



PM POLYTECHNIC

A Unit of Puran Murti Educational Society
Approved by AICTE, Ministry of HRD, Govt. of India,
Affiliated to State Board of Technical Education, Panchkula, Haryana

SCHEME FOR FOURTH SEMESTER (AUTOMOBILE ENGINEERING)

Sr. No.	Subject	Study Scheme			EVALUATION SCHEME						Total Marks
					INTERNAL ASSESSMENT		EXTERNAL ASSESSMENT (EXAMINATION)				
		Theory	Practical	Written Paper		Practical					
		Max. Marks	Max. Marks	Max. Marks	Hrs.	Max. Marks	Hrs.				
4.1*	Materials and metallurgy	3	-	2	25	25	100	3	50	2	200
4.2	Mechanics of vehicle	4	-	-	25	-	100	3	-	-	125
4.3	Auto engine-1	4	-	4	25	25	100	3	50	2	200
4.4	Manufacturing Technology-2	4	-	4	25	25	100	3	50	2	200
4.5	Chassis Body and transmission-1	4	-	4	25	25	100	3	50	2	200
4.6**	Computer Aided Drafting	-	-	3	-	50	-	-	50	3	100
# Student Centered Activities		-	-	4	-	25	-	-	-	-	25
Total		19	-	21	125	175	500	-	250	-	1050

* Common with other diploma programmes in Mechanical Engineering

** Common with diploma programme in Mechanical engineering in(CAD,CAM Design and Robotics)

Student Centered Activities will comprise of co-curricular activities like extension lectures, library studies, games, Hobby clubs e.g. photography, painting, singing, seminars, declamation contests, educational field visits, N.C.C.,NSS, Cultural Activities, Civil Defence/Disaster Management activities etc.



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SYLLABUS: Polytechnic (AE)

Department: Automobile Engineering – 4th Semester

Subject: Material and Metallurgy (Theory)

Subject Code: 120342

Detailed Contents

Unit No.1 Introduction

- Topic No.1: Introduction
- Topic No.2: History
- Topic No.3: Scope of material
- Topic No.4: Classification of material
- Topic No.5: Properties

Unit No.2 Crystallography

- Topic No.6: Fundamentals
- Topic No.7: Deformation
- Topic No.8: Failure mechanism

Unit No. 3 Metals and Alloys

- Topic No.9: Introduction
- Topic No.10: Cast iron
- Topic No.11: Steels
- Topic No.12: Non ferrous material

Unit No. 4 Theory of heat treatment

- Topic No.13: Purpose of heat treatment
- Topic No.14: Martenstic transformation

Unit No. 5 Engineering Plastics

- Topic No.15: Important sources of plastics
- Topic No.16: Classification

Unit No. 6 Advanced Materials

- Topic No.17: Composites
- Topic No.18: Ceramics

Unit No.7 Miscellaneous Materials

- Topic No.19: Properties and uses of Asbestos
- Topic No.20: Materials for bearing metals, Spring material
- Topic No.21: Refractory materials.



STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
4	-	-	25	-	100	3	-	-	125

TEXT BOOKS:

1. Material and Metallurgy by Vipul Singh, Eshan Publication.
2. Material and Metallurgy by K.P.S. Chauhan, Eagle publication

RECOMMENDED BOOKS

1. Text book of Material Science by R.K. Rajput; Katson Pubs, Ludhiana
2. Text book of Material Science by Varinder Kumar, Eagle Publisher, Jalandhar
3. Text book of Material Science by V.K. Manchanda; India Publishing House, Jalandhar.
4. Engg. Metallurgy by R.A. Higgins, Standard Publishers, New Delhi
5. Introduction to Material Science by A.R. Gupta, Satya Prakashan, New Delhi.



