers
5. K. Newton, W. Steeols, T. K. Garrett-The Motor Vehicle : Butterworth Heinemann.
6. Joseph Heitner – Automotive Mechanics : Principles & Practices, CBS Publishers & Distributors.
7. Dr. Amitosh De "Automobile Engineering" Galgolia Publication Ltd, New Delhi.

AUTOMOBILE POWER TRAIN

L 3	T 0	P 0		**Course Code No.: AEPC206**
Total Contact hrs.: 45 **Credit: 3**			**Total Marks: 100**	**Theory:** End Term Exam: 60 P.A.: 40

RATIONALE:

The modern automobile is made up of many systems which in turn are made up of a number of subsystems, components and innumerable parts. The systems can be grouped under four major headings viz. The Engine, The Power Train, The Chasis and the Electrics & Electronics.

The power developed by the engine of the automobile is delivered to the wheels through the Power Train. Function of the power train is not only to transmit the torque developed by the engine, but also to suitably multiply it with suitable change of rotational speeds to allow the vehicle to accelerate during starting, and also allows reverse motion of the vehicle, and differential wheel speeds during turning.

The various systems constituting the power train are of vital importance for proper movement of an automobile, and hence to be studied by every automobile engineer.

COURSE OUTCOME:

On successful completion of the course, students will be able to:

CO1: Identify various systems of an automobile power train
CO2: Describe the functions and construction clutches
CO3: Discuss manual and automatic transmission systems
CO4: Explain drive shaft assembly and rear axle assembly
CO5: Differentiate the transmission systems of motor cycle and scooter

COURSE CONTENT

UNIT	TOPIC/SUB-TOPIC	TOTAL HRS.
1.0	**INTRODUCTION** Various systems of an automobile power train	**1**
2.0	**CLUTCHES** **2.1** Function and requirement of clutch; types of automotive clutches: single disc and multi disc dry friction clutch, wet (oil) friction clutch, semi centrifugal clutch **2.2** Clutch construction; mechanical linkage for clutch operation **2.3** Clutch problems; clutch adjustment; clutch service • Explain operation of manually operated clutch during engagement and disengagement • Identify different components of an automotive clutch • Describe construction of automotive clutches • Sketch and explain how clutch linkage operates	**9**

- List different types of problems in a clutch
- Explain how to assemble a clutch.

3.0 MANUAL TRANSMISSION SYSTEM **10**

3.1 Requirement of multi-speed transmission (gear box); components of a gear box; sliding mesh; synchronizer; gear shifting mechanism: Floor shift, steering column shift

3.2 Four speed gear box: Construction and power flow in different gears; overdrive; gear ratios

3.3 Transmission problems and remedies; gear oil

4.0 AUTOMATIC TRANSMISSION SYSTEM **10**

4.1 Definition and advantages

4.2 Working principle and construction of a torque converter; planetary gear box- principle of operation; planetary holding units : clutches, bands, overrunning clutch; hydraulic control system

4.3 Common defects and remedies in automatic transmission

5.0 DRIVE SHAFT ASSEMBLY **5**

5.1 Drive (or propeller) shaft requirements; types : torque tube, Hotchkiss; universal joint; slip joint

5.2 Troubleshooting and preventive maintenance

6.0 REAR AXLE ASSEMBLY **7**

6.1 Turning of an automobile; function of a differential; construction details of a differential

6.2 Types of rear axle: full floating, three quarter floating, semi floating; axle shafts, bearings and housing.

6.3 Rear axle trouble shooting, service and preventive maintenance.

7.0 POWER TRANSMISSION SYSTEM OF MOTOR CYCLE AND SCOOTER **3**

N.B.: Each student group should conduct at least five of the above or similar practical work. Each group should not exceed more than10 students. Care should be taken to ensure that each student of the groups are actually participating in the practical work.

