



# 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-MECHANICAL ENGINEERING (TOOL AND DIE)

OSr. No.	Subject	Study Scheme			EVALUATION SCHEME						Total Marks
					INTERNAL ASSESSMENT		EXTERNAL ASSESMENT (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	3	200
4.2*	HYDRAULIC AND PNEUMATIC SYSTEM	4	-	2	25	25	100	3	50	3	200
4.3*	JIGS, FIXTURES AND GAUGES- DESIGN AND DRAWING	3	-	2	-	50	100	3	-	-	150
4.4*	BASIC OF MECHANICAL ENGINEERING	3	-	2	25	25	100	3	50	3	200
4.5*	Workshop Technology-11	3	-	-	25	-	100	3	-	-	125
4.6*	Workshop Practice- 11	-	-	9	-	100	-	-	100	3	200
4.7*	COMPUTER AIDED DRAFTING	-	-	3	-	50	-	-	50	3	100
# Student Centred Activities		-	-	4	-	25	-	-	-	-	25
<b>Total</b>		<b>16</b>		<b>24</b>	<b>100</b>	<b>300</b>	<b>500</b>	<b>-</b>	<b>300</b>	<b>-</b>	<b>1200</b>

\* Common with other diploma programmes

+ Includes 25 marks for Viva-voce

# Student Centred 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.



## SYLLABUS: Polytechnic (T&D)

Department: Mechanical Engineering – 4<sup>th</sup> 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 No5: 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

#### 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.

#### INSTRUCTIONAL STRATEGY

While imparting instructions, teacher should show various types of engineering materials to the students. Students should be asked to collect samples of various materials available in the market. Visits to industry should be planned to demonstrate use of various types of materials or Heat Treatment Processes in the industry.



# 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

### 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
<b>Total</b>	<b>64</b>	<b>100</b>





# 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

**Subject: Materials And Metallurgy (Practical)**

**Subject Code: 120342(P)**

### List of practical

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, aluminum, 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	
-	-	4	-	25	-	-	50	2	75



## Detailed Contents

### Unit No.1 Introduction:

- Topic No.1: Need, Scope and Importance of Hydraulic and Pneumatic
- Topic No.2: Hydrostatic and Hydrodynamic Definitions
- Topic No.3: Properties of Fluid, Pascal's Law
- Topic No.4: Continuity Equation and Bernoulli's Equation
- Topic No.5: Advantages and Limitations of Hydraulic and Pneumatic Systems

### Unit No.2 Hydraulic Elements:

- Topic No.6: Hydraulic Pipes- Type, Materials, Designations, Pressure Ratings Selection Criteria. Piping Layout, Concept, Rules/Norms
- Topic No.7: Hydraulic Pump- Type, Construction, Working Applications And Selection Criteria.
- Topic No.8: Control Valves- Type, Designation, Symbols, Working And Applications
- Topic No.9: Hydraulic Actuators- Type, Working And Applications
- Topic No.10: Other Elements Such As Filters, Manifold, Receivers, Coolers And Connecters

### Unit No.3 Fundamentals of Pneumatics:

- Topic No.11: Compressible Fluid Flow, Mass Flow Rate,
- Topic No.12: Compressible Fluid- Type, Properties and Applications.

### Unit No.4 Pneumatic Elements:

- Topic No.13: Pipes- Type, Designations, Applications and Properties
- Topic No.14: Air Compressor- Type (Reciprocating and Rotary), Working And Selection Criteria
- Topic No.15: Pneumatic Cylinders- Type, Symbol, Cushion, Assemblies, Mounting and Installation.
- Topic No.16: Air Motors- Type, Working and Applications.
- Topic No.17: Pneumatic Valves- Type, Symbols, Working, Applications And Selection Criteria
- Topic No.18: Other Elements - Air Receivers, Filters, Pressure Regulator, Lubricator

### Unit No.5 Hydraulic and Pneumatic Circuits:

- Topic No.19: Concept, Meaning and ISO Symbols, Basic Hydraulic And Pneumatic Circuits- Type, Circuit Diagrams.
- Topic No.20: Rules or Norms for Designing Hydraulic and Pneumatic Circuits.

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

### RECOMMENDED BOOKS

1. Hydraulics and Pneumatics (A Technician and Engineer Guide) by Andrew Parr; Butterworth Publishers.
2. Hydraulic and Pneumatic Systems by S. R Majumdar; TMH Publishers.
3. Mechatronics by W. Bolton; Pearson.