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SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	07	15
2	07	15
3	14	30
4	08	16
5	03	06
6	03	06
7	06	12
Total	64	100





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Subject: Materials and Metallurgy (Practical)

Subject Code: 120342(P)

List of Practicals

- 1: Classification of about 25 specimens of materials/machine parts into
 - (i) Metals and non metals
 - (ii) Metals and alloys
 - (iii) Ferrous and non ferrous metals
 - (iv) Ferrous and non ferrous alloys
- 2: Given a set of specimen of metals and alloys (copper, brass, aluminium, cast iron, HSS, Gun metal); identify and indicate the various properties possessed by them.
- 3: Study of heat treatment furnace.
- 4: Study of a metallurgical microscope and specimen polishing machine
- 5: To prepare specimens of following materials for microscopic examination and to examine the microstructure of the specimens of following materials:
 - i) Brass ii) Copper iii) Grey iv) Malleable v) Low carbon steel vi) High carbon steel
- 6: To anneal a given specimen and find out difference in hardness as a result of annealing
- 7: To normalize a given specimen and to find out the difference in hardness as a result of normalizing
- 8: To harden and temper a specimen and to find out the difference in hardness due to tempering

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
-	-	2		25	-	-	50	2	75



Detailed Contents

Unit No.1 Simple Mechanism

Topic no.1: Definition of Link, Kinematic Pair, Kinematic Chain, Mechanism, Inversions and Machines.
Topic no.2: Lower pairs, four bar chain, Slider crank chain, Double slider crank chain, higher pairs

Unit No.2 Motion and Turning Moment

Topic no.3: Displacement, velocity and acceleration of piston. Angular velocity and angular acceleration of connecting rod
Topic no.4: Calculations of piston effort and crank effort at different angles, Flywheel
Topic no.5: Fluctuation of energy for fly wheel.
Topic no.6: Analysis of Hooke's Joint

Unit No.3 Power Transmission

Topic no.7: Flat belt, V-belt and chain drives.
Topic no.8: Horse power transmitted and condition for maximum horse power transmitted.- Velocity ratios Transmitted by belts
Topic no.9: Belts- Simple, compound and epicyclical gear box.

Unit No.4 Vehicle in Motion

Topic no.10: Air, grade, and rolling resistances. - Tractive effort, traction, Inertia load, Draw bar pull and power required to proper a vehicle.
Topic no.11: Calculations of acceleration and tractive effort required in case of front wheel drive, rear wheel drive and four wheel drive.
Topic no.12: Centrifugal force and its effect on vehicle stability on banked and Unbanked road.

Unit No.5 Vehicle Control

Topic no.19: Braking friction and limits of braking.- Retardation and Braking force, calculations in case of front wheel, rear wheel and all wheel braking
Topic no.20: Weight transfer during braking.- Stopping distance and stopping time
Topic no.21: Davis and Ackermann Steering Mechanism, Correct Steering angle

Unit no.6 Balancing

Topic no.22: Concepts of static and dynamic balancing, working of static and dynamic machine
Topic no.23: Balancing of rotating masses-single rotating mass by a single mass Rotating in the same plane and by two masses rotating in different Planes,
Topic no.24: Balancing of several masses rotating in the same plane. Balancing of several masses rotating in different planes

Unit no. 7 Vibrations

Topic no.25: Introduction, Types of vibrating motion, Types of free vibrations, Natural Frequency of Free Longitudinal Vibrations, Natural frequency of free, Transverse vibrations
Topic no.26: Causes of vibration in rotating bodies, damping of vibrations, Free Damped vibrations (Vacuum)

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment			External Assessment (Examination)			
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
4	-	-	25	-	100	3	-	-	125

TEXT BOOKS:

1. Mechanics of Vehicles by Vijay Singh, Ishan Publication.

RECOMMENDED BOOKS

1. Theory of Machines by R.S. Khurmi
2. Automobile Engineering Vol-I, II, Dr. Kirpal Singh, Standard Publishers and Distributor, New Delhi
3. Theory of Machines by D.R. Malhotra; Satya Parkashion
4. Theory of Machines by PL Balaney; Khanna Publishers, Delhi.