REFERENCE BOOKS:

1. Dr. Kirpal Singh, Automobile Engineering : Vol. I and II, Standard Publishers Distributors
2. Harbans Singh Reyat – The Automobile : S. Chand & Company Ltd.
3. William H. Crouse and Donald L. Anglin - Automotive Mechanics : Tata McGraw Hill Publishing Company Ltd., New Delhi
4. Shyam K. Agrawal - Internal combustion Engines : New Age International (P) Limited, Publishers
5. K. Newton, W. Steeols, T. K. Garrett-The Motor

Vehicle : Butterworth Heinemann.
6. Joseph Heitner – Automotive Mechanics : Principles & Practices, CBS Publishers & Distributors.
7. V. A. W. Hiller & Peter Coombes, Hiller's Fund of Motor Vehicle Tech. (Book-I)
8. Dr. Amitosh De "Automobile Engineering" Galgolia Publication, New Delhi.

MOTOR VEHICLES ACT

L 2	T 0	P 0		**Course Code No.: AEPC208**
Total Contact hrs.: 30 **Credit: 2**			**Total Marks: 100**	**Theory :** End Term Exam: 60 P.A.: 40

RATIONALE:

The Motor Vehicles Act is a central legislation through which the road transport is regulated in the country. In recent amendments of the act the environmental issue is considered to encourage vehicles operating on eco-friendly fuels. People dealing with automobiles have to deal with licensing, registration, insurance, offences, penalties etc. as user, dealer, owner or driver of automobiles. The automobile engineering diploma holders may go for entrepreneurship like running an automobile garage, taking dealership of automobile or they may go for doing jobs in automobile organizations. The knowledge of motor vehicles act help the students to deal with procedural parts of their job efficiently.

COURSE OUTCOME

On successful completion of the course, students will be able to:
CO1: Identify the details of State Motor Vehicles Act
CO2: Examine the licensing process of drivers and conductors
CO3: List the registration rules of motor vehicles and traffic control regulations along with signs
CO4: Summarize motor vehicle insurance and penalty norms
CO5: State transport fee estimation norms

COURSE CONTENT

UNIT	TOPIC/SUB-TOPIC	HRS.	TOTAL HRS.
1.0	Definitions and salient features of Motor Vehicles Act.		**3**
2.0	Licensing of drivers of motor vehicles and licensing of conductors of stage carriages.		**3**
3.0	Registration of motor vehicles.		**3**
4.0	Control of transport vehicles.		**3**
5.0	Special provisions relating to State Transport Undertakings.		**3**
6.0	Control of traffic.		**3**
7.0	Insurance of motor vehicles.		**3**
8.0	Offences, Penalties and Procedure.		**3**
9.0	Schedules: Traffic signs, schedule for compensation.		**3**
10.0	Transport fee estimation method		**3**

REFERENCE BOOK:

1. Motor Vehicles Act, 1988
Ed. T. N. Shukla, Kamala Law House, Kolkata – 700 001.

MACHINE DESIGN

L 3	T 0	P 0		Course Code No.: AEPC210
Total Contact Hrs.: 45 Credit: 3			Total Marks: 100	Theory: End Term Exam: 60 P. A: 40

RATIONALE

Machine design is the art of planning or devising new or improved machines to accomplish specific purposes. Idea of design is helpful in visualizing, specifying and selection of parts and components which constitute a machine. Hence all automobile engineers should be conversant with the subject.

COURSE OUTCOME

On successful completion of the course, students will be able to:

CO1: Recognize Indian standards, IS codes and the concept of limit, fit and tolerances
CO2: State the design aspects of riveted, welded joints and screw threads
CO3: Identify the design aspects of shafts, shaft coupling and bearings
CO4: Explain the design aspects of drives, gears and fly wheel
CO5: Sumamrize the design aspects of clutches and brakes

