



SCHEME FOR FOURTH SEMESTER (MECHANICAL 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	3	200
4.2	Hydraulics and Hydraulic Machines	3	-	2	25	25	100	3	50	3	200
4.3*	I.C. Engines	3	-	2	25	25	100	3	50	3	200
4.4**	Machine Design and Drawing	2	-	6	25	25	100	3	25 (VIVA)	3	175
4.5**	Workshop Technology – II	3	-	-	25	-	100	3	-	-	125
4.6**	Workshop Practice – II	-	-	9	-	100	-	-	100	3	200
# Student Centred Activities		-	-	5	-	25	-	-	-	-	25
Total		14	-	26	125	225	500	-	275	-	1125

** Common with other diploma programmes in production engineering.

+ Includes 25 marks for Viva-voce

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.

Industrial Training - After examination of 4th Semester, the students shall go for training in a relevant industry/field Organization for a minimum period of one month and shall prepare a diary. It shall be evaluated during 5th semester by his/her teacher for 50 marks. The students shall also prepare a report at the end of training and shall present it in a seminar, which will be evaluated for another 50 marks. This evaluation will be done by HOD and lecturer in charge – training in the presence of one representative from training organization.



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

SYLLABUS: Polytechnic (M.E)

Department: Mechanical 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	
3	-	-	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
Total	64	100





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

- Classification of about 25 specimens of materials/machine parts into
 - Metals and non metals
 - Metals and alloys
 - Ferrous and non ferrous metals
 - Ferrous and non ferrous alloys
- 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.
- Study of heat treatment furnace.
- Study of a metallurgical microscope and specimen polishing machine
- To prepare specimens of following materials for microscopic examination and to Examine the microstructure of The specimens of following materials.
 - Brass
 - Copper
 - Grey
 - Malleable
 - Low carbon steel
 - High carbon steel
- To anneal a given specimen and find out difference in hardness as a result of annealing
- To normalize a given specimen and to find out the difference in hardness as a result of normalizing
- 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	
-	-	3		25	-	-	50	-	75



Detailed Contents

Unit No. 1 Introduction

Topic No.1: Fluid, types of fluid;

Topic No.2: properties of fluid via mass density, weight density (specific weight), specific volume, capillarity, specific Gravity, viscosity, compressibility,

Topic No.3: properties of fluid: surface tension, kinematic viscosity and dynamic viscosity and their units.

Unit No.2 Pressure and its measurement

Topic No.4: Concept of pressure (Atmospheric Pressure, gauge pressure, absolute, pressure), Pascal's Law, Static Pressure

Topic No.5: Pressure measuring devices: peizometer tube manometers - simple U-tube

Topic No.6: differential single column, inverted U-tube, micro manometer including simple problems

Topic No.7: Bourdon pressure gauge, Diaphragm pressure gauge, dead weight pressure Gauge

Unit No. 3 Flow of fluids

Topic No.8: Types of fluid flow – steady and unsteady, uniform and non-uniform, laminar and turbulent; rate of Flow and their units;

Topic No.9: continuity equation of flow; potential energy of a flowing fluid; total head;

Topic No.10: Bernoulli's theorem (statement and proof) and its applications .Discharge measurement with the help Of venturi-meter,

Topic No.11: orifice meter, pitot-tube, limitations of Bernoulli's theorem simple problems.

Unit No. 4 Flow through pipes

Topic No.12: Definition of pipe flow, wetted perimeter, hydraulic mean depth, hydraulic gradient; loss of head due to friction, Chezy's equation and Darcy's equation of head loss (without proof),

Topic No.13: Reynold's number and its effect pipe friction; siphon, Nozzle – definition, velocity of liquid flowing Through the nozzle, power developed. Water hammer, anchor block siphon, surge tank (concept only).