### INSTRUCTIONAL STRATEGY

1. Teacher should lay emphasis in making the students conversant with concepts and principles of hydraulic and pneumatic systems.
2. Various hydraulic and pneumatic elements should be demonstrated during teaching

### SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (hrs.)	Marks Allotted (%)
1	08	15
2	20	30
3	06	10
4	20	30
5	10	15
<b>Total</b>	<b>64</b>	<b>100</b>



# 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

**Subject: Hydraulic and Pneumatic Systems (Practical)**

**Subject Code: 121841(P)**

**List of practical**

1. Study and demonstration of various hydraulic devices/elements.
2. Study and demonstration of various pneumatic devices/elements
3. Operate hydraulic circuits based on simple system requirement. ( at least 3)
4. Operate, pneumatic circuit based on simple systems requirements (at least 3)
5. Visit to a related industry

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





**Section - A**

**Unit No.1 Jigs and Fixtures**

- Topic No.1: Introduction to Jig and Fixture
- Topic No.2: Advantages of jig and fixture
- Topic No.3: Concept of interchangeability

**Unit No.2 Location and Clamping Devices**

- Topic No.4: Principles of Location
- Topic No.5: 3-2-1 Principle of Location
- Topic No.6: Location Methods
- Topic No.7: Clamping
- Topic No.8: Clamping Devices

**Unit No.3 Drilling Jigs**

- Topic No.9: Jigs
- Topic No.10: Drilling Jigs
- Topic No.11: Drilling Bushes

**Unit No.4 Fixtures**

- Topic No.12: Introduction
- Topic No.13: Types of Fixtures

**Unit No.5 Limit Gauges**

- Topic No.14: Introduction
- Topic No.15: Classification of Limit Gauges
- Topic No.16 Thread Gauges
- Topic No.17: Go and Not Go Gauges

**Section - B**

**Unit No.6 Design and Drawing of Drilling Jigs**

**Unit No.7 Design and Drawing of Fixtures for Milling**

**Unit No.8 Design and Drawing of Limit Gauges (Plug, Ring and Snap gauge)**

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	
3	-	-	-	-	100	3	-	-	100

**Note\***

The question paper on this subject will consist of two parts:

Section A will contain theory part to the extent of 50%.

Section B will contain design & drawing to the extent of 50%.

At least, 2 Industrial visits should be arranged in the related industry.

**RECOMMENDED BOOKS**

1. Prakash H Joshi, Press tools design & construction, Wheeler Publisher.
2. Donaldson, Fundamental of tool design.
3. Surrender Kr & Umesh Chandra, Production Engg. & Design, Satya Parkashan, New Delhi.
4. D. Engene Ostergard, Basic Die Making; Mc Graw Hill Book Co.



# 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

## SUGGESTED DISTRIBUTION OF MARKS

Topic No	Time Allotted(hrs)	Marks Allotted (%)
1	05	10
2	07	14
3	10	20
4	12	24
5	14	32
<b>Total</b>	<b>48</b>	<b>100</b>







**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

**Subject: Basics of Mechanical Engg. (Theory)**

**Subject Code: 121845**

**Detailed Contents**

**Unit No.1 Thermodynamics**

- Topic No.1: Introduction
- Topic No.2: laws of thermodynamics
- Topic No.3: Classification & working of IC engine
- Topic No.4: Otto cycle and diesel cycles
- Topic No.5: Parts of IC engine & nomenclature of engine
- Topic No.6: working of two and four stroke IC&SI engine and difference

**Unit No.2 Flywheel**

- Topic No.7: Introduction
- Topic No.8: Function of flywheel, types of flywheel
- Topic No.9: Energy stored in flywheel
- Topic No.10: Coefficient of energy and speed

**Unit No.3 Cam & Followers**

- Topic No.11: introduction
- Topic No.12: Definition of cam and followers
- Topic No.13: classification of cam and followers

**Unit No. 4: Power Transmission Devices**

- Topic No.14: Belt drives and types of belt drives
- Topic No.15: Gear drives and types of gear drives
- Topic No.16: Comparison b/w belt and gear drives
- Topic no.17: Study of differential of automobile

**Unit No. 5 Clutches**

- Topic No.18: Introduction
- Topic No.19: Function & types of clutches

**Unit No. 6: Brakes**

- Topic No. 20: Introduction
- Topic No.21: classification and their types

**Unit No.7: Vibration**

- Topic No.22: Introduction and types, possible causes
- Topic No. 23: Harmful effects and its remedies

**Unit No.8: Balancing**

- Topic No. 24: Need of balancing, concept of static and dynamic balancing

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

**RECOMMENDED BOOKS**

1. Theory of Mechanism & Machine by A Ghosh and A. K. Malik; East West Press(Pvt.) Ltd. N. Delhi.
2. Theory of Machines by R.S. Khurmi ; S. Chand Publication.
3. I.C. Engines by R. C. Sharma & M.L. Mathur.
4. Thermodynamics by R. K. Rajput.



# 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

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	12	24
2	06	12
3	04	08
4	08	20
5	03	06
6	03	06
7	06	12
8	06	12
<b>Total</b>	<b>64</b>	<b>100</b>





# 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

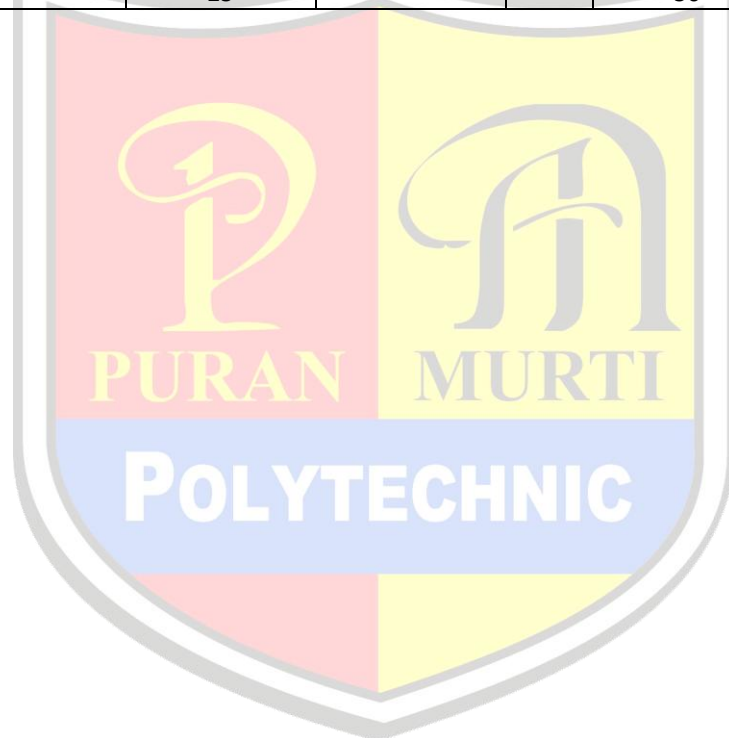
**Subject: Basics Of Mechanical Engineering (Practical)**

**Subject Code: 121845(P)**

### List of practical

1. Study of two stroke and four stroke S. I. Engine with cut sections
2. Study of two stroke and four stroke C. I. Engine with cut sections.
3. Study of flywheel
4. Study of models of clutches: - single plate, multiplate, centrifugal

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





### Detailed Contents

#### Unit No.1 Cutting Tool and Material

- Topic No.1: Single Point Cutting Tool
- Topic No.2: Tool geometry
- Topic No.3: Properties Of Cutting Tool
- Topic No.4: Study of Various Cutting Tool

#### Unit No.2 Lathe

- Topic No.5: Principle of Lathe Machine
- Topic No.6: Lathe Tool and Their Operation
- Topic No. 7: Cutting Parameters
- Topic No.8: Lathe Accessories

#### Unit No.3 Drilling

- Topic No.9: Principle and Classification of Drilling Machine
- Topic No.10: Various Cutting Operations on Drilling Machine
- Topic No.11: Nomenclature of Drilling

#### Unit No .4 Boring

- Topic No.12: Principle & Classification Of Boring
- Topic No.13: Boring Tool & Boring Bars

#### Unit No.5 Shaping, Planing & Slotting

- Topic No.14: Working Principle
- Topic No.15: Types of Shaper & Slotter
- Topic No.16: Types of Tool Used & Their Geometry

#### Unit No.6 Broaching

- Topic No.17: Introduction & Types Of Broaching Machine
- Topic No.18: Types & Detail of Tool

#### Unit No.7 Jigs & Fixture

- Topic No.19: Principle & Importance Of Jigs & Fixture
- Topic No.20: Locatintg & Clamping Device

#### Unit No.8 Cutting Fluid & Lubricants

- Topic No.19: Function & Types Of Cutting Fluid
- Topic No.20 Selection of Cutting Fluid Material
- Topic No.22: Estimation in Welding Shop

#### Unit No.9 Estimates In Foundry Shop

- Topic No.23: Estimation In Foundry Shop

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	
3	-	-	25	-	100	3	-	-	125

#### 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.

#### INSTRUCTIONAL STRATEGY

1. Teachers should lay emphasis in making students conversant with concepts and principles of manufacturing processes.
2. Focus should be on preparing jobs using various machines in the workshop



# 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

## SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	04	08
2	12	26
3	06	14
4	04	08
5	04	08
6	04	08
7	06	12
8	08	16
<b>Total</b>	<b>48</b>	<b>100</b>





# 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

**Subject: Workshop Practice – II (Practical)**

**Subject Code: W.P. II (P)**

### List of Practical

#### Turning Shop

- Job 1. Grinding of single point turning tool.
- Job 2. Exercise of simple turning and step turning.
- Job 3. A composite job involving, turning, taper turning, external thread cutting and knurling.

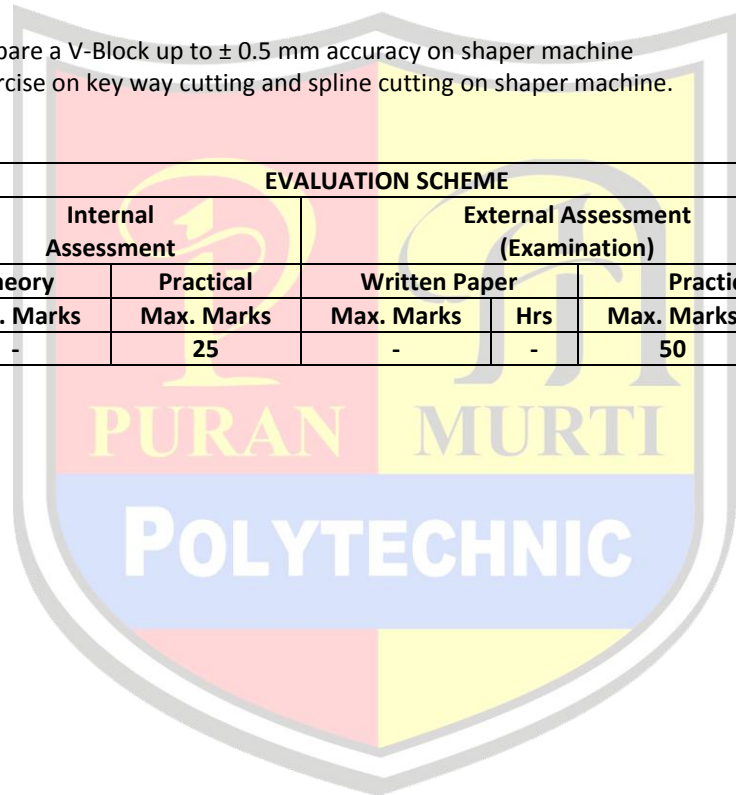
#### Advance Fitting Shop

- Job 1. Exercise on drilling, reaming, counter boring, counter sinking and tapping
- Job 2. Dove tail fitting in mild steel
- Job 3. Radius fitting in mild steel
- Job 4. Pipe threading with die

#### Machine Shop

- Job 1. Prepare a V-Block up to  $\pm 0.5$  mm accuracy on shaper machine
- Job 2. Exercise on key way cutting and spline cutting on shaper machine.

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





### PRACTICE WORK

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 color 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, and 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)  
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.

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	
-	-	3	-	50	-	-	50	3	
									100

### RECOMMENDED BOOKS

1. Engineering Drawing with AutoCAD 2000 by T. Jeyapooran; Vikas Publishing House, Delhi.
2. AutoCAD for Engineering Drawing Made Easy by P. Nageswara Rao; Tata McGraw Hill, New Delhi.
3. AutoCAD 2000 for you by Umesh Shettigar and Abdul Khader; Janatha Publishers, Udupi.
4. Auto CAD 2000 by Ajit Singh, TMH, New Delhi.

### INSTRUCTIONAL STRATEGY

1. Teachers should show model or realia of the component/part whose drawing is to be made.
2. Emphasis should be given on cleanliness, dimensioning, & layout of sheet.
3. Teachers should ensure use of IS codes related to drawing.