



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 THIRD SEMESTER (MECHANICAL ENGINEERING)

Sr. No.	Subject	Study Scheme			EVALUATION SCHEME						Total Marks
					INTERNAL ASSESSMENT		EXTERNAL ASSESMENT (EXAMINATION)				
		Hrs/Week			Theory	Practical	Written Paper		Practical		
		L	T	P	Max. Marks	Max. Marks	Max. Marks	Hrs.	Max. Marks	Hrs.	
3.1**	Strength of Materials	4	-	2	25	25	100	3	50	3	200
3.2**	Thermodynamics	4	-	2	25	25	100	3	50	3	200
3.3**	Basics of Electrical and Electronics Engineering	3	-	2	25	25	100	3	50	3	200
3.4**	Workshop Technology	3	-	-	50	-	100	3	-	-	150
3.5**	Machine Drawing	-	-	6	-	50	100	3	25 (viva)	2	175
3.6**	Workshop Practice -1	-	-	6	-	100	-	-	100	3	200
# Student Centred Activities		-	-	5	-	25	-	-	-	-	25
Total		14	-	23	125	250	500	-	275	-	1150

** Common with diploma programme in production Engineering

student centered activities will comprise of co-curricular activities like extension lectures , library studies,games, hobby clubs eg. 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 (MECHANICAL)

Department: MECHANICAL ENGINEERING – 3th Semester

Subject: Strength Of Material (Theory)

Subject Code: 120331

Detailed Contents

Unit No. 1 Stresses and Strains

- Topic No.1: Concept of load, stresses and strain, Tensile compressive and shear stresses and strains
- Topic No.2: Concept of Elasticity, Elastic limit and limit of proportionality.
- Topic No.3: Hook's Law, Young Modulus of elasticity, Nominal stress
- Topic No.4: Stress strain diagram, Yield point, plastic stage, Ultimate strength and breaking stress
- Topic No.5: Proof stress and working stress, Factor of safety, Poisson's ratio, Shear modulus
- Topic No.6: Longitudinal and circumferential stresses in seamless thin walled Cylindrical shells (derivation of these formulae not required)

Unit No. 2 Resilience

- Topic No.7: Resilience, proof resilience and modulus of resilience, Strain energy due to direct stresses
- Topic No.8: Stresses due to gradual, sudden and falling load.
- Topic No.9: Numerical problems

Unit No. 3 Moment of Inertia

- Topic No.10: Concept of moment of Inertia and second moment of area, Radius of gyration, section modulus
- Topic No.11: Theorem of perpendicular axis and parallel axis (without derivation):
- Topic No.12: Second moment of area of common geometrical sections: Rectangle, Triangle, and Circle (without Derivation) Second moment of area for I,T,
- Topic No.13: Simple numerical problems.

Unit No. 4 Bending Moment and Shearing Force

- Topic No.14: Concept of beam and type of loading, Concept of end supports-Roller, hinged and fixed
- Topic No.15: Concept of bending moment and shearing force
- Topic No.16: B.M. and S.F. Diagram for cantilever and simply supported beams with and without overhang subjected to concentrate and U.D.L

Unit No. 5 Bending stresses

- Topic No.17: Concept of Bending stresses, Theory of simple bending
- Topic No.18: Use of the equation $f/y = M/I = E/R$, Concept of moment of resistance
- Topic No.19: Bending stress diagram, Calculation of maximum bending stress in beams of rectangular, circular, and T section.
- Topic No.20: Permissible bending stress Section modulus for rectangular, circular and symmetrical I section

Unit No. 6 Columns

- Topic No.22: Concept of column, modes of failure, Types of columns
- Topic No.22: Buckling load, crushing load, Slenderness ratio
- Topic No.23: Factors effecting strength of a column, End restraints, Effective length
- Topic No.24: Strength of column by Euler Formula without derivation