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SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	10	15
2	10	18
3	08	12
4	10	15
5	08	12
6	10	16
7	08	12
Total	64	100





Detailed Contents

Unit No.1 Introduction

- Topic no.1: Internal engine , Concept of internal engine
- Topic no.2: Engine dimension-bore, stroke, dead centers, Compression ratio, swept volume, clearance volume
Engine capacity, engine torque, engine power at the Crank shaft.
- Topic no.3: Classification of engine on the basis of stroke, Fuel, ignition, cooling no. arrangement.
- Topic no.4: Reciprocating and rotary engines.
- Topic no.5: concept of 2stroke and 4stroke Engine and their Comparison. Working principle of 2stroke and 4 stroke Engine.

Unit No.2 Constructional Detail

- Topic no.6: Construction detail of cylinder block, cylinder head, Connecting rod, crankshaft, camshaft.
- Topic no.7: Valve mechanism
- Topic no.8: Flywheel and Damper.

Unit No.3 Fuel system

- Topic no.9: Fuel system in spark ignition engine, fuel feed system, fuel pumps- its types, fuel tank, fuelling
- Topic No.10: Fuel filters, concept of carburetion. Working and construction of a simple carburettor. Advantages of using fuel injection system in spark ignition engines
- Topic No.11: Constructional details of MPFI system. Dry and wet aircleaner, concept of VVT technology

Unit No.4 Ignition System in S.I. Engine

- Topic No. 12: concept of ignition system, battery and magneto type ignition system. Function of ignition coil.
- Topic No.13: Condenser, contact braking point, distributor, spark plug
- Topic No.14: Distribution less ignition system, electronic ignition system.

Unit No.5 Cooling System

- Topic No.15: Necessity of cooling System. Air cooling, water Cooling System. Components of water cooling System.
- Topic No.16: Radiators, thermostat, Water Pump, Fan , Pressure cap, Water Jackets
- Topic No.17: Antifreeze Solution, trouble shooting.

Unit No.6 Lubrication System

- Topic No.18: Necessity of lubrication system, pressure lubrication system, splash iubrication system.
- Topic No.19: Components of lubrication system oil pump, Oil lines, Oil filtrs, Oil coolers.
- Topic No.20: classification & Service resting of lubricating oil additives for lubricants.

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment			External Assessment (Examination)			
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks		Hrs
4	-	-	25	-	100	3	-		-

TEXT BOOKS:

1. Auto Engine by Vijay Singh, Ishan Publication.
2. Auto Engine , BSW publication

RECOMMENDED BOOKS

1. Automobile Engineering – Vol. II by Dr. Kirpal Singh; Standard Publishers Distributors.
2. Automobile Engineering by R.B. Gupta; Satya Prakashan, New Delhi
3. Automotive Engines by Srinivasan, TMH, Delhi



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Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	12	15
2	11	15
3	10	20
4	12	20
5	09	14
6	10	16
Total	64	100





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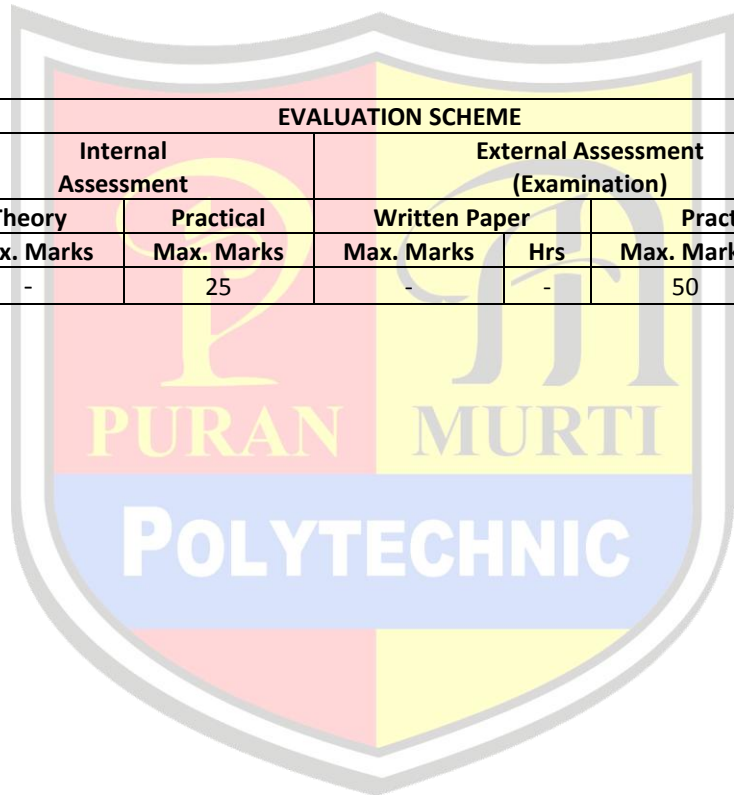
Subject: Auto Engine - I (Practical)

