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**DIPLOMA IN MECHANICAL ENGINEERING
COMPARISON BETWEEN 'A' SCHEME AND 'B' SCHEME**

THIRD SEMESTER:

Sno.	A-Scheme		B-Scheme		Remarks
	Sem	Subject	Sem	Subject	
1	III	Mechanics Of Materials	III	Strength Of Materials	Enclosed
2	III	Manufacturing Processes	III	Manufacturing Technology – I	No Change
3	III	Fluid Mechanics & Fluid Power	III	Fluid Mechanics & Fluid Power	Enclosed
4	III	Machine Drawing - CAD	III	Machine Drawing - CAD	No Change
5	III	Mechanics Of Materials And Fluid Mechanics Lab	III	Strength Of Materials And Fluid Mechanics Lab	No Change
6	III	Workshop – I	III	Workshop –I	No Change
7	--	-----	III	Computer Application Practical	Newly Introduced

ADDITION AND DELETION

III SEMESTER (A- SCHEME) – MECHANICS OF MATERIALS

This subject was renamed as **STRENGTH OF MATERIALS** (B- scheme III semester)

UNITS	CHANGES
I - Mechanical properties of materials, Simple stresses and strains	Friction part is shifted from I unit to IV Unit
II - Geometrical properties of sections and Thin cylinders and thin spherical shells	Without any changes III Unit shifted to II Unit for convince of sequence
III - Shear force and Bending moment diagrams , Deflection of beams	Deflection of beams is brought from V Unit and attached under III Unit without any changes for convince of sequence.
IV - Theory of Simple bending and Friction	Theory of simple bending is brought from V Unit and attached under IV Unit without any changes for convince of sequence. Friction part is shifted from I Unit
V - Torsion and Springs	No Change

ADDITION AND DELETION

III SEMESTER (A- SCHEME) – FLUID MECHANICS & FLUID POWER

This subject was named as same as **FLUID MECHANICS & FLUID POWER** (B-scheme III semester)

UNITS	CHANGES
UNIT I : PROPERTIES OF FLUIDS AND DIMENSIONAL ANALYSIS	“Derivation of hydrostatic forces and problems – deleted. To acquire the fundamental knowledge of unit system. This is the basic required knowledge to build the knowledge of other mechanical subjects. Dimensional Analysis – basics, theorems and problems – added. Hydrostatic forces problems are not widely used in Mechanical Engg.
UNIT II : FLOW OF FLUIDS AND FLOW THROUGH PIPES	No changes
UNIT III: IMPACT OF JETS AND HYDRAULIC TURBINES	No changes
UNIT IV: CENTRIFUGAL AND RECIPROCATING PUMPS	No changes
UNIT V : PNEUMATIC AND HYDRAULIC SYSTEMS	No changes

FOURTH SEMESTER:

SN.	A-SCHEME		B-SCHEME		REMARKS
	SEM	SUBJECT	SEM	SUBJECT	
1	IV	Engg. Thermodynamics	IV	Engg. Thermodynamics	Enclosed
2	IV	Machine Shop Technology	IV	Manufacturing Technology -li	No Change
3	----	-----	IV	Renewable Energy Sources	Newly Introduced
4	IV	Electrical & Electronics Engg.	IV	Electrical & Electronics Engg.	No Change
5	IV	Thermal Engg. Lab	IV	Thermal Engg. Lab	No Change
6	IV	Electrical & Electronics Engg. Lab	IV	Electrical & Electronics Engg. Lab	No Change
7	IV	Workshop II Practical	IV	Workshop II Practical	No Change

ADDITION AND DELETION

IV SEMESTER (A- SCHEME) – ENGINEERING THERMODYNAMICS

This subject was named as same as **ENGINEERING THERMODYNAMICS** (B- scheme IV semester)

UNITS	CHANGES
I -Fundamentals And Applications Of Thermodynamics	No Change
II - Second Law Of Thermodynamics, Entropy And Air Cycles	No Change
III - Air Compressors And Gas Turbines	It is brought from IV unit and attached under IIIUnit without any changes for convince of sequence.
IV - Fuels & Combustion Of Fuels And Internal Combustion Engines	Fuels & Combustion Of Fuels topic is newly included in this IV Unit. Internal Combustion Engines is shifted from III unit for convince of sequence.
V - Performance Of I.C Engines and Heat transfer	Performance of I.C Engines is shifted from III unit for convince of sequence. Existing PSYCHROMEv Internal Combustion Engines is shifted from III unit for convince of sequence.

FIFTH SEMESTER:

SNO.	A-SCHEME		B-SCHEME		REMARKS
	SEM	SUBJECT	SEM	SUBJECT	
1	V	Design Of Machine Elements	V	Design Of Machine Elements	Enclosed
2	V	Thermal Engineering	V	Thermal Engineering	No Change
3	VI	Industrial Engg. & Management	V	Industrial Engg. & Management	Shifted from VI Sem to V Sem Enabling the Students to perform in Campus Interview, Changes Enclosed
4(I)	V	Metrology, Machine Tool Maintenance And Testing	V	Metrology And Quality Control	Enclosed
4(II)	V	Refrigeration And Air Conditioning	V	Refrigeration And Air Conditioning	Enclosed
5	--	-----	V	Communication & Life Skills Practical	Newly Introduced
6(I)	V	Metrology, Machine Tool Maintenance And Testing Practical	V	Metrology And Quality Control Practical	Enclosed
6(II)	V	Refrigeration And Air Conditioning Practical	V	Refrigeration And Air Conditioning Practical	Enclosed
7	V	Workshop III	V	Workshop III	No Change

ADDITION AND DELETION

V SEMESTER (A- SCHEME) – Design of Machine Elements

This subject was named as same as **Design of Machine Elements** (B- scheme V semester)

Unit	Changes
Unit I	Knuckle Joint, Welded Joints Added, Design Of Sleeve & Cotter Joint, Shifted From Ii Unit
Unit II	Design Of Marine Coupling Added. Flexible Coupling Description Alone Added.
Unit III	No Change
Unit IV	No Change
Unit V	No Change

ADDITION AND DELETION

V SEMESTER (A- SCHEME) – REFRIGERATION AND AIR-CONDITIONING

This subject was named as same as **REFRIGERATION AND AIR-CONDITIONING** (B- scheme V semester)

UNITS	CHANGES
UNIT I : Refrigeration System & Refrigeration Equipment	No Change
UNIT II : Vapour compression Refrigeration System & Vapour Absorption Refrigeration System & Cryogenic Refrigeration System	Refrigerators for above 2 K - Philips Refrigerator, Giffered McMohan refrigerator, refrigerators for below 2 K - Magnetic refrigeration systems are added
UNIT III: Refrigerant flow Control, refrigerants & Lubricants and Application of refrigeration	blends of refrigerants (R400 and R500 Series), electronic expansion valve
UNIT IV: Psychrometric and comfort Air conditioning and Air-conditioning System	Renamed as psychrometric properties. # Air conditioning system included In IV units bring from V unit with deleting of Central plant system, air distribution and duct systems tools and installation servicing and maintenance of R&AC# are added