Unit No. 7 Torsion

- Topic No.25: Concept of torsion- difference between torque and torsion. Use of torque equation for circular shaft
- Topic No.26: Comparison between solid and hollow shaft with regard to their strength and weight
- Topic No.27: Power transmitted by shaft, Concept of mean and maximum torque

Unit No. 8 Springs

- Topic No.28: Closed coil helical springs subjected to axial load and impact load , Stress deformation
- Topic No.29: Stiffness and angle of twist and strain energy, Proof resilience
- Topic No.30: Laminated spring (semi elliptical type only), Determination of number of plates



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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. SOM by Birinder Singh,; Katson Publishing House, New Delhi.
2. SOM by RS Khurmi; S.Chand & Co; New Delhi
3. Elements of SOM by D.R. Malhotra & H.C.Gupta; Satya Prakashan, New Delhi..

INSTRUCTIONAL STRATEGY

1. Expose the students to real life problems.
2. 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	8	12
2	6	10
3	10	16
4	8	12
5	8	12
6	8	12
7	10	16
Total	64	100



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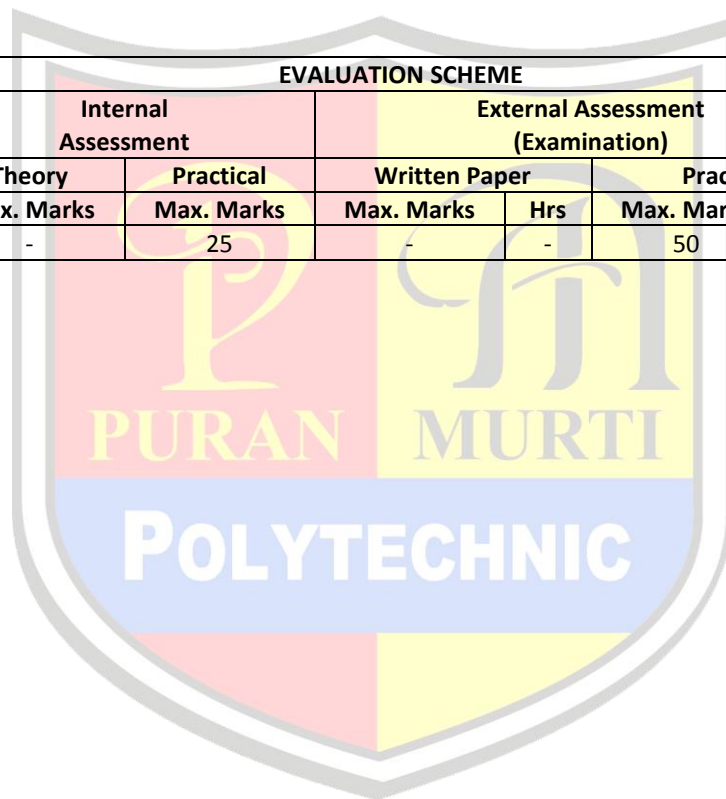
Subject: Strength of Materials (Practical)

Subject Code: 120331(P)

List of Practical

1. Tensile test on bars of Mild steel and Aluminum.
2. Bending tests on a steel bar or a wooden beam.
3. Impact test on metals
 - a) Izard test
 - b) Charpoy test
4. Torsion test on specimens of different metals for determining modulus of rigidity.
5. To determine the stiffness of a helical spring and to plot a graph between load and Extension
6. Hardness test on different metals.