Subject Code: 120341(P)

List of Practical

- 1: Servicing of lubricating system
- 2: Servicing of fuel systems in petrol engines
- 3: Servicing of fuel injector
- 4: Servicing of F.I.P (Fuel Injection Pump)
- 5: Engine tune up
- 6: Study of turbocharger
- 7: Servicing of cooling system
- 8: Study of engine block
- 9: Servicing of fuel system in diesel engine
- 10: Study of M.P.F.I engine

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
-	-	4	-	25	-	-	50	3	75





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Subject: Manufacturing Technology-II (Theory)

Subject Code: 31753

Detailed Contents

Unit No.1 Drilling and Boring

- Topic No.1: Type of drills
- Topic No.2: Type of drilling machines
- Topic No.3: Accessories used in drilling machine
- Topic No.4: Introduction to boring
- Topic No.5: Type of boring machines

Unit No.2 Machining Process

- Topic No.6: Types of milling machine
- Topic No.7: Grinding and their operation
- Topic No.8: Type of grinding machine

Unit No.3 Finishing Operations

- Topic No.9: Lapping
- Topic No.10: Honing and their functions

Unit No.4 Gear Production

- Topic No.11: Gear cutting
- Topic No.12: Gear shaving machines
- Topic No.13: Gear cutters and coolants

Unit No.5 CNC Machines

- Topic No.14: Introduction to CNC
- Topic No.15: Advantage, productivity, accuracy and cost

Unit No.6 Bending and Forming

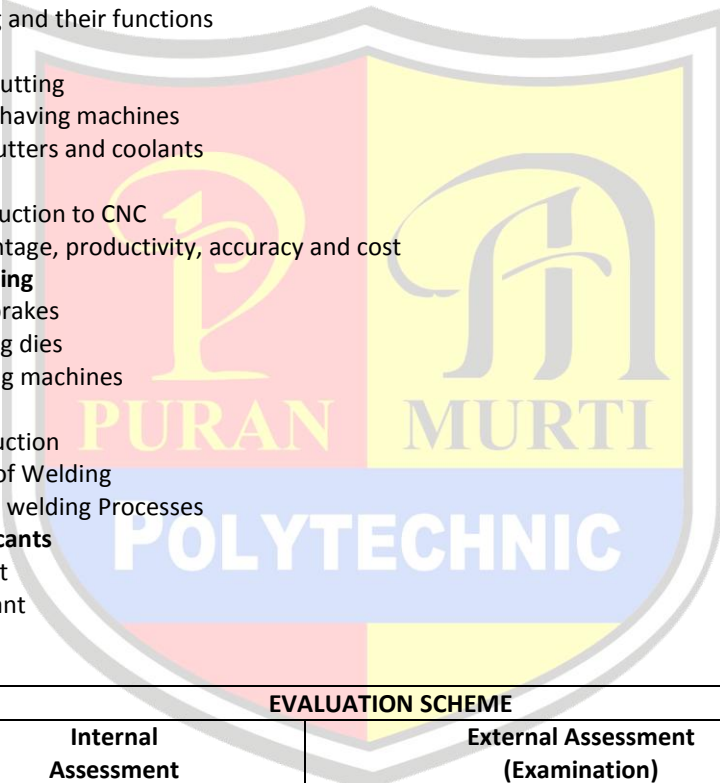
- Topic No.16: Press brakes
- Topic No.17: Bending dies
- Topic No.18: Forming machines

Unit No.7 Welding

- Topic No.19: Introduction
- Topic No.20: Types of Welding
- Topic No.21: Special welding Processes

Unit No.7 Coolant and Lubricants

- Topic No.22: Coolant
- Topic No.23: Lubricant



EVALUATION SCHEME									Total Marks
STUDY SCHEME			Internal Assessment		External Assessment (Examination)				
			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
4	-	-	25	-	100	3	-	-	125

TEXT BOOKS:

1. Workshop Technology by Vijay Singh, Eshan Publication.
2. Elements of Workshop Technology by SK Chaudhary & Hazra, Asia Publishing House.

RECOMMENDED BOOKS

1. Workshop Technology by BS Raghuvanshi, Dhanpat Rai & Sons, Delhi.
2. Workshop Technology Vol. – I, II & III by Chapman, Standard Publishers Distributors, New Delhi.
3. Workshop Practice by RK Singhal, SK Kataria & Sons, New Delhi.
4. Production Technology by HMT, Tata McGraw Hill, New Delhi.



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Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	10	16
2	16	24
3	06	06
4	04	06
5	06	1010
6	06	1810
7	14	20
8	02	04
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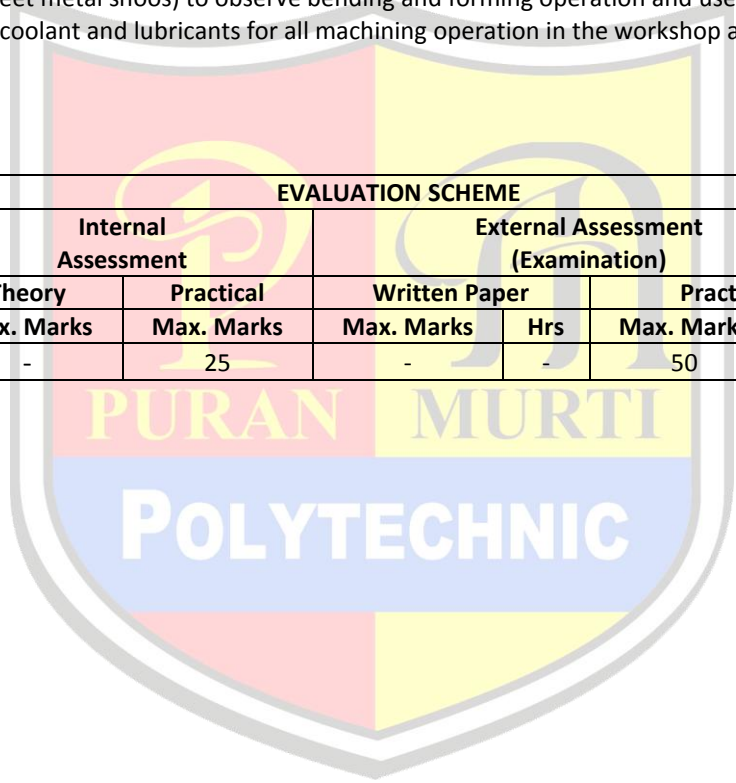
Subject: Manufacturing Technology - II (Practical)

Subject Code: 120144(P)

List of Practical

1. Introduction to drilling and boring machines, an exercise of simple drilling and boring operation, selection of speeds and feeds, use of jigs and fixtures and coolant.
2. Simple exercises on shaper
3. Practice on horizontal and vertical milling machines, work holding devices and types of milling cutters
4. Practice on cylindrical and centre less grinding machine, selection, dressing and storage of grinding machines. Use of lubricants.
5. Practice on honing machines with selection of honing sticks, honing and finish pattern in the bore. Bore geometry measurement.
6. Observe working of CNC machines including setting of cutting parameters and dimensions and loading of tools, repeatability of operation and adjustment for wear allowances.
7. Visit to industry (sheet metal shoes) to observe bending and forming operation and use of dies.
8. Use of appropriate coolant and lubricants for all machining operation in the workshop and during Industrial visits.

STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
-	-	4	-	25	-	-	50	3	75





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Subject: Chassis Body & Transmission (Theory)

Subject Code: 30343

Detailed Contents

Unit No.1 Chassis and Body

- Topic No.1: Vehicles
- Topic No.2: Types of Chassis
- Topic No.3: Major Assemblies
- Topic No.4: Alternating arrangement
- Topic No.5: Car Body`
- Topic No.6: Body Upholstery
- Topic No.7: Body Streamlining
- Topic No.8: Protective Coatings
- Topic No.9: Air-Conditioning
- Topic No.10: Types of Frame and Body

Unit No.2 Clutch

- Topic No.11: Introduction
- Topic No.12: Types of Clutch
- Topic No.13: Clutch Plate
- Topic No.14: Lining Material

Unit No. 3 Transmission

- Topic No.15: Introduction
- Topic No.16: Types of Gearbox
- Topic No.17: Overdrive
- Topic No.18: Over running Clutch
- Topic No. 19: Epicyclic Gearbox
- Topic No. 20: Torque Converter
- Topic No. 21: Transfer Gearbox

Unit No. 4 Driveline

- Topic No.22: Propeller shaft
- Topic No.23: Universal joints
- Topic No.24: Constant velocity joints
- Topic No.25: final drive
- Topic No.26: Differential
- Topic No.27: rear axles
- Topic No.28: Constant velocity joints
- Topic No.29: Common faults and remedies

Unit No. 5 Front axle

- Topic No.30: Introduction
- Topic No.31: Types of front axles
- Topic No.32: Load distribution
- Topic No.33: steering head
- Topic No.34: steering knuckle

Unit No. 6 Steering

- Topic No.35: Steering mechanism
- Topic No.36: Ackerman's Principle of steering
- Topic No.37: steering gear
- Topic No.38: steering linkages
- Topic No.39: front and geometry
- Topic No.40: Cornering force & power
- Topic No.41: over and under steering





STUDY SCHEME			EVALUATION SCHEME						Total Marks
			Internal Assessment		External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
4	-		25	-	100	3	-	-	125

TEXT BOOKS:

1. CHASSIS BODY TRANSMISSION by Vijay Singh, Eshan Publication.

RECOMMENDED BOOKS

1. Automobile Engineering, Vol. I – II by Dr. Kirpal Singh, Standard Publishers, Delhi
2. Automobile Engineering by GBS Narang, Khanna Publishers, Delhi
3. Chassis, Body and Transmission by Vijay Singh & Raj Kumar, Ishan Publications, Jalandhar.
4. Chassis, Body and Transmission-II by G.S.Aulakh, Eagle Prakashan, Jalandhar.
5. Automobile Engineering by R.B. Gupta, Satya Prakashan, New Delhi.
6. Automobile Engineering by Vijay Singh & Raj Kumar ; Ishan Publications, Jalandhar.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	10	06
2	12	08
3	14	22
4	10	16
5	06	10
6	12	18
Total	64	100



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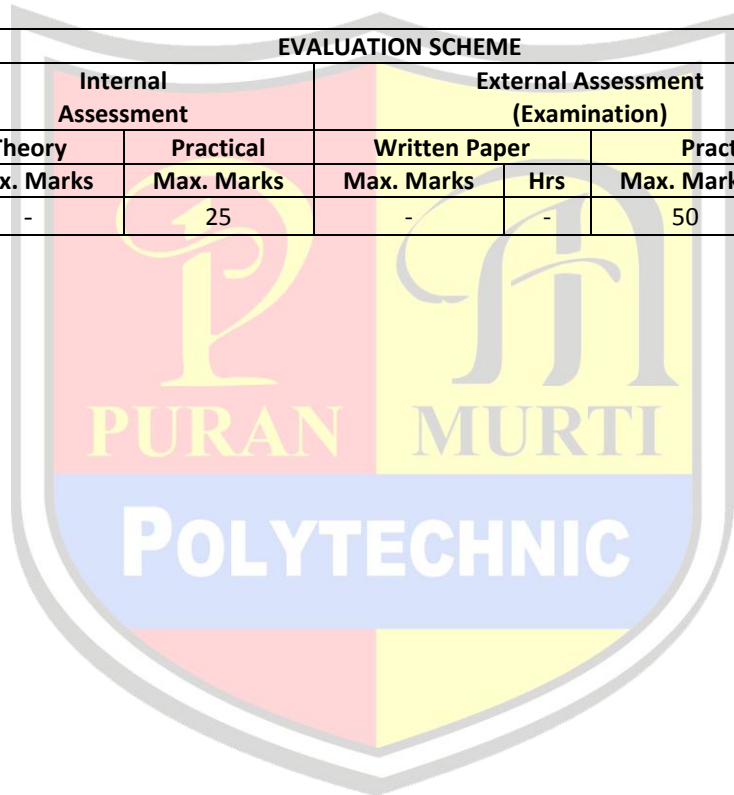
Subject: Chassis, Body And Transmission-I (Practical)

Subject Code: 120343(P)

List of Practical

1. Study and sketches of Heavy and Light vehicle chassis.
- 2: Identify and servicing of single plate and multi plate clutch.
- 3: Study and sketch of centrifugal clutch.
- 4: Servicing and overhauling of constant mesh and synchromesh gear box
- 5: Servicing of universal joints, slip joint and propeller shaft
- 6: Servicing of differential, adjustment of crown and pinion backlash.
- 7: Checking and adjustment of steering geometry, camber, caster, Toe-in, Toe-out, kingpin inclination.
- 8: Study of live axles.

STUDY SCHEME		EVALUATION SCHEME							Total Marks
		Internal Assessment			External Assessment (Examination)				
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
-	-	4	-	25	-	-	50	2	75





List of Practical

1. Introduction to AutoCAD : Starting up, practice on – how to create a new drawing file setting drawing limits & saving a file, drawing lines in different ways using absolute coordinates, user co-ordinates, WCS, UCS, drawing circles, drawing arcs, drawing ellipses. Drawing polygons, drawings splines. Drawing polylines, using window, zoom commands.
2. Practice on Edit commands such as erase, copy, mirror, array, offset, rotate, oops, undo, redo, scale, stretch, trim, break, extend, chamfer, fillet, O snap command
3. Practice on Text commands: editing text, text size, text styles, change properties commands.
4. Practice on Layer Commands: creating layer, freeze, layer on/off colour assigning, current layer, load line type, lock & unlock layer, move from one layer to other.
5. Practice on Hatching, Hatch pattern selection.
6. Practice on Dimensioning, linear dimensioning, angular dimensioning radius/.diameter dimensioning O-snap command, aligned dimensioning, editing of dimensioning, tolerances in dimensioning.
7. Practice on print/plot commands. Export/import commands.
8. Practice on making complete drawings of components by doing following exercises:
 - a) Detail and assembly drawing of the following using AUTOCAD (2D) (4 sheets)
 - Plummer Block
 - Wall Bracket
 - Stepped pulley, V-belt pulley
 - Flanged coupling
 - Machine tool Holder (Three views)
 - Screw jack or knuckle joint
 - b) Isometric Drawing by CAD using Auto CAD (one sheet)
 - c) Drawings of following on computer:
 - Cone
 - Cylinder
 - Isometric view of objects
9. Modeling (02 sheets) 3D modeling, Transformations, scaling, rotation, translation
10. Creating Chamfer and Fillet Practice on surface modeling, create part file, practice on assembly of parts, creating assembly view, orthographic views, section view (Practice on different views, practice on data transfer)
11. Introduction to Other Software; (Pro Engineer/CATIA / Inventor/ Unigraphics/ Solid Work: Salient features.

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			Internal Assessment			External Assessment (Examination)			
Hrs/week			Theory	Practical	Written Paper		Practical		
L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs	Max. Marks	Hrs	
-	-	3	-	50	-	-	50	3	100