UNIT V : Cooling Load Calculation Energy Conservation Techniques	Duct design – equal friction method – velocity reduction method – problems Chilled water Systems – Air handling Units. Energy Conservation and design decisions-heat reclaim - thermal storage –ice builder – ice harvester- variable refrigerant flow(VRF)- variable primary flow (VPF)
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ADDITION AND DELETION

VI SEMESTER (A- SCHEME) – INDUSTRIAL ENGINEERING AND MANAGEMENT

This subject was named as same as **INDUSTRIAL ENGINEERING AND MANAGEMENT** (B- scheme V semester)

UNITS	CHANGES
I – Plant Engineering & Plant Safety.	“Safety laws and regulations – Indian factories act 1948 and provision” has been removed It may be learned in the industry if needed
II – Method Study and Work Measurement	No Change
III – Production Planning and Quality Control	Statistical Process Control has been introduced. This knowledge also necessary in the Quality Department.
IV – Principles of Management and Personnel Management	5S concepts , GEMBA and KANBAN system are introduced Now a days industries require knowledge in this area.
V – Financial Management and Materials Management	No Change

ADDITION AND DELETION

V SEMESTER (A - SCHEME) – METROLOGY, MACHINE TOOL MAINTENANCE AND TESTING LAB

This subject has been renamed as **METROLOGY AND QUALITY CONTROL LAB** (B- SCHEME V SEM)

UNITS	CHANGE
PART A	<ul style="list-style-type: none"> ❖ Study of coordinate machine ❖ Profile projector - added
PART B	<ul style="list-style-type: none"> ❖ Draw the frequency histogram, frequency polygon & ogive curve using given data. ❖ To draw the normal distribution curve, standard deviation, variance for the

	<p>measured data.</p> <ul style="list-style-type: none"> ❖ To draw & interpret the control charts for variables ❖ To draw & interpret the control charts for attributes ❖ Study of sampling techniques. - added ❖ Machine tool maintenance and testing moved to part A
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SIXTH SEMESTER:

SNo.	A-SCHEME		B-SCHEME		REMARKS
	SEM	SUBJECT	SEM	SUBJECT	
1			VI	Entrepreneurial Development	Newly Introduced
2	VI	Computer Aided Design And Manufacturing	VI	Computer Aided Design And Manufacturing	No Change
3(I)	VI	Elective Theory –I	VI	Elective Theory –I	No Change
		Automobile Engineering		Automobile Engineering	
3(II)	VI	Elective Theory –I	VI	Elective Theory –I	No Change
		Mechatronics		Mechatronics	
4	VI	Computer Aided Design And Manufacturing Practical	VI	Computer Aided Design And Manufacturing Practical	No Change
5	--	-----	VI	Process Automation Practical	Newly Introduced
6(I)	VI	Elective Practical –II	VI	Elective Practical –II	No Change
		Automobile Engineering Practical		Automobile Engineering Practical	
6(II)	VI	Elective Practical –II	VI	Elective Practical –II	No Change
		Mechatronics Practical		Mechatronics Practical	
7	VI	Workshop III	VI	Workshop III	No Change

Annexure – I
CURRICULAM AND SCHEME OF EXAMINATION
DIPLOMA IN MECHANICAL ENGINEERING
Full Time
'B' SCHEME

Total Curriculum Hours :35 Hours / Week

Total Working Hours:35 Hours / Week – 14 Weeks / Semester

III SEMESTER

Sl. No.	Subject Code	Name of the Subject	Total Hours per Week	Duration of Exam. Hours	Examination Marks			Minimum Marks for Pass
					Allocation of Marks			
					IA	BE	Total	
1	MEB310	Strength of Materials	6	3	25	75	100	40
2	MEB320	Manufacturing Technology – I	5	3	25	75	100	40
3	MEB330	Fluid Mechanics & Fluid Power	6	3	25	75	100	40
4	MEB340	Machine Drawing – CAD	6	3	25	75	100	50
5	MEB350	Strength of Materials and Fluid Mechanics Lab	4	3	25	75	100	50
6	MEB360	Work Shop – I (Smithy, Foundry & Welding)	4	3	25	75	100	50
7	B0003	Computer Applications – Practical**	4	3	25	75	100	50

IV SEMESTER

Sl. No.	Subject Code	Name of the Subject	Total Hours per Week	Duration of Exam. Hours	Examination Marks			Minimum Marks for Pass
					Allocation of Marks			
					IA	BE	Total	
1	MEB410	Engineering Thermodynamics	6	3	25	75	100	40
2	MEB420	Manufacturing Technology – II	5	3	25	75	100	40
3	MEB430	Renewable Energy Sources	6	3	25	75	100	40
4	MEB440	Electrical and Electronics Engineering	6	3	25	75	100	50
5	MEB450	Heat Power Engg. Lab.	4	3	25	75	100	50
6	MEB460	Electrical and Electronics Engineering Lab.	4	3	25	75	100	50
7	MEB470	Workshop –II practical	4	3	25	75	100	50

V SEMESTER

Sl. No.	Subject Code	Name of the Subject	Total Hours per Week	Duration of Exam. Hours	Examination Marks			Minimum Marks for Pass
					Allocation of Marks			
					IA	BE	Total	
1	MEB510	Design of Machine Elements	6	3	25	75	100	40
2	MEB520	Thermal Engineering	5	3	25	75	100	40
4	MEB530	Industrial Engineering & Industrial Management	5	3	25	75	100	40
3	Elective Theory – I		5	3	25	75	100	40
	MEB541	Refrigeration and Air Conditiong						
	MEB542	Metrology and Quality Control Practical						
5	B0002	Communications & Life Skills – Practical**	4	3	25	75	100	50
6	Elective Practical – I		6	3	25	75	100	50
	MEB561	Refrigeration and Air Conditiong Practical						
	MEB562	Metrology and Quality Control Practical						
7	MEB570	Workshop – III Practical	4	3	25	75	100	50

****Common with all Branches of Diploma in Engineering / Technology**

VI SEMESTER

Sl. No.	Subject Code	Name of the Subject	Total Hours per Week	Duration of Exam. Hours	Examination Marks			Minimum Marks for Pass
					Allocation of Marks			
					IA	BE	Total	
1	B0001	Enterprenuerial p Development	5	3	25	75	100	40
2	MEB620	Computer Aided Design and Manufacturing	5	3	25	75	100	40
3	Elective Theory –II		5	3	25	75	100	40
	MEB631	Automobile Engineering						
	MEB632	Mechatronics						
4	MEB640	Computer Aided Design and Manufacturing – Practical	6	3	25	75	100	50
5	MEB650	Process Automation – Practical	4	3	25	75	100	50
6	Elective Practical – II		4	3	25	75	100	50
	MEB661	Automobile Engineering Practical						
	MEB662	Mechatronics Practical						
7	MEB670	Project Work	6	3	25	75	100	50