Topic No.14: Loss of head in pipes due to sudden enlargement, sudden contraction, obstruction on flow path, Change of direction and pipe fittings (without proof)

Unit No. 5 Flow through orifice

Topic No.15: Cc, Cv, Cd, flow through drowned, partially drowned orifices,

Topic No.16: time for emptying a tank through a circular orifice. Simple problems

Unit No. 6 Hydraulic machines

Topic No.17: Description, operation and application of hydraulic systems – hydraulic ram, hydraulic jack, hydraulic brake , hydraulic accumulator

Topic No.18: hydraulic door closer, hydraulic press, selection of specification of above systems for different applications

Unit No. 7 Water turbines and pumps

Topic No.19: Concept of a turbine, types of turbines –impulse and reaction type (concept only) difference between them. Construction and working of pelt on wheel,

Topic No.20: Francis turbine, Propeller and Kaplan turbines. Unit speed, unit power, unit discharge, specific speed Of turbines, selection of turbines based on specific speed

Topic No.21: Concept of hydraulic pump, single acting reciprocating pump (construction and operation only), vane, Screw and gear pumps

Topic No.22: Construction, working and operation of centrifugal pump. Performance efficiencies and specifications Of a centrifugal pump

Topic No.23: Trouble shooting and problems in centrifugal pumps and remedial measures, pitting, cavitations,

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



RECOMMENDED BOOKS

1. Fluid Mechanics by KL Kumar; S Chand and Co Ltd., Ram Nagar, New Delhi.
2. Hydraulics and Fluid Mechanics Machine by RS Khurmi ; S.Chand & Co. Ltd., New Delhi.
3. Fluid Mechanics through Problems by RJ Garde; Wiley Eastern Ltd., New Delhi.
4. Fluid Mechanics by Dr AK Jain, Khanna Publishers, New Delhi.
5. Hydraulic and Pneumatic Control by K Shammuga Sundaram, S. Chand & Co.Ltd., New Delh
6. Hydraulics and Hydraulic Machinery by Dr. Jagadish Lal; Metropolitan BookCompany Ltd.Delhi.
7. Hydraulic and Pneumatic Power and Control Design, Performance and Application by Yeaple, McGraw Hill,
8. Pneumatic Controls by Festo Didactic; Bangalore.
9. Pneumatics Control: An Introduction to the Principles by Werner Deppert and Kurt Stoll; Vogel – Verlag. INSTRUCTIONAL STRATEGY

INSTRUCTIONAL STRATEGY

1. Use computer based learning aids for effective teaching-learning
2. Expose students to real life problems
3. Plan assignments so as to promote problem solving abilities and develop continued learning skills

SUGGESTED DISTRIBUTION OF MARKS

Unit No.	Time Allotted for Lectures (Periods)	Marks Allotted (%)
1	04	08
2	07	16
3	08	16
4	08	16
5	05	15
6	06	15
7	10	16
Total	48	100



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

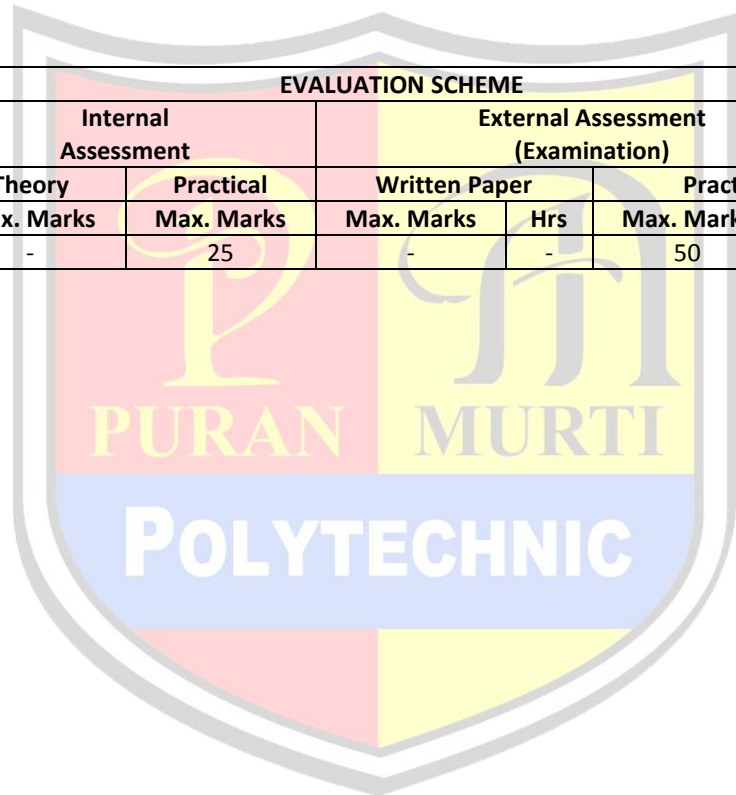
Subject: Hydraulic and Hydraulic Machine (Practical)

Subject Code: 121741(P)

List of practical

1. Measurement of pressure head by employing.
 - i) Piezometer tube
 - ii) Single and double column manometer
2. To find out the value of coefficient of discharge for a venturimeter.
3. Measurement of flow by using venturimeter.
4. Verification of Bernoulli's theorem.
5. To find coefficient of friction for a pipe (Darcy's friction).
6. To study hydraulic circuit of an automobile brake and hydraulic ram.
7. Study the working of a Pelt on wheel and Francis turbine.
8. To study a single stage centrifugal pump for constructional details and its operation to find out its normal head and discharge.

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	3	75





Detailed Contents

Unit No.1 I.C. Engines

- Topic No.1: Introduction
- Topic No.2: working of two stroke cycle
- Topic No.3: Working of four stroke cycle
- Topic No.4: S.I engines and C.I engines
- Topic No.5: Otto cycles and Diesel cycles
- Topic No.6: Location and Function of various parts of I.C Engines and materials used

Unit No.2 Fuel Supply In Petrol Engine

- Topic No.7: Concept of carburetion
- Topic No.8: Air fuel ratio
- Topic No.9: Simple carburetion and its application, MPFI
- Topic No.10: Common rail system, super charger, turbo Charger

Unit No.3 Fuel system of diesel engine

- Topic No.11: components of fuel system
- Topic No.12: Description and working of fuel feed pump
- Topic No.13: Fuel injection pump
- Topic No.14: Injectors

Unit No. 4 Ignition System of IC engines

- Topic No.15: Description of battery coil system
- Topic No.16: Magnet Ignition system
- Topic No.17: Electronic ignition system
- Topic no.18: Fault finding in ignition system and remedial Action

Unit No. 5 Cooling and Lubrication

- Topic No.19: Function of cooling system
- Topic No.20: Air & water cooling system, use of thermostat, Radiators & forced circulation in water cooling
- Topic No.21: Function of lubrication, types & properties
- Topic No.22: Lubrication system of engine
- Topic No.23: Fault finding in cooling & lubrication

Unit No. 6 Testing of I.C Engines

- Topic No.24: Engine power – indicated & brake power
- Topic No.25: Efficiency – mechanical, relative and volumetric
- Topic No.26: Methods of finding indicated & brake power
- Topic No.27: Morse test for petrol engine, heat balance sheet
- Topic No.28: Concept of pollutants in SI&CI engine pollution control
- Topic No.29: Norms of two wheelers – BIS, methods of Reducing pollution
- Topic No.30: Alternative fuels like CNG & LPG

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. Elements of Heat Engines by Pandey and Shah; Charotar Publishing House, Anand.
2. Thermal Engineering by PL. Ballaney; Khanna Publishers, New Delhi.
3. Engineering Thermodynamics by CP. Arora; Tata McGraw Hill Publishers, NewDelhi.
4. Thermal Engineering by RK Purohit; Standard Publishers Distributors, New Delhi.



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

INSTRUCTIONAL STRATEGY

1. Use computer based learning aids for effective teaching-learning
2. Expose students to real life problems
3. Plan assignments so as to promote problem solving abilities and develop continued learning skills

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	09	20
2	08	16
3	06	12
4	06	12
5	10	20
6	09	20
Total	48	100





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: IC Engine (Practical)

Subject Code: 121743(P)

List of Practical

1. Study of a two stroke engine using cut section model, note the function and material of each part.
2. Study of a four stroke engine using cut section model. Note the function of each part
3. Study of battery ignition system of a multi-cylinder petrol engine stressing ignition timings, setting, fixing order and contact breaker; gap adjustment .
4. Study of cooling of IC engine.
5. Study of lubricating system of IC engine.
6. Determination of BHP by dynamometer.
7. Morse test on multi-cylinder petrol 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	
-	-	2	-	25	-	-	50	-	





Detailed Contents

Unit No.1 Introduction of Design

Topic No.1: Definition, Type & Necessity of Design.

Topic No.2: Comparison of Designed & Undersigned Work, Design Procedure. Characteristics of Good Designer.

Topic No.3: Design Terminology: Stress, Strain, and Factor of Safety, Stress Concentration, Fatigue, and Endurance Limit.

Topic No.4: Engineering Materials and their Properties, Selection Criterion.

Unit No.2 Design Failure

Topic No.5: Theories of Failure.

Topic No.6: Classification of Loads.

Topic No.7: Design under Tensile, Compressive and Torsion loads.

Unit No.3 Design of Shaft

Topic No.8: Type of Shaft, Shaft Materials, Type of Loading on Shaft, Standard sizes of Shaft available.

Topic No.9: Shaft (Solid and Hollow) Subjected to Torsion Only. Determination of Diameter by Strength & Rigidity Criterion.

Topic No.10: Shafts Subjected to Bending.

Topic No.11: Shafts Subjected to both Torsion and Bending.

Unit No. 4 Design of Key

Topic No.12: Types, Material & Function of Keys.

Topic No.13: Failure of Keys by Shearing and Crushing.

Topic No.14: Design of Key.

Unit No. 5 Design of Screwed Joints

Topic No.15: Introduction, Advantage, Disadvantage and Location of Screw Joints.

Topic No.16: Important terms used in Screw Threads, Designation of Screw Threads.

Topic No.17: Initial Stresses due to Screw up Forces.

Topic No.18: Stresses due to Combined Forces.

Topic No. 19: Design of Power Screws (Press, Screw Jack, Screw Clamp).

Unit No. 6 Cams

Topic No.20: Types of Cam & Followers.

Topic No.21: Profile of Cam with Knife Edge & Roller Follower

Unit No. 7 Gears

Topic No.22: Nomenclature of Gears.

Topic No.23: Drawing the Actual Profile of In volute Teeth Gear by Different Methods.

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	-	6	25	25	100	3	25	3	
175									

RECOMMENDED BOOKS

1. Machine Design by R.S. Khurmi and JK Gupta, Eurasia Publishing House (Pvt.) Limited, New Delhi.
2. Machine Design by V.B.Bhandari, Tata McGraw Hill, New Delhi.
3. Engineering Design by George Dieter; Tata McGraw Hill Publishers, New Delhi.
4. Mechanical Engineering Design by Joseph Edward Shigley; McGraw Hill, Delhi.



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

INSTRUCTIONAL STRATEGY

1. While imparting instructions, focus should be on concepts.
2. Presentation should be arranged for various topics.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	08	12
2	05	06
3	06	16
4	04	10
5	04	32
6	03	12
7	02	12
Total	48	100





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 Technology-II (Theory)

Subject Code: 121744

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
Total	48	100





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 (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 ± 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	
-	-	9	-	100	-	-	100	3	200