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





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Subject: Thermodynamics (Theory)

Subject Code: 121732

Detailed Contents

Unit No.1 Fundamental Concepts

- Topic No.1: Basic of Thermodynamic
- Topic No.2: Thermodynamic Systems
- Topic No.3: Properties of System
- Topic No.4: Thermodynamic Equilibrium
- Topic No.5: Quasi Static Process
- Topic No.6: Reversible and Irreversible Processes
- Topic No.7: Zeroth Law of Thermodynamics
- Topic No.8: Definition of Properties

Unit No.2 Laws of Perfect Gases

- Topic No.9: Definition of Gases and Perfect Gas
- Topic No.10: Boyle's Law
- Topic No.11: Charles's Law
- Topic No.12: Avogadro's Law
- Topic No.13: Renault's Law
- Topic No.14: Universal Gas Constant
- Topic No.15: Characteristics Gas Constant Derivation
- Topic No.16: Specific Heat at Constant Pressure
- Topic No.17: Specific Heat at Constant Volume

Unit No.3 Thermodynamic Processes of Gases

- Topic No.18: Isochoric Process
- Topic No.19: Isobaric Process
- Topic No.20: Isothermal Process
- Topic No.21: Hyperbolic Process
- Topic No.22: Isentropic Process
- Topic No.23: Polytrophic Process
- Topic No.24: Throttling Process

Unit No.4 Laws of Thermodynamics

- Topic No.25: Laws of Conservation Of Energy
- Topic No.26: First Law of Thermodynamics
- Topic No.27: Application of First Law Of Thermodynamics To Non-Flow Systems
- Topic No.28: Steady Flow Energy Equation
- Topic No.29: Application of Steady Flow Energy to Equation
- Topic No.30: Heat Source and Heat Sinks
- Topic No.31: Second Laws of Thermodynamics
- Topic No.32: Perpetual Motion Machine of First Kind
- Topic No.33: Carnot Engine
- Topic No.34: Introduction of Third Law of Thermodynamics
- Topic No.35: Concept of Irreversibility

Unit No.5 Ideal and Real Gases

- Topic No. 36: Concept of Ideal Gas
- Topic No. 37: Enthalpy And Specific Heat Capacities Of An Ideal Gas
- Topic No. 38: $P - V - T$ Surface of An Ideal Gas
- Topic No. 39: Triple Point
- Topic No. 40: Real Gases
- Topic No. 41: Vander-Wall's Equation

Unit No.6 Properties of Steam

- Topic No. 42: Formation of Steam And Related Terms
- Topic No. 43: Thermodynamics Properties Of Steam



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- Topic No. 44: Steam Tables
- Topic No. 45: Internal Latent Heat
- Topic No. 46: Internal Energy of Stream
- Topic No. 47: Entropy of Water
- Topic No. 48: Entropy of Steam
- Topic No. 49: T- S Diagrams, Mollier Diagram (H – S Chart)
- Topic No. 50: Expansion of Steam
- Topic No. 51: Quality of Steam (Dryness Fraction)
- Topic No. 52: Measurement of Dryness Fraction

Unit No.7 Steam Generator

- Topic No. 53: Uses Of Steam
- Topic No. 54: Classification of Boilers
- Topic No. 55: Comparison of Water and Fire Tube Boilers
- Topic No. 56: Lancashire Boiler
- Topic No. 57: Babcock and Wilcox Boilers
- Topic No. 58: Nestle Boiler
- Topic No. 59: Introduction to Modern Boiler

Unit No.8 Air Compressors

- Topic No. 60: Functions of Air Compressor
- Topic No. 61: Uses Of Compressed Air
- Topic No. 62: Type of Air Compressors
- Topic No. 63: Single Stage Reciprocating Air Compressor
- Topic No. 64: Multistage Compressors
- Topic No. 65: Rotary Compressors

Unit No.9 Introduction to Heat Transfer

- Topic No. 66: Modes of Heat Transfer
- Topic No. 67: Fourier's Law
- Topic No. 68: Steady State Conduction
- Topic No. 69: Composite Structures
- Topic No. 70: Natural and Forced Convection
- Topic No. 71: Thermal Radiation

Study Scheme				Evaluation Scheme			Total Marks
Lectures per week				Internal Assessment	External Assessment (Examination)		
L	T	P	Credits	Max. Marks	Max. Marks	Exam Duration	
4	-	-		25	100	3 hours	125

TEXT BOOKS:

1. Thermodynamics (G.S. AULAKH).

RECOMMENDED BOOKS

1. Engineering Thermodynamics by PK Nag; Tata McGraw Hill, Delhi.
2. Basic Engineering Thermodynamics by Roy Chaudhary; Tata McGraw Hill, Delhi.
3. Engineering Thermodynamics by CP Arora; Tata McGraw Hill, Delhi.
4. A Treatise on Heat Engineering by VP Vasandani and DS Kumar; Metropolitan Book Company.

INSTRUCTIONAL STRATEGY

1. Expose the students to real life problems.
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SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	07	12
2	06	10
3	08	12
4	12	18
5	06	10
6	07	10
7	06	10
8	08	12
9	04	06
Total	64	100





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Subject: Thermodynamics (Practical)

Subject Code: 121732(P)

List of Practical

1. Determination of temperature by
 - 1.1 Thermocouple
 - 1.2 Pyrometer
 - 1.3 Infrared thermometer
2. Demonstration of mountings and accessories on a boiler.
3. Study of boilers (through industrial visit)
4. Study of air compressors.
5. Demonstration of heat transfer through conduction, convection and Radiation

Study Scheme				Evaluation Scheme			Total Marks
Lectures per week				Internal Assessment	External Assessment (Examination)		
L	T	P	Credits	Max. Marks	Max. Marks	Exam Duration	
		2		25	50		75





Detailed Contents

Unit No. 1 Welding

- Topic No.1: Welding Process
- Topic No.2: Gas Welding
- Topic No.3: Arc Welding
- Topic No.4: Other Welding Processes
- Topic No.5: Welding Defects

Unit No. 2 Pattern Making

- Topic No.6: Types of pattern, Pattern material, allowances
- Topic No.7: Introduction to cores, core boxes and core materials

Unit No. 3 Moulding and Casting

- Topic No.6: Moulding Sand
- Topic No.7: Mould Making
- Topic No.8: Casting Processes
- Topic No.9: Gating and Riser System
- Topic No.10: Melting Furnaces
- Topic No.11: Casting Defects

Unit No. 4 Metal Forming Processes

- Topic No.12: Press Working
- Topic No.13: Forging
- Topic No.14: Rolling
- Topic No.15: Extrusion and Drawing

Unit No. 5 Plastic Processing

- Topic No.15: Industrial use of plastics, situation where used.
- Topic No.16: Injection moulding-principle, working of injection moulding machine
- Topic No.17: Compression moulding-principle, and working
- Topic No.18: Potential and limitations in the use of plastics

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	100	3	-	-	150

RECOMMENDED BOOKS

1. Workshop Technology by BS Raghuvanshi : Dhanpat Rai and Sons Delhi
2. Elements of Workshop Technology by SK Choudhry and Hajra : Asia Publishing House
3. Manufacturing Technology by M Adithan and A.B. Gupta; Wiley Eastern India Ltd. New Delhi.
4. Welding Engineering by RL Aggarwal and T Manghnani; Khanna Publishers, Delhi
5. A Text Book of Production Engineering by PC Sharma; S Chand and Company Ltd. Delhi
6. Foundry Technology by KP Sinha and DB Goel; Roorkee Publishing House,
7. A Text Book of Manufacturing Science and Technology by A Manna, PrenticeHall of India, Delhi.