**CURRICULAM AND SCHEME OF EXAMINATION
DIPLOMA IN MECHANICAL ENGINEERING
SANDWICH PATTERN
'B' SCHEME**

Total Curriculum Hours :35 Hours / Week

Total Working Hours: 35 Hours / Week – 14 Weeks / Semester

III SEMESTER

Sl. No.	Subject Code	Name of the Subject	Total Hours per Week	Duration of Exam. Hours	Examination Marks			Minimum Marks for Pass
					Allocation of Marks			
					IA	BE	Total	
1	MEB310	Strength of Materials	6	3	25	75	100	40
2	MEB320	Manufacturing Technology – I	5	3	25	75	100	40
3	MEB330	Fluid Mechanics and Fluid Power	6	3	25	75	100	40
4	MEB410	Engineering Thermodynamics	6	3	25	75	100	50
5	MEB340	Machine Drawing – CAD	4	3	25	75	100	50
6	MEB450	Heat Power Engg. Lab.	4	3	25	75	100	50
7	MEB370	Computer Applications – Practical	4	3	25	75	100	50

IV SEMESTER**INDUSTRIAL TRAINING SPELL I (DEC TO MAY)**

Sl. No.	Subject Code	Name of the Subject	Total Hours per Week	Duration of Exam. Hours	Examination Marks			Minimum Marks for Pass
					Allocation of Marks			
					IA	BE	Total	
1	MEB420	Manufacturing Technology -II	4	3	25	75	100	40
2	MEB350	Strength of Materials and Fluid Mechanics Lab.	3	3	25	75	100	50
3	MEB480	Industrial Training (Report Writing & Viva-Voce	**	3	25	75	100	50

V SEMESTER

Sl. No.	Subject Code	Name of the Subject	Total Hours per Week	Duration of Exam. Hours	Examination Marks			Minimum Marks for Pass
					Allocation of Marks			
					IA	BE	Total	
1	MEB510	Design of Machine Elements	6	3	25	75	100	40
2	MEB440	Electrical and Electronics Engineering	4	3	25	75	100	40
3	MEB430	Renewable Energy Sources	5	3	25	75	100	40
4	MEB541& MEB542	Elective Theory – I	5	3	25	75	100	40
5	MEB460	Electrical and Electronics Engineering Lab.	4	3	25	75	100	50
6	MEB561& MEB562	Elective Practical – I	3	3	25	75	100	50
7	MEB360	Work Shop - I (Smithy, Foundry & Welding) Practical	4	3	25	75	100	50
8	MEB470	Work Shop –II Practical	4	3	25	75	100	50

VI SEMESTER

Sl. No.	Subject Code	Name of the Subject	Total Hours per Week	Duration of Exam. Hours	Examination Marks			Minimum Marks for Pass
					Allocation of Marks			
					IA	BE	Total	
1	MEB610	Enterprenuerial Development	5	3	25	75	100	40
2	MEB520	Thermal Engineering	6	3	25	75	100	40
3	MEB620	Computer Aided Design and Manufacturing	5	3	25	75	100	40
4	MEB631 & MEB632	Elective Theory – II	4	3	25	75	100	50
5	MEB550	Communications and Life Skills – Practical	3	3	25	75	100	50
6	MEB640	Computer Aided Design and Manufacturing – Practical	4	3	25	75	100	50
7	MEB661 & MEB662	Elective Practical- II	4	3	25	75	100	50
8	MEB57	Work Shop – III – Practical	4	3	25	75	100	40

VII SEMESTER

INDUSTRIAL TRAINING SPELL II (JUNE TO NOVEMBER)

Sl. No.	Subject Code	Name of the Subject	Total Hours per Week	Duration of Exam. Hours	Examination Marks			Minimum Marks for Pass
					Allocation of Marks			
					IA	BE	Total	
1	MEB530	Industrial Engineering and Management	4	3	25	75	100	50
2	MEB650	Process Automation Practical	3	3	25	75	100	50
3	MEB670	Project Work	3	3	25	75	100	50
4	MEB680	Industrial Training (Report Writing & Viva-Voce)	**	3	25	75	100	50

CURRICULAM AND SCHEME OF EXAMINATION DIPLOMA IN MECHANICAL ENGINEERING

Part Time 'B' SCHEME

Total Curriculum Hours :18 Hours / Week

Total Working Hours: 18 Hours / Week - 14 Weeks / Semester

III SEMESTER

Sl. No.	Subject Code	Name of the Subject	Total Hours per Week	Duration of Exam. Hours	Examination Marks			Minimum Marks for Pass
					Allocation of Marks			
					IA	BE	Total	
1	MEB310	Strength of Materials	4	3	25	75	100	40
2	MEB330	Fluid Mechanics & Fluid Power	4	3	25	75	100	40
3	BE 16	Engineering Graphics-I (Tutorial)	4	3	25	75	100	40
4	MEB350	Strength of materials and fluid Mechanics lab	3	3	25	75	100	50
5	MEB370	Computer Applications Practical	3	3	25	75	100	50

IV SEMESTER

Sl. No.	Subject Code	Name of the Subject	Total Hours per Week	Duration of Exam. Hours	Examination Marks			Minimum Marks for Pass
					Allocation of Marks			
					IA	BE	Total	
1	MEB320	Manufacturing Technology -I	3	3	25	75	100	40
2	MEB410	Engineering Thermodynamics	4	3	25	75	100	40
3	MEB430	Renewable Energy Sources	4	3	25	75	100	40
4	BE 26	Engineering Graphics-II	3	3	25	75	100	40
5	MEB360	Workshop - I (Foundary, Smithy and Welding)-Practical	4	3	25	75	100	50

V SEMESTER

Sl. No.	Subject Code	Name of the Subject	Total Hours per Week	Duration of Exam. Hours	Examination Marks			Minimum Marks for Pass
					Allocation of Marks			
					IA	BE	Total	
1	MEB420	Manufacturing Technology-II	4	3	25	75	100	40
2	MEB440	Electrical and Electronics Engineering	3	3	25	75	100	40
3	MEB340	Machine Drawing CAD Practical	4	3	25	75	100	50
4	MEB460	Electrical and Electronics Engineering Practical	3	3	25	75	100	50
5	MEB470	Workshop-II Practical	4	3	25	75	100	50

VI SEMESTER

Sl. No.	Subject Code	Name of the Subject	Total Hours per Week	Duration of Exam. Hours	Examination Marks			Minimum Marks for Pass
					Allocation of Marks			
					IA	BE	Total	
1	MEB520	Thermal Engineering	4	3	25	75	100	40
2	MEB510	Design of Machine Elements	4	3	25	75	100	40
3	MEB570	Workshop III Practical	3	3	25	75	100	50
4	MEB450	Heat Power Engg. Lab	3	3	25	75	100	50
5	MEB550	Communication & Life Skills Practical	4	3	25	75	100	50