COURSE CONTENT

UNIT		TOPIC/SUB-TOPIC	TOTAL CONTACT HOURS
1.0	**INTRODUCTION TO MACHINE DESIGN:**		**3**
	1.1	Introduction to Indian standards, I.S. codes related to preferred numbers (I.S.1076) and standard sizes.	
	1.2	Limits and fits and tolerances:-Basic hole system, Basic System, Reading of Tables from I.S.919,2709;Use in Engineering Drawing, selection of standard limits and fits Indian standard, Surface roughness.	
	1.3	Types of load, Ideas of stress concentration, factor ofsafety - Collect information on preferred numbers, material properties from relevant codes and hand books. - Use limit, Fits and tolerances in machine design.	
2.0	**RIVETED AND WELDED JOINTS:**		**8**
	2.1	Essential quantities of rivet, strength of rivet. Types of rivet heads and joints .Failures of riveted joint, strength of joint. Efficiency of rivet joint.	
	2.2	Design of Boiler joints: - Design of longitudinal Butt joint for boiler. - Design of circumferential Lap joint for a boiler.	

- Types of Welded joints (Lap and Butt joint)
- Basic symbols; Strength of butt joints.
Stresses for welded joints-stresses for concentration factor for welded joints.

3.0 SCREW THREADS AND JOINTS: **4**

3.1 Design of screwed, stresses due to external forces, design of bolts for cylinder cover.

3.2 Design of nut, bolted joints under eccentric loading.
- To design and draw screwed joints given loading on the joints.

4.0 SHAFTS AND SHAFT COUPLING: **7**

4.1 Design of shafts on the basis of strength and rigidity (say solid and hollow shaft).

4.2 Design of axle.

4.3 Design of shaft subjected to:-
(a) Fluctuation loads.
(b) Axial load in addition to combine.
(c) Torsion and bending load.

4.4 Design of shafts and shafts coupling for specified duty.
Design shafts and shafts coupling for given loading condition.

5.0 BEARINGS: **5**

5.1 Simple loaded shafts on bearings, calculations (shaft diameter and bearing loads.

5.2 Types of bearings, bearing materials, bearing lubrication (I.S.10260, I.S.11473)

5.3 Design and drawing of journal bearing (simple type).

5.4 Rolling contact bearing-types, standard dimensions and designation of bearings, selection of rolling element bearing from catalogues hand books.

5.5 Design of shaft mounted on anti-friction bearings.
- To design journal bearing for given load.
- Select rolling bearing for given loading.

6.0 DRIVES AND GEARS: **4**

6.1 Pulleys- Design of hub rims, arm, key and key way.

6.2 Flats Belt drive: Belt speed, coefficient of friction between belt and pulley.
Standard belt thickness and widths, velocity ratio of a belt drive. Power transmitted by belt.

6.3 Spur gear: Calculation of number of teeth's, gear ratio, forces acting between gear wheels, selection of gear dimensions.
- Design gear drive for given power and speed.
- Design pulley for given power, speed and angle of contact.

7.0 FLY WHEEL: **5**

7.1 Coefficient of fluctuation of speed and energy.

7.2 Maximum fluctuation of energy-energy stored in flywheel.

7.3 Stresses in a flywheel Rim and arm.

	7.4	Design of flywheel arms, shafts, Hub and key.	
	7.5	Construction of flywheel.	
8.0	**CLUTCHES:**		**4**
	8.1	Types of clutches, considerations in designing a friction clutch.	
	8.2	Design of a Disc or Plate clutch.	
	8.3	Design of a cone clutch and centrifugal clutch.	
9.0	**BRAKE:**		**5**
	9.1	Types of brake-pivoted block or shoe brake.	
	9.2	Double block or shoe brake.	
	9.3	Calculation of their torques.	

REFERENCE BOOKS:

1. P. C. Sharma and D. K. Aggarwal: Machine Design – S. K. Kataria &Sons, Delhi.
2. R. L. Khurmi and J. K. Gupta: Machine Design – Eurasia Publishing House Ltd.
3. R. B. Gupta: Machine Design – Satya Prakashan, New Delhi.
4. J. E. Shigley and Charles R. Mischke: Mechanical Engineering Design – McGraw-Hill Book Company.
5. N. C. Pandya and C. S. Shah : Elements of Machine Design – Charotar Publishing House, Anand.
6. Allen S. Hall, Alfred R. Holowenko and Herman G. Laughlin : Schaum's Outline of theory and Problems of Machine Design – McGraw – Hill Book Company.
7. M. F. Spotts : Design of Machine Elements – Prentice Hall of India Limited.
8. Aaron D. Deutschman, Walter J. Michels and Charles E. Wilson: Machine Design : Theory and Practice – Macmillan Publishing Co. Inc
9. IS : 1076 (Part 1 and 2) : 1985 Bureau of Indian Standards.
10. IS : 919 (Part 1 and 2) : 1993 Bureau of Indian Standards.
11. IS : 10206 (Part 1,2,3) : 1982 Bureau of Indian Standards.
12. IS : 14473: 1997 Bureau of Indian Standard

FLUID POWER ENGINEERING LAB

L **0**	**T** **0**	**P** **2**		**Course Code No.: AEPC212**
Total Contact Hrs.: 30 **Credit: 1**			**Total Marks: 100**	**Practical:** End Term Exam: 40 P. A: 60

RATIONALE:

The knowledge of properties of fluid as well as various components of fluid powered systems (hydraulic as well as pneumatics) are essential to fulfill the requirements of curriculum of automobile engineering.

COURSE OUTCOME:

On successful completion of the course, students will be able to:

CO1: Verify Bernoulli's principle
CO2: Demonstrate measurement technique of discharge through pipe
CO3: Measure pressure and velocity
CO4: Operate hydraulic trainer kit
CO5: Operate pneumatic trainer kit

COURSE CONTENT

UNIT	**TOPIC/SUB-TOPIC**	**TOTAL HRS. 15**
1	Verification of Bernoulli's Principle	
2	Measurement of discharge through a pipe	
3	Measurement of Pressure and Velocity i) Show that pressure head of a liquid increases linearly with depth using (i) piezometric tube, (ii) double column manometer and (iii) differential manometer ii) Calibrate a pressure gauge by using different columns of water contained in a flexible PE tube. iii) To determine the velocity distribution in a pipeline and calculate average velocity using a pitot tube.	
4	To operate a hydraulic circuit trainer kit on different circuits.	
5	To operate a pneumatic circuit trainer kit on different pneumatic circuits.	

AUTOMOBILE ENGINE II LAB

L 0	T 0	P 2		Course Code No.: AEPC214
Total Contact Hrs.: 30 Credit: 1			Total Marks: 100	Practical: End Term Exam: 40 P. A: 60

RATIONALE:

Modern automobile is a complex combination of systems, each designed for maximum efficiency and for compatible relationship with others. Each system must be maintained in first class operating condition, or it may affect the operation of the other related systems. The knowledge and skill required for servicing and maintenance of various components of automobiles are very much integral part of curriculum.

COURSE OUTCOME

On successful completion of the course, students will be able to:

CO1: Explain fuel injection systems
CO2: Discuss different lubricating systems
CO3: Demonstrate the processes of servicing of oil pump and catalytic converters
CO4: Explain the technique of finding efficiencies of engines
CO5: Explain pollution measurement techniques

COURSE CONTENT

UNIT	TOPIC/SUB-TOPIC	TOTAL HRS. 15
1	Study of diesel fuel injection system (testing of injector)	
2	Study of petrol fuel injection system	
3	Study of different lubricating systems (using chart of lubricating system, drawing lubricating system)	
4	Servicing of oil pump	
5	Servicing of catalytic converters	
6	Determination of BHP, thermal efficiency of single and multi-cylinder engine	
8	Pollution measurement using pollution measurement instrument (gas analyzer).	

AUTOMOBILE POWER TRAIN LAB

L 0	T 0	P 2		**Course Code No.: AEPC216**
Total Contact Hrs.: 30 **Credit: 1**			**Total Marks: 100**	**Practical:** End Term Exam: 40 P. A: 60

RATIONALE:

Modern automobile is a complex combination of systems, each designed for maximum efficiency and for compatible relationship with others. Each system must be maintained in first class operating condition, or it may affect the operation of the other related systems. The knowledge and skill required for servicing and maintenance of various components of automobiles are very much integral part of
curriculum.

COURSE OUTCOME:

On successful completion of the course, students will be able to:

CO1: Explain clatch assembly details
CO2: Identify the problems related to clutch functioning
CO3: Illustrate gear box lubrication process
CO4: Demonstrate the process of dissembling and refitting of an universal joint
CO5: Explain the working of differential

COURSE CONTENT

UNIT	TOPIC/SUBTOPIC	TOTAL HRS.
		15
1	Removal and opening of a clutch assembly, inspect the components for wear, refit the assembly	
2	Drive a car to identify any of the following problems of the clutch : (i) chatter (ii) slipping (iii) drag (iv) pedal pulsation (v) pedal stiffness (vi) noise	
3	Check lubricant level, drain and refill lubricant in a gear box	
4	Disassemble a gearbox and determine gear ratios in various gears	
5	Disassemble and refit an universal joint	
6	Study the working of a differential.	

AUTOMOBILE WORKSHOP

L 0	T 0	P 4		Course Code No.: AEPC218
Total Contact Hrs.: 60 Credit: 2			Total Marks: 100	Practical: End Term Exam. :40 P.A. : 60

RATIONALE:

Today millions of automobiles, trucks and buses operate on the streets and highways. There are huge number of off-the-road vehicles such as tractors, power mowers, motor cycles. Huge number of mechanics work to keep all this equipment going. Most automotive troubles can be avoided by periodic inspection and adjustment of these parts of a vehicle which experience has shown are most apt to fail. Even with reasonable periodic care however, some trouble must be expected. Automotive maintenance and trouble shooting has a threefold purpose : to demonstrate how to forestall most troubles, to show how to locate quickly and accurately the source of trouble which has already developed and to describe how to restore the vehicle to satisfactory operation once it is known what is wrong with it. This practical subject is essential for diploma student because it provides the scope for hands-on-experience in maintenance and trouble shooting of automobiles.

COURSE OUTCOME

On successful completion of the course, students will be able to:

CO1: Explain various aspects of servicing of engines along with decarburization
CO2: Describe the inspection of crankshaft
CO3: Demonstrate the servicing aspects of different parts of an automobile
CO4: Summarize vehicle emission control techniques

COURSE CONTENT

UNIT	TOPIC/SUB-TOPIC	TOTAL HRS.
1.0	**ENGINES SERVICING (PETROL ENGINE)**	**3**
	1.1 Dismantling of a multi-cylinder petrol engine	
	1.2 Cleaning the parts	
	1.3 Inspection of parts for their condition	
	1.4 Checking the cylinder bores for ovality, piston diameter	
	1.5 Removal of piston rings	
	1.6 Cleaning of piston ring groove	
	1.7 Fitting piston in the cylinder	
	1.8 Servicing and cleaning of air cleaner	
	1.9 Reassembling the engine.	
2.0	**ENGINE SERVICING (DIESEL ENGINE)**	**3**
	2.1 Dismantling a multi cylinder diesel engine	
	2.2 Cleaning the parts	
	2.3 Inspection of parts for their condition	
	2.4 Checking the cylinder bores for ovality	
	2.5 Checking of valves for regrinding.	
3.0	**DECARBONIZING OF ENGINES**	**2**
	3.1 Removing carbon deposits from engine combustion chamber, piston crown, valve parts	

4.0 INSPECTION OF CRANKSHAFT **2**

4.1 Replacement of bearing and setting of journal bearings, crank-pin bearings and crank shaft bearings, measuring bearing clearances by gauges.

5.0 VALVE SERVICING **2**

5.1 Replacement of valves, valve seat facing(new valve), valve seat re-facing (old valve), replacement of valve guide
5.2 Checking and replacement of defective valve springs
5.3 Facing of tappet and rocker arm
5.4 Adjusting valve tappets
5.5 Valve clearance adjustment
5.6 Valve timing adjustment.

6.0 SERVICING OF COOLING SYSTEM **2**

6.1 Servicing of water pump
6.2 Adjustment of fan belt tension
6.3 Radiator repairing and servicing.

7.0 SERVICING OF LUBRICATION SYSTEM **2**

7.1 Servicing of oil-pump filter
7.2 Cleaning of oil gallery and changing of engine oil and oil filter.

8.0 SERVICING OF FUEL SUPPLY SYSTEMS **2**

8.1 Servicing of fuel supply system including cleaning of petrol /diesel tank
8.2 Servicing of petrol/diesel fuel pump and testing of fuel pump pressure and vacuum.

9.0 SERVICING OF CARBURETOR **2**

9.1 Disassembling a carburetor of a good running petrol engine
9.2 Cleaning the parts (cleaning agents carbon, tetrachloride or lacquer thinner)
9.3 Visual inspection and replacement of defective parts
9.4 Replacing the packings with new at every dismantle and assembly of carburetor
9.5 Identifying the various circuits starting, idling, high speed accelerating, pump circuits.
9.6 Assembling the carburetor and refitting on the engine
9.7 Tuning-up the engine by tuning equipment.

10.0 SERVICING OF FUEL INJECTION SYSTEM **2**

10.1 Study of fuel injection pump on a live diesel engine (single cylinder and multi-cylinder)
10.2 Bleeding of fuel injection system of the engine along with advance and retard (ignition)
10.3 Calibration and phasing of fuel injection pump (using calibration and phasing machine)
10.4 Dismantling an injector of an engine
10.5 Cleaning and inspection of various parts
10.6 Replacement of defective parts
10.7 Refitting and testing of injector by a nozzle tester attached with a compressor.

11.0 SERVICING OF IGNITION SYSTEM **2**

11.1 Engine tuning including spark plug cleaning and gap adjustment (using spark plug cleaner and tester along with air compressor)
11.2 Idling speed and high speed adjustment
11.3 Testing of ignition coil and condenser by coil condenser tester
11.4 Testing of spark plug on running engine.

12.0 SERVICING OF DISTRIBUTOR **1**

12.1 Testing of rotor and spark advance mechanism
12.2 Contact breaker point cleaning, setting and gap adjustment (cleaning agent carbon tetrachloride and lacquer thinner)
12.3 Visual inspection of wires of faulty insulation or poor connection
12.4 Setting ignition timing.

13.0 SERVICING OF STORAGE BATTERY **1**

13.1 Inspection of battery using hydrometers and cell testers
13.2 Charging of battery
13.3 Prevention of leakage in batteries

14.0 SERVICING OF CHARGING SYSTEM **1**

14.1 Servicing of generator and cleaning of commutator and tuning
14.2 Rewinding field and armature, replacing brushes, brush holders and springs
14.3 Adjustment of regulator and cutout and checking of ammeter connections.

15.0 SERVICING OF STARTING SYSTEM **1**

15.1 Servicing starter motor and replacement of brushes
15.2 Repair of Bendix or any other drive.

16.0 EMISSION CONTROL **2**

16.1 Pollution testing with the aid of exhaust gas analyser (petrol/diesel).

NOTE: At least 10 no. of servicing should be conducted per semester where a batch of five students will work for each servicing.

REFERENCE BOOKS:

1. Dr. Kirpal Singh – Automobile Engineering Vol. I and II, Standard Publishers Distributors.
2. William H. Crouse and Donald L. Anglin – Automotive Mechanics : Tata McGraw Hill Publishing Company Ltd., New Delhi
3. Central Instructional Media Institute – Mechanic Motor Vehicle 1st year Trade Practical – New Age International (P) Limited Publishers
4. Ernest Verk and Edward D. Spicer – Automotive : Maintenance and Trouble Shooting, D.B. Taraporevala Sons & Co. Private Ltd., Bombay - 1
5. Ernest Verk and Walter Billiet – Automotive Engines : Maintenance and Repair, D. B. Taraporevala Sons & Co. Private Ltd., Bombay - 1
6. Joseph Heitner – Automotive Mechanics : Principles & practices, CBS Publishers & Distributors
7. S. Srinivasan – Automotive Mechanics, Tata McGraw - Hill Publishing Company Limited,New Delhi.
8. Dr. Amitosh De “Automobile Engineering” Galgotia Publication Ltd, New Delhi.

MINOR PROJECT

L 0	T 0	P 4		**Course Code. No.: PR202**
Total Contact hrs.: 60 **Credit: 2**			**Total Marks: 100**	**Practical:** End Term Exam. :40 P.A. : 60

RATIONALE

Minor Project offers students an opportunity to apply theoretical knowledge in a practical setting, thereby enhancing their technical skill and problem solving skill. This course has been designed for students to understand the basics of carrying out any engineering project which includes Literature survey, methodology, setting up objective and scope of the project work.

COURSE OUTCOMES:

After completing this course, student will be able to:

- Identify the objective and scope of work
- Undertake interdisciplinary literature survey.
- Prepare methodology of the project work.
- Demonstrate necessary field and laboratory experiments.
- Handle necessary equipment.

COURSE CONTENT DETAILS

UNIT NO.	CONTENT	HOURS
UNIT –I	**Objective and Scope of work** • Introduction to the project. • Clear statement of project objectives. • Explanation of the scope and limitations of the project. • Justification for why the project is important or relevant.	**12**
UNIT –II	**Literature Survey** • Review of existing literature and research related to the project. • Identification of gaps in current knowledge. • Discussion of relevant theories, models, and previous work in the field. • Proper citations and references to sources.	**12**
UNIT –III	**Methodology** • Detailed explanation of the research methods and approaches to be used. • Description of data collection techniques (if applicable). • Explanation of any experiments or simulations to be conducted. • Ethical considerations and research ethics, if applicable.	**12**
UNIT –IV	**Handling of Instruments and Experiments** • Description of the tools, equipment, or software to be used. • Details on how experiments or simulations will be conducted. • Safety precautions and protocols, if relevant. • Data collection and analysis methods.	**12**
UNIT –V	**Comprehensive Progress Presentation** • Regular progress reports or presentations to track the development of the project.	**12**

	• Presentation of findings, data, and results obtained so far. • Discussion of any challenges encountered and how they were addressed. • Feedback received from mentors or advisors and any adjustments made to the project plan.	

ESSENCE OF INDIAN KNOWLEDGE & TRADITION

L **2**	**T** **0**	**P** **0**		**Course Code No.: AU202**
Total Contact hrs.: 30 **Credit: 0**				**Progressive Assessment only**

RATIONALE:

Considering the need of protecting Indian knowledge and tradition, the diploma level students of Automobile Engineering should be facilitated the concepts Indian traditional knowledge and to make them understand the importance of roots of knowledge system and methods of application in today's life and how to protect traditional knowledge system. Interpretation of the concepts of Intellectual property to protect the traditional knowledge as well as importance of Traditional knowledge in Agriculture and Medicine must be known.

COURSE OUTCOME:

On successful completion of the course, students will be able to:

CO1: Discuss the concepts of traditional Indian knowledge and roots of knowledge system and indigenous knowledge system
CO2: Explain the technique of protection of traditional Indian knowledge
CO3: Discuss legal frameworks of traditional knowledge
CO4: State intellectual property rights
CO5: State traditional knowledge in Different Sectors

COURSE CONTENT

UNIT	**TOPIC/SUB-TOPIC**	**TOTALHRS.**	
1	Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge (Unani / Siddha/ Ayurveda), Indigenous Knowledge (IK), characteristics, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge of Meghalaya	07	**30**
2	Protection of traditional knowledge(TK): The need for protecting traditional knowledge, Significance of TK Protection, value of TK in global economy, Role of Governmentto harness TK.	07	
3	Legal framework and TK: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.	06	
4	Traditional knowledge and intellectual property: Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, Geographical Indications (GI).	04	

5	Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK	06

REFERENCE BOOKS:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. "Knowledge Traditions and Practices of India" Kapil Kapoor.
3. Madhya Himalayi Sanskriti mein Gyan, Vigyan evam Paravigyan by Prof PC Pandey.

Suggested Online Link:

Web Links:
1.https://www.youtube.com/watch?v=LZP1StpY
EPM 2.http://nptel.ac.in/courses/12110600/