INSTRUCTIONAL STRATEGY

1. Teachers should lay special emphasis in making the students conversant with concepts, principles, procedures and practices related to various manufacturing processes.
2. Focus should be laid in preparing jobs using various machines/equipment in the workshop.
3. Use of audio-visual aids/video films should be made to show specialized operations



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SUGGESTED DISTRIBUTION OF MARKS

Unit No.	Time Allotted for Lectures (Periods)	Marks Allotted (%)
1	16	32
2	03	08
3	16	32
4	08	18
5	05	10
Total	48	100





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Subject: Machine Drawing (Theory)

Subject Code: 121734

Detailed Contents

Unit No.1:-Limits and Fits

- Topic No.1: Introduction and Need of Limit and Fit.
- Topic No.2: Basic Size, Zero Line, Limit.
- Topic No.3: Deviations, Tolerances.
- Topic No.4: Fits and Types of Fits.
- Topic No.5: Representations of Tolerances.
- Topic No. 6: System of Fits(Hole Basis and Shaft Basis).
- Topic No.7: Numerical related to Standard Tolerance Unit.
- Topic No.8: Numerical related to Limits and Fits.

Unit No. 2:- Introduction To Drawing Office Equipments

- Topic No.9: List of Drawing Instruments and Other Drawing Materials
- Topic No.10: Scaling such as Enlarged Scales and Reduced Scales.

Unit No.3:-Assembly Drawing

- Topic No.11: Assembly of Universal Coupling.
- Topic No.12: Assembly of Oldham Coupling.
- Topic No.13: Bushed Bearing (Assembled Drawing)
- Topic No.14: Ball Bearing and Roller Bearing (Assembled Drawing).
- Topic No.15: Plummer Block (Assembled Drawing)
- Topic No.16: Foot step Bearing (Assembled Drawing).
- Topic No.17: Pulleys (Fast and Loose).
- Topic No.18: Pipe Joints
- Topic No.19: Lathe Tool Holder.
- Topic No.20 Sketching practice of bearing, bracket and pulley.

Unit No. 4:-Drilling Jig

- Topic No.21: Assembly Drawing of Drilling Jig.

Unit No. 5: Machine Vice

- Topic No.22: Assembly Drawing of Machine Vice.

Unit No. 6:-I C Engine Parts

- Topic No.23: Assembly Drawing Of Piston and Ring.
- Topic No.24: Assembly Drawing Of Connecting Rod
- Topic No.25: Assembly Drawing of Crank Shaft.

Unit No.7:-Mechanical Screw Jack

- Topic No26: Assembly Drawing Of Mechanical Screw Jack.

Study Scheme				Evaluation Scheme			Total Marks
Lectures per week				Internal Assessment	External Assessment (Examination)		
L	T	P	Credits	Max. Marks	Max. Marks	Exam Duration	
-	-	6	4	50	100	3 hours	100

TEXT BOOKS:

1. Machine drawing of Eshaan Publication.
2. Machine Drawing by North Publication.

REFERENCE BOOKS:

1. Machine Drawing by P.S. Gill; S.K. Kataria and Sons; Ludhiana
2. A Text Book of Machine Drawing by R.K.Dhawan; S. Chand and Co. Ltd New Delhi.
3. Machine Drawing by N.D. Bhatt; Charotar Book Depot. Anand.



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INSTRUCTIONAL STRATEGY

1. Teachers should show model or realia of the components/part whose drawing is to be made
2. Emphasis should be given to cleanliness, dimensioning, layout of sheet
3. Teachers should ensure use of IS codes related to drawing
4. Focus should be on the proper selection of drawing instrument and its proper use





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Subject: Basics of Electrical and Electronics Engineering (Theory)

Subject Code: 120136

Detailed Contents

Unit No.1 Application and Advantage of Electricity

- Topic No.1: Difference between ac and dc
- Topic No.2: Various applications of electricity
- Topic No.3: Advantages of electrical energy over other types of energy

Unit No.2 Basic Electrical Quantities

- Topic No.4: Definition of voltage with their units, name of instruments used for measuring
- Topic No.5: Current with their units, name of instruments used for measuring
- Topic No.6: Power with their units, name of instruments used for measuring
- Topic No.7: Energy with their units, name of instruments used for measuring

Unit No.3 Electromagnetic Induction

- Topic No.8: Production of e.m.f.
- Topic No.9: Idea of a transformer and its working principle

Unit No.4 Transmission and Distribution System

- Topic No.10: Key diagram of 3 phase transmission and distribution system,
- Topic No.11: Brief functions of accessories of transmission line.
- Topic No.12: Difference between high and low voltage distribution system
- Topic No.13: Identification of three-phase wires, neutral wire and earth wire in a low voltage Distribution system.
- Topic No.14: Identification of voltages between phases and between one phase and Neutral.
- Topic No.15: Difference between three-phase and single-phase supply.
- Topic No.16: Arrangement of supply system from pole to the distribution board
- Topic No.17: Function of service line
- Topic No.18: Energy meter
- Topic No.19: Main switch
- Topic No.20: Distribution board

Unit No.5 Domestic Installation

- Topic No.21: Various types of domestic circuits,
- Topic No.22: Various accessories and parts of domestic electrical installation.
- Topic No.23: Identification of wiring systems,
- Topic No.24: staircase installation

Unit No.6 Electric Motors and Pumps

- Topic No.25: Definition and various applications of single-phase and three-phase motors.
- Topic No.26: Connection and starting of three-phase induction motor by star-delta starter.
- Topic No.27: Conversion of horse power in watts or kilowatts
- Topic No.28: Type of pumps and their applications
- Topic No.29: Difference between direct online starter and star delta starter
- Topic No.30: Characteristics and applications of servo motors

Unit No.7 Electrical Safety

- Topic No.31: Electrical shock and precautions against shock
- Topic No.32: Treatment of electric shock
- Topic No.33: Concept of fuses and their classification
- Topic No.34: Selection and application
- Topic No.35: Concept of earthing
- Topic No.36: Various types of earthing
- Topic No.37: Applications of MCBs and ELCBs

Unit No.8 Basic Electronics

- Topic No.38: Basic idea of semiconductors – P and N type
- Topic No.39: Diodes, Zener diodes and their applications
- Topic No.40: Transistor – PNP and NPN, symbols, identification of terminals of Transistor



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Topic No.41: Current flowing in a transistor

Topic No.42: Its characteristics and uses.

Topic No.43: Characteristics and applications of a thruster

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. Basic Electrical Engineering by PS Dhogal; Tata McGraw Hill Publishers, New Delhi
2. A Text Book of Electrical Technology, Vol. I and II by BL Thareja; S Chand and Co., New Delhi
3. Basic Electronics by VK Mehta; S Chand and Co., New Delhi
4. Electrical Machines by SK Bhattacharya; Tata McGraw Hill, New Delhi

INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time allotted (Hrs)	Marks Allotted (%)
1	04	10
2	04	10
3	04	10
4	08	15
5	08	15
6	10	18
7	04	10
8	06	12
Total	48	100



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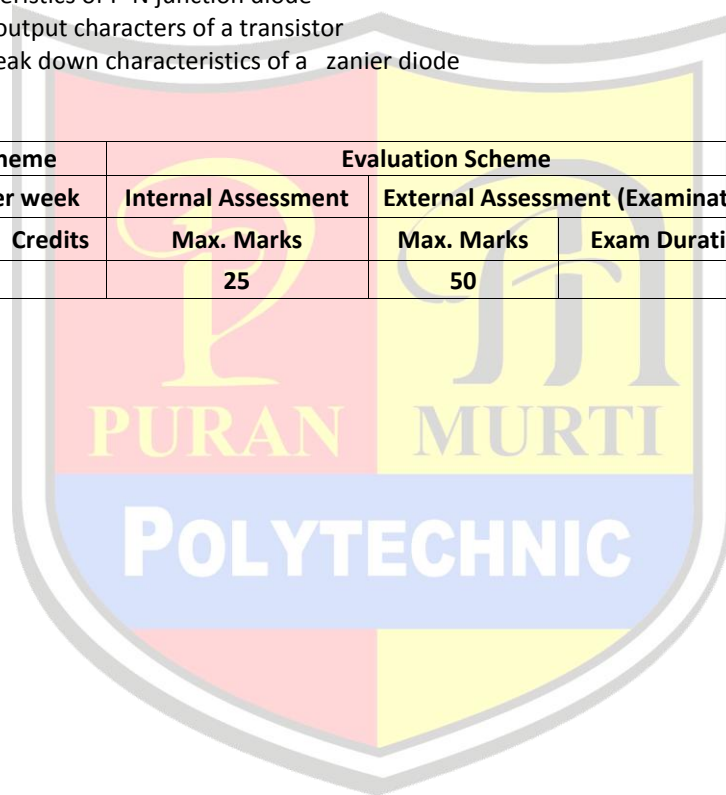
Subject: Basics of Electrical and Electronics Engineering (Theory)

Subject Code: 120136(P)

List of practical

1. Connection of a three-phase motor and starter with fuses and reversing of direction of rotation
2. Connection of a single-phase induction motor with supply and reversing of its direction of rotation
3. To test a battery for its charged and discharged condition
4. Identify the different faults in a domestic wiring system
5. Connection and reading of an electric energy meter with supply and load using ammeter, voltmeter.
6. Study of a distribution board for domestic installation
7. Ohm's law verification
8. Verification of law of resistance in series
9. Verification of law of resistance in series
10. Draw V-I characteristics of P-N junction diode
11. Draw input and output characters of a transistor
12. Draw reverse break down characteristics of a zener diode

Study Scheme				Evaluation Scheme			Total Marks
Lectures per week				Internal Assessment	External Assessment (Examination)		
L	T	P	Credits	Max. Marks	Max. Marks	Exam Duration	75
		2		25	50		





LIST OF PRACTICALS

General introduction to hand tools used in foundry, welding and pattern making and smithy shop.

Welding Shop

- Job 1. Preparing gas welding joint in vertical position joining M.S. Plates
- Job 2. Exercise on gas cutting of mild steel plate with oxy-acetylene gas torch.
- Job 3. Exercise on gas welding of cast iron and brass part or component.
- Job 4. Exercise on preparation of T Joint by arc welding
- Job 5. Exercise on spot welding/seam welding
- Job 6. Exercise on MIG and TIG welding

Pattern making

- Job 1. Preparation of solid/single piece pattern.
- Job 2. Preparation of two piece/split pattern
- Job 3. Preparation of a pattern on wooden lathe
- Job 4. Preparation of a self cored pattern
- Job 5. Preparation of a core box.

Foundry Shop

- Job 1. Preparation of mould with solid pattern on floor.
- Job 2. Preparation of floor mould of solid pattern using cope.
- Job 3. Preparation of floor mould of split pattern in cope and drag of moulding box.
- Job 4. Moulding and casting of a solid pattern of aluminum
- Job 5. Preparing a mould of step pulley and also preparing core for the same.
- Job 6. A visit to cast iron foundry should be arranged to have first hand knowledge of cast iron melting pouring and casting.
- Job 7. Testing of moisture contents and strength of moulding sand

Forging Shop/Fitting Shop/Sheet Metal Shop

- Job 1. Preparation of single ended spanner by hand/machine forging.
- Job 2. Preparation of simple die
- Job 3. Demonstration of spinning process on lathe and spinning a bowl on a lathe machine.
- Job 4. Demonstration of grinding process on lathe machine and grinding a job on a lathe machine
- Job 5. Preparation of utility item out of G.I. sheet.
- Job 6. Preparation of drilling Jig.1. Preparing gas welding joint in vertical position joining M.S. Plates

Study Scheme				Evaluation Scheme			Total Marks
Lectures per week				Internal Assessment	External Assessment (Examination)		
L	T	P	Credits	Max. Marks	Max. Marks	Exam Duration	
		9		100	100		200