VII SEMESTER

Sl. No.	Subject Code	Name of the Subject	Total Hours per Week	Duration of Exam. Hours	Examination Marks			Minimum Marks for Pass
					Allocation of Marks			
					IA	BE	Total	
1	MEB541 & MEB542	Elective Theory - I	3	3	25	75	100	40
2	MEB620	Computer Aided Design and Manufacturing	4	3	25	75	100	40
3	MEB610	Entrepreneurial Development	4	3	25	75	100	40
4	MEB640	Computer Aided Design and Manufacturing - Practical	4	3	25	75	100	50
5	MEB561 & MEB562	Elective Practical - I	3	3	25	75	100	50

VIII SEMESTER

Sl. No.	Subject Code	Name of the Subject	Total Hours per Week	Duration of Exam. Hours	Examination Marks			Minimum Marks for Pass
					Allocation of Marks			
					IA	BE	Total	
1	MEB530	Industrial Engineering and Industrial Management	4	3	25	75	100	40
2	MEB631 & MEB632	Elective Theory – II	4	3	25	75	100	40
3	MEB650	Process Automation Practical	4	3	25	75	100	50
4	MEB661 & MEB662	Elective Practical –II	3	3	25	75	100	50
5	MEB670	Project Work	3	3	25	75	100	50

ELECTIVE THEORY – I

MEB541 Metrology and Quality Control

MEB542 Refrigeration and Airconditioning

ELECTIVE PRACTICAL – I

MEB561 Metrology and Quality Control Practical

MEB562 Refrigeration and Airconditioning Practical

ELECTIVE THEORY – II

MEB631 Automobile Engineering

MEB632 Mechatronics

ELECTIVE PRACTICAL – II

MEB661 Automobile Engineering Practical

MEB662 Mechatronics Practical

MEB310 STRENGTH OF MATERIALS

6 Hrs/Week
16 Weeks /Sem.
Total Hrs : 96
OBJECTIVES:

- Define various mechanical properties of materials.
- Calculate the deformation of materials, which are subjected to axial load and shear.
- Determine the moment of Inertias of various section used in the Industry.
- Estimate the stresses induced in thin and thick cylinder under internal pressure
- Draw the Graphical representation of shear force and bending moment of the beam subjected to different loads.
- Construct SFD and BMD.
- Calculate the power transmitted by the solid & hollow shafts.
- Distinguish different types of spring and their applications.
- Define types of friction.

TOPICS AND ALLOCATION

Unit	Topic	TIME (Hrs)
I.	Mechanical properties of materials, Simple stresses and strains	18
II.	Geometrical properties of sections and Thin cylinders and thin spherical shells	18
III.	Shear force and Bending moment diagrams , Deflection of beams	18
IV.	Theory of Simple bending and Friction	18
V.	Torsion and Springs	18
	Revision and test	6
	TOTAL	96

UNIT I

MECHANICAL PROPERTIES OF MATERIALS, SIMPLE STRESSES AND STRAINS

18 Hrs

Mechanical properties of materials:

Engineering materials – Ferrous and nonferrous materials -Definition of mechanical properties such as strength –elasticity, plasticity, ductility, malleability, stiffness, toughness, brittleness,hardness, wear resistance, machinability, castability and weldability - Alloying elements-effect of alloying element - Fatigue, fatigue strength, creep – temperature creep – cyclic loading and repeated loading – endurance limit.

Simple stresses and strains

Introduction – Definition – Load, stress and strain – Classification of force systems – Behavior of mild steel in tension upto rupture – Stress – Strain diagram – percentage of elongation and percentage reduction in area – Hooke’s law – Definition – Young’s modulus working stress, factor of safety, load factor, shear stress and shear strain modulus of rigidity. Linear strain – Deformation due to tension and compressive force – Simple problems in tension, compression and shear force.

Definition – Lateral strain – Poisson’s ratio – volumetric strain – bulk modulus – problems connecting linear, lateral and volumetric deformation – Elastic constants and their relationship – Problems on elastic constants. Definition – Composite bar – Problem in composite bars subjected to tension and compression – Temperature stresses and strains – Simple problems – Definition – strain energy – proof resilience – modulus of resilience – The

expression for strain energy stored in a bar due to Axial load – Instantaneous stresses due to gradual, sudden, impact and shock loads – Problems computing instantaneous stress and deformation in gradual, sudden, impact and shock loadings.

UNIT II

GEOMETRICAL PROPERTIES OF SECTIONS AND THIN CYLINDERS AND THIN SPHERICAL SHELLS

18hrs

Geometrical properties of sections:

Introduction – definition – center of gravity and centroid-position of centroids of plane geometrical figures such as rectangle, triangle, circle and trapezium-problems to determine the centroid of angle, channel, T and I sections only (No problems on removed sections)- Definition-centroidal axis-Axis of symmetry. Moment of Inertia – Statement of parallel axis theorem and perpendicular axis theorem. (No derivation)-moment of Inertia of lamina of rectangle, circle, triangle, I and channel sections-(No derivations)-Definition-Polar moment of Inertia-radius of gyration – Problems computing moment of inertia and radius of gyration for angle, T, Channel and I sections.(No problems on removed sections).

Thin Cylinders and Thin Spherical Shells:

Introduction – Definition – Thin and thick cylindrical shell – Derivation of Hoop and longitudinal stress causes in a thin cylindrical shell subjected to internal pressure – simple problems – Derivation of tensile stress induced in a thin spherical shell subjected to internal pressure – simple problems

UNIT III

SHEAR FORCE AND BENDING MOMENT DIAGRAMS AND DEFLECTION OF BEAMS

18hrs

Shear force and Bending moment diagrams:

Introduction – classification of beams – Definition – shear force and Bending moment – sign conventions for shear force and bending moment – types of loadings – Relationship between load, force and bending moment at a section – shear force diagram and bending moment diagram of cantilever and simple supported beam subjected to point load and uniformly distributed load – Determination of Maximum bending moment in cantilever beam and simple supported beam when they are subjected to point load and uniformly distributed load - simple problems.

Deflection Of Beams

Introduction – Definition – slope, deflection, stiffness and flexural rigidity – Derivations of relationship between slope, Deflection and Radius of curvature – Derivation of slope and deflections of cantilever and simply supported beam by area moment method under point load and UDL– simple problems.

UNIT IV

THEORY OF SIMPLE BENDING AND FRICTION

18hrs

Theory of simple bending:

Introduction – theory of simple bending – Assumptions – Neutral axis – bending stress distribution – moment of resistance – bending equation – $M/I=f/y=E/R$ (No Derivation) – Definition – section modulus - rectangular and circular sections – strength of beam – simple problems involving flexural formula for cantilever and simple supported beam.

Friction:

Introduction – Definition – Force of friction – Limiting friction – Static Friction – Dynamic friction – Angle of friction – co-efficient of friction – cone of friction – Laws of static and dynamic friction.

UNIT V

TORSION AND SPRINGS

18hrs

Torsion

Introduction – theory of torsion – Assumptions – torsion equation – strength of solid and hollow shafts – power transmitted – Definition – Polar modulus – Torsional rigidity – strength and stiffness of shafts – comparison of hollow and solid shafts in weight and strength considerations – Advantages of hollow shafts over solid shafts – Problems.

Springs

Introduction – Types of springs – Laminated and coiled springs – Types of coiled springs – closely coiled helical spring subjected to an axial load – problem to determine shear stress, deflection, stiffness and resilience of closed coiled helical springs.

Revision and Test

6Hrs

Text Books:

1. A. K. Upadhyay, Applied Mechanics, published by Charotar Publishing House, Opp. Amul Dairy, Court Road, Anand 388 001, India 2002.
2. R. S. Khurmi, Strength of Materials, S.Chand & Co., Ram Nagar, New Delhi – 2002.
3. R.K.Bansal , Engineering Mechanics ,Lakshmi Publications

Reference Books:

1. SB Junnarkar, Dr. HJ Shara, Applied Mechanics, 16th Edn 2001, Charator publishing house, Anand 388001.
2. S. Ramamrutham, Strength of Materials, 15th Edn 2004, Dhanpat Rai Pub. Co., New Delhi
3. Nagan & Palani , Engineering Mechanics , Tata McGraw Hill Publications.

**Strength of Materials
Model Question paper**

Time: 3 Hours

Max Marks: 75

- [Note: (1) Answer all questions choosing any two divisions from (a) and any one from (b) of each question.
 (2) All questions carry equal marks.
 (3) Each division in (a) carries 4 marks and in (b) carries 7 Marks]

- | | | | | |
|---|---|---|---|---|
| I | a | 1 | Define Elasticity , creep, and wear resistance | 4 |
| | | 2 | The rod of a hydraulic lift is 1.2m long and 32mm in diameter. It is attached to a plunger 100mm in diameter under a pressure of 8N/mm ² . If E=2x10 ⁵ N/mm ² find the change in length of the rod. | 4 |
| | | 3 | Define hooks law , factor of safety ,and Poisson’s ratio | 4 |
| | b | 1 | A copper rod 30mm diameter is surrounded tightly by a cast iron tube of 60mm outside diameter the end being firmly fastened together. When put to a compressive load of 12KW. What load will be shared by each. Also estimate the amount by which the compound bar shortens on a length of 10mm. Assume E _{ci} =1.2x10 ⁵ N/mm ² .E _c =1x10 ⁵ N/mm ² . | 7 |

		2	A steel rod of 20mm diameter 6m long is connected to two grips one at each end at a temperature of 120°C. Find the pull exerted when the temperature falls to 40°C. (i). If the end do not yield (ii) If the ends yield by 1mm. Take $E=0.2 \times 10^5$ and $\alpha = 12 \times 10^{-6} \text{C}$.	7
II	a	1	Determine the position of centroid of a channel section having the following dimensions . Top and bottom flanges 150 x 20 mm and web 300 x 20 mm.	4
		2	A Spherical vessel 3 m diameter is subjected to an internal pressure of 1.5 N/mm ² Find the thickness of the vessel required if the max stress is not to exceed 90 N/mm ² Take efficiency of the joint as 75%	4
		3	Define the terms moment of inertia and radius of gyration	4
	b	1	An I-section has the top flange 120mm x 20 mm thick web 180 x 20 mm thick and the bottom flange 200mmx 40mm thick calculate the I_{xx} , I_{yy} , K_{xx} , & K_{yy} of the section.	7
		2	Calculate the increase in volume enclosed by a boiler shell 2.5m long , 1m in diameter when it is subjected to an internal pressure of 150 N/mm ² The wall thickness is such that the maximum tensile stress in the shell is 2150 N/mm ² under this pressure $E=200 \text{KN/mm}^2$, $1/m=0.3$	7
III	a	1	Draw the shear force and bending moment diagram of a cantilever beam with a point load of 50KN at free end. The length of the beam is 8m.	4
		2	List the types of loads acting on beam.	4
		3	To what radius apiece of rectangular steel strip 30mm wide and 4 mm thick can be bent in to an arc form, if the maximum bending stress is limited to 240 N/mm ² ? $E = 2 \times 10^5 \text{ N/mm}^2$.	4
	b	1	A simply supported horizontal beam 5 m long carries concentrated loads of 70 KN, 90 KN , 50 KN and 80 KN at distances 1 m , 3 m , 4 m and 4.5 m respectively from the left hand support. Find support reactions and draw S.F.D and B.M.D.	7
		2	The depth of a beam having symmetrical section is 200 mm and $I = 20000 \times 10^4 \text{ mm}^4$. The beam is simply supported over a span of 6 meters. What concentrated load may be carried by the beam if the permissible stress is 120 N/mm ²	7
IV	a	1	State the assumptions made in the theory of Simple bending.	4
		2	What is limiting friction. and Explain angle of friction.	4
		3	Overall depth 200mm and 10m long is simply supported a central point load of 10KN. Determine the maximum fibre stresses in the beam.	4

- b 1 A cantilever 1 m long is of rectangular section of width 40 mm and depth 60 mm. Calculate the maximum UDL that can be allowed on the entire length of the cantilever without exceeding a deflection of 3.5 mm at the end and a bending stress of 55 N/mm² anywhere in the beam $E = 2 \times 10^5 \text{ N/mm}^2$ 7
- A wooden beam of rectangular section 100 x 200 mm is simply supported over a span of 6m. Determine the udl it may carry, if the bending stress is not to exceed 7.5 N/mm². Estimate the concentrated load it may carry at the centre of the beam with the same permissible stress. 7
- v a 1 State the assumptions made in theory of pure torsion. 4
- 2 Distinguish between a closely coiled helical spring and an open coiled helical spring. 4
- 3 A closely coiled helical spring made of steel wire 10 mm diameter has 15 coils of 100 mm mean diameter. calculate the deflection under an axial load of 200 N . What is the stiffness of the spring? $C = 8 \times 10^4 \text{ N/mm}^2$ 4
- b 1 A truck weighing 30KN and moving at 5 Km/hr has to be brought to rest by buffer. Find how many springs, each of 18 coils will be required to the energy of motion during a compression of 200mm. The spring is made out of 25mm diameter steel rod coiled to a mean diameter of 240mm. Take $N = 0.84 \times 10^5 \text{ N/mm}^2$. 7
- 2 Calculate the diameter of the shaft required to transmit 75 KW at 120 rpm if the maximum torque is likely to exceed the mean by 25 % and the maximum permissible shear stress is 55 N/mm² . Calculate the angle of twist in a length of 3 m . $C = 8 \times 10^4 \text{ N/mm}^2$ 7

MEB320 MANUFACTURING TECHNOLOGY - I

5 Hrs/Week
16 Weeks /Sem.
Total Hrs : 80

OBJECTIVE:

- Acquire Knowledge about types of pattern, casting, moulding.
- Explain hot working and cold working processes
- Describe the various casting processes
- Appreciate the safety practices used in welding.
- Explain powder metallurgy process
- Distinguish the different heat treatment processes
- Explain the lathe and its working parts.
- Describe the functioning of semi automatic and automatic lathes.
- Compare the various types of gauges used in metrology
- Compare the various types of linear and angle measuring devices.

TOPICS AND ALLOCATION

UNIT	TOPIC	TIME (Hours)
I.	Foundry	15
II.	Forging and Welding	15
III.	Powder Metallurgy and Heat Treatment	15
IV.	Lathe Work, Theory of Metal cutting	15
V.	Semi Automatic and Automatic Lathes -Metrology	15
	Revision Test	5
	Total	80

UNIT – I

FOUNDRY

15hrs

PATTERNS

Patterns – definition – pattern materials – factors for selecting pattern materials – single piece solid, split patterns – pattern allowances – core prints.

MOULDING

Moulding – definition – moulding boxes, moulding sand – ingredients – silica – clay – moisture and miscellaneous materials – properties of moulding sand – sand additives – moulding sand preparation – mixing – tempering and conditioning – types of moulding – green sand – dry sand – machine moulding – Top and bottom squeezer machines – Jolting machines – sand slinger- core – CO₂ process core making – types of core – core boxes.

CASTING

Casting – definition – sand casting using green sand and dry sand – gravity die casting – pressure die casting – hot and cold- chamber processes – centrifugal casting – continuous casting – chilled casting – malleable casting – melting of cast iron – cupola furnace – melting of non ferrous metals – crucible furnace melting of steel and arc furnaces – induction furnaces – instrument for measuring temperature – optical pyrometer – thermo electric

pyrometer – cleaning of casting – tumbling, trimming, sand and shot blasting – defects in casting – causes and remedies – safety practices in foundry.

UNIT – II

FORGING AND WELDING

13hrs

Hot working, cold working – advantages of hot working and cold working– hot working operations – rolling – forging, smith forging, drop forging, upset forging, press forging – roll forging. Welding – arc welding definition – arc welding equipment – arc welding methods – carbon arc, metal arc, Metal Inert gas (MIG), Tungsten inert gas (TIG), Atomic hydrogen, Plasma arc, Submerged arc and Electro slag welding, Gas welding – definition Gas Welding Equipment– oxy – acetylene welding Three types of flame– resistance welding – definition – classification of resistance welding – butt – spot – seam – projection welding – welding related processes – oxy – acetylene cutting – arc cutting – hard facing bronze welding – soldering and brazing special welding processes – cast iron welding – thermit welding – solid state welding, ultrasonic, diffusion and explosive welding – explosive cladding – modern welding, electron beam and laser beam welding – types of welded joints – merits and demerits of welded joints – inspection and testing of welded joints – destructive and non destructive types of tests – magnetic particle test – radiographic and ultrasonic test defects in welding – causes and remedies – safety practices in welding .

UNIT – III

POWDER METALLURGY AND HEAT TREATMENT

15 hrs

Methods of manufacturing metal powders – atomization, reduction and electrolysis deposition – compacting – sintering – sizing – infiltration – mechanical properties of parts made by powder metallurgy – design rules for the power metallurgy process. Heat treatment processes – purpose – procedures – applications of various heat treatment processes – Iron – carbon equilibrium diagram – full annealing – process annealing stress relief annealing – spheroidising annealing – isothermal annealing – normalizing – hardening – tempering – quenching medium – different types and their relative merits – case hardening – pack carburizing – cyaniding – nitriding – induction hardening and flame hardening.

UNIT – IV

LATHE WORK AND THEORY OF METAL CUTTING

15hrs

Theory of lathes – specifications – simple sketches – principal parts – head stock – back geared type – all geared type – tumbler gear mechanism – quick change gear box – apron mechanism – carriage cross slide – automatic, longitudinal and cross feed mechanism – tail stock and its functions – work holding device – face plate – three jaw chuck – four jaw chuck – catch plate and carrier – types of centres – machining operations done on lathe straight turning – step turning-taper turning-knurling-Thread cutting-Facing-Boring-chamfering-lathe attachments – tool post grinders – milling attachments-cutting speed-feed-depth of cut. Cutting tool material-High carbon Steel-High Speed Steel-Stellites-Cemented carbides-ceramics-Composition and applications for the above-Single point cutting tool-nomenclature-tool life-Chip Breakers.

UNIT – V

SEMI AUTOMATIC AND AUTOMATIC LATHES, METROLOGY

15hrs

Semi automatic lathes:

Types of semi automatic lathes – capstan and turret lathes – difference between turret and capstan – tools and work holding devices – self opening die head – collapsible taps – simple tool lay out – process sheet.

Automatic Lathes:

Automatic lathe – classification of single spindle automatic lathe – principle of automatic lathes – automatic screw cutting machines – multi spindle automatic lathes – use of cams in automats. Metrology, Micrometer – inside and outside vernier caliper-digital vernier-digital micrometer – vernier height gauge – digital type vernier micrometers – depth gauges –

applications – plug and ring gauges – snap gauges – thread micrometers – gear tooth vernier – bevel protractor – slip gauges – sine bar – comparators – mechanical (dial gauges) – electrical, optical and pneumatic comparators – profile measurements – optical flat – surface finish measurements – profilometers.

Revision and Test

5Hrs

Text Books:

1. Hajra Chowdry & Bhattacharaya, Elements of workshop Technology Volume I & II, Edn. XI, Media Promoters & Publishers Pvt. Ltd., Seewai Building 'B', 20-G, Noshir Bharucha Marg, Mumbai 400 007 – 2007.
2. R. S. Khurmi & J. K. Gupta, A Text book of workshop Technology, Edn. 2, S.Chand & Co., Ram Nagar, New Delhi - 2002.

Reference Books:

1. Begeman, Manufacturing process, Edn. 5, McGraw Hill, New Delhi 1981.
2. WAJ Chapman, Workshop Technology, Volume I, II, & III, Vima Books Pvt. Ltd., 4262/3, Ansari Road, Daryaganj, New Delhi 110 002.
3. Raghuvanshi, Workshop Technology, Khanna Publishers.
Jain & Gupta, Production Technology, Edn. XII, Khanna Publishers, 2-B, North Market, NAI Sarak, New Delhi 110 006 - 2006
4. P. C. SHARMA, Production Technology, Edn. X, S.Chand & Co. Ltd., Ram Nagar, New Delhi 110 055 - 2006
5. HMT, Production Technology, Edn. 18, published by Tata McGraw Hill publishing Co. Ltd.,
7 West Patel Nagar, New Delhi 110 008. – 2001.
6. Kalpakjian, Manufacturing Engineering & Technology

**Model Question paper
Manufacturing Technology - I**

Time: 3 Hours

Max Marks: 75

[Note: Answer all questions. Selecting any two from (a) and any one from (b).
All questions carry equal marks]

- | | |
|---|---|
| I. (a) (1) What is meant by pattern allowances and explain any one. | 4 |
| (2) Explain the optical pyrometer and its uses. | 4 |
| (3) Write short notes on malleable casting. | 4 |
| (b) (1) Draw and explain the various types of patterns. | 7 |
| (2) Sketch and explain the working of Direct Arc furnace with its advantages and disadvantages. | 7 |
| II. (a) (1) Explain the principal of Resistance welding process with its advantages. | 4 |
| (2) Explain TIG welding process. | 4 |
| (3) Explain oxy – Acetylene cutting process. | 4 |
| (b) (1) Sketch and explain Electro – Slag welding process with its applications, advantages and demerits. | 7 |
| (2) Explain the drop – forging process with a neat sketch and state the advantages and applications. | 7 |
| III. (a) (1) Explain the chemical reduction method in powder metallurgy. | 4 |
| (2) State the purposes and applications of normalizing. | 4 |
| (3) What is full analyzing? Explain briefly. | 4 |

- (b) (1) What are the steps involved powder metallurgy manufacturing process?
 Explain Sintering process. 7
- (2) Write short notes on 1. Hardening 2. Flame Hardening
 3. Case Hardening Process
 7
- IV. (a) (1) Explain Face plate. 4
 (2) How a Lathe is specified? 4
 (3) What are the different causes of tool failure? 4
- (b) (1) Explain the working of the tumbler gear mechanism in a lathe . 7
 (2) Write short notes on: 1. High speed steel 2. Ceramics 3. Stellites 7
- V. (a) (1) What is gear tooth Vernier? Write its uses. 4
 (2) Explain plug and ring gauges with their uses. 4
 (3) Describe bar feeding mechanism. 4
- (b) (1) Explain the working of Pneumatic comparator with suitable sketch. 7
 (2) Explain with neat sketch Automatic screw cutting machine. 7

MEB330 FLUID MECHANICS & FLUID POWER

6 Hrs/Week
16 Weeks /Sem.
Total Hrs : 96 hrs

OBJECTIVES:

- Define the properties of Fluids.
- Explain the working of pressure measuring devices
- Know the fundamental unit systems
- Explain continuity equation and Bernoulli's Theorem
- Assess the impact of frictional loss of head in flow through pipes
- Estimate the discharge through orifices
- Distinguish the working principles of pumps and turbines.
- Explain the working of centrifugal pumps and reciprocating pumps.
- Compare pneumatic system with hydraulic system
- Draw Pneumatic circuits for industrial application.
- State the properties of hydraulic Systems
- Develop hydraulic circuit for machine tools applications.

TOPICS AND ALLOCATION AND ALLOCATION OF HOURS:

Unit	Topic	TIME (Hrs)
I.	Properties of fluids and Dimensional Analysis	18
II.	Flow of fluids and Flow through pipes	18
III.	Impact of jets and Hydraulic turbines	18
IV.	Centrifugal and Reciprocating pumps	18
V.	Pneumatic and Hydraulic systems	18
	Revision and test	6
	TOTAL	96

UNIT I

PROPERTIES OF FLUIDS AND DIMENSIONAL ANALYSIS

18 Hrs

Introduction – definition of fluid – classification of fluids – ideal and real fluids – properties of a fluid – definition and units. Pressure – units of pressure – pressure head – atmospheric, gauge and absolute pressure – problems – Pascal's law and its applications - pressure measurement – piezometer tube – simple U-tube manometer – differential U-tube manometer – problems – precautions in using manometers – mechanical gauges – Bourdon's tube pressure gauge – diaphragm pressure gauge. Hydrostatic forces – definition – total pressure – centre of pressure- pressure diagrams.

Dimensional Analysis

Fundamental dimensions – dimensional homogeneity – uses of the principle of dimensional homogeneity- Buckingham's π theorem method.

UNIT II

FLOW OF FLUIDS AND FLOW THROUGH PIPES

18 Hrs

FLOW OF FLUIDS

Types of fluid flow – path line and stream line – mean velocity of flow – discharge of a flowing fluid – equation of continuity of fluid flow – energies of fluid – Bernoulli's theorem –

statement, assumptions and proof – applications and limitations of Bernoulli's theorem – venturi meter – derivation for discharge – orifice meter – differences between venturi meter and orifice meter – problems. Orifice – types – applications – hydraulic coefficients – determining hydraulics coefficients – discharge through orifice discharging freely – problems – mouth pieces – classifications – discharge through external cylindrical mouth piece – problems.

FLOW THROUGH PIPES

Flow through pipes – laws of fluid friction – hydraulic gradient line – total energy line – wetted perimeter – hydraulic mean radius – loss of head due to friction – Darcy-Weisbach equation and Chezy's formula – problems – minor losses (description only) – power transmission through pipes – problems.

UNIT III

IMPACT OF JETS AND HYDRAULIC TURBINES

18 Hrs

IMPACT OF JETS

Impact of jet – on a stationary flat plate held normal to the jet and inclined to the direction of jet – on a flat plate moving in the direction of jet – on a series of moving plates or vanes – force exerted and work done by the jet– problem.

HYDRAULIC TURBINES

Hydraulics turbines – classifications – Pelton wheel – components and working – speed regulation – work done and efficiency of Pelton wheel – working proportions – problems – Francis and Kaplan turbines – components and working – draft tube – functions and types – surge tank – simple surge tank – differences between impulse and reaction turbines.

UNIT IV

CENTRIFUGAL AND RECIPROCATING PUMPS

18 Hrs

Centrifugal pumps

Centrifugal pumps – classifications – working of single stage – components (with types if any) multi stage pumps – advantages – priming – priming chamber – head of a pump – manometric, mechanical, overall efficiencies – problems – cavitation – special pumps – deep well and jet pumps – trouble shooting in centrifugal pumps.

Reciprocating pumps

Reciprocating pumps – classifications – working of single acting and double acting reciprocating pumps – plunger and piston pumps – discharge of a reciprocating pump– theoretical power required – coefficient of discharge – slip – problems – negative slip – indicator diagram – separation – air vessels (functions and working).- Fluid power pumps – external and internal gear, vane and piston pumps

UNIT V

PNEUMATIC AND HYDRAULIC SYSTEMS

18 Hrs

PNEUMATIC SYSTEMS

Pneumatic systems – elements – filter – regulator – lubricator unit – pressure control valves – pressure relief valves – pressure regulation valves – directional control valves – 3/2 DCV, - 4/2 DCV, -4/3 DCV, 5/2 DCV, 5/3 DCV- flow control valves – throttle, shuttle and quick exhaust valves – ISO symbols of pneumatic components – pneumatic circuits – direct control of single acting cylinder – operation of double acting cylinder – operation of double acting cylinder with metering-in control / metering-out control –use of shuttle valve in pneumatic circuits – use of quick exhaust valve in pneumatic circuits – automatic operation of double acting cylinder – merits and demerits of pneumatic system – applications.

HYDRAULIC SYSTEMS

Hydraulic system – elements – merits and demerits – pneumatic system Vs hydraulic system- service properties of hydraulic fluids – hydraulic accumulators – weighted or gravity, spring loaded, gas operated, bladder type accumulators — ISO symbols for hydraulic components – hydraulic circuits using sequence valve – counter balance valve – hydraulic circuit for – shaping machine, surface grinding or milling machine – hydraulic jack – hydraulic lift – hydraulic intensifiers – hydraulic press.

Text Books:

1. R.S.Khurmi, A Text Book of Hydraulics, Fluid Mechanics and Hydraulic Machines, Edn. 18, published by S.Chand & Co., Ram Nagar, New Delhi.
2. R.K.Rajput, A Text Book of Hydraulics
3. Antony Esposito, Fluid Power with Applications, Prentice – hall of India Pvt. Ltd.

Reference Books:

1. Jagadishlal, Hydraulic Machines, 1990, published by Metropolitan Book Co. Pvt. Ltd., 1 Faiz Bazaar, New Delhi – 6.
2. R.K.Bansal, Fluid Mechanics and Hydraulic Machines , Edn. 8, Laxmi Publications P. Ltd., 22 Golden house, Daryaganj, New Delhi 110 002 – 2003.
3. Andrew Parr, Hydraulics and Pneumatics (A Technician’s and Engineer’s Guide)
4. FESTO manual, Fundamentals of Pneumatic control Engineering
5. Text book of Hydraulics by H. Meixner and R.Kober, Edn. 1990 published by FIESTO DIDACTIC KG, D – 7300 Esslingen, 1977, 1988.

**Model Question paper
Fluid Mechanics and Fluid Power**

Time: 3 Hours

Max Marks: 75

[Note: Answer all questions. Selecting any two from (a) and any one from (b).
All questions carry equal marks]

- | | | | | |
|----|---|---|--|---|
| I | a | 1 | Define a fluid. Name the properties of fluid which changes with variation in temperature. | 4 |
| | | 2 | One liter of petrol weights 7 N. Calculate its specific weight, density specific volume and relative density. | 4 |
| | | 3 | Find the expression for the power P, developed by a pump when P depends upon the head H, the discharge Q and specific weight w of the fluid. | 4 |
| | b | 1 | A simple U-tube mercury Manometer is used to measure the pressure of water in a pipe line. The mercury level in the open tube is 70mm, higher than that on the left tube. The height of water in the left tube is 50 mm. Calculate the pressure in the pipe in (a) 'M' water (b) KN/m ² . | 7 |
| | | 2 | The pressure difference ΔP in a pipe of diameter D and length l due to turbulent flow depends on the velocity v, viscosity μ , density ρ and roughness K. using Buckingham's π – theorem, obtain an expression for ΔP . | 7 |
| II | a | 1 | State the difference between a venture meter and orifice meter. | 4 |
| | | 2 | Define: laminar flow and turbulent flow. | 4 |
| | | 3 | Define the term vena – contracta and coefficient of contraction. | 4 |

			Calculate the flow of water in liters/hours through a 40 cm. X 15 cm. Venturimeter when the differential gauge connected to the mouth and throat is 250 mm. of mercury assuming the coefficient of the meter as 0.98.	7
		2	The ratio between length and diameter of the pipe is 600. Determine the head lost due to friction using chezy's formula, if velocity of water is 5 m/s. Take Chezy's constant as 98	7
III	a	1	Find the force exerted by a 50 mm. diameter jet directed against a flat plate held normal to the direction of the jet, when the jet velocity is 40 m/s and the plate is stationary.	4
		2	Sketch and explain the arrangement of a double jet Pelton turbine	4
		3	List the main components of a Kaplan turbine.	4
	b	1	Explain the construction and working of a Francis turbine with a neat sketch.	7
		2	A Pelton wheel running at a speed of 600 r.p.m. is working under a head of 140 m. The bucket are semi - circular. The discharge through the nozzle is 50 lit/s and the Diameter of the wheel is 600 mm.	7
			Calculate - (i) Power available at the nozzle: and (ii) hydraulic efficiency of wheel, If $C_v = 0.98$.	
IV	a	1	Briefly explain any one type of casing of a centrifugal pump.	4
		2	A Centrifugal pump delivers 50 lps of water to a total height of 25 m. Assuming An overall efficiency of 75%, find the power required to run the pump.	4
		3	What is an indicator diagram? Draw a theoretical indicator diagram and explain.	4
	b	1	State the reasons for at least five common troubles in the operation of a centrifugal pump and give the remedies for each.	7
		2	In a single acting single stage reciprocating pump, the cylinder has a diameter of 150 mm and a stroke of 300 mm. The water is to be raised to a height of 20m when the pump is running at 40 rpm. Determine the theoretical power. If the actual discharge of the pump is 210 litres per minute, find the coefficient of discharge and percentage slip.	7
v	a	1	What is Hydraulic system? List the elements in it.	4
		2	Write short notes on FRL unit.	4
		3	Explain the working of a Hydraulic press with a line diagram	4
	b	1	Explain with a neat sketch, the construction and working of hydraulic jack.	7
		2	Explain with a neat sketch, hydraulic circuit for surface grinder table	7

MEB340 MACHINE DRAWING - CAD

6 Hrs/Week
16 Weeks /Sem
Total Hrs : 96

OBJECTIVES:

- Appreciate the need of sectional view and types of sections.
- Draw sectional views using different types of sections.
- Explain the use of threaded fasteners and the types of threads.
- Compare hole basis system with shaft basis system.
- Select different types of fits and tolerance for various types of mating parts.
- Practice on AutoCAD commands in making 2D drawings.
- Draw assembled drawings of different types of joints and couplings using AutoCAD
- Draw assembled drawings of various types of machine elements using AutoCAD.

TOPIC AND ALLOCATION

Unit	Topic	Time (Hrs)
I.	Section views	3
II.	Limits, fits and tolerances	3
III.	Keys and surface finish	3
IV.	Screw Threads and fasteners	6
V.	Machine Drawing Practice	15
	CAD Drawings	60
Revision and Test		6
Total		96

UNIT I

SECTION VIEWS:

3hrs

Introductions – need for sectioning – Hatching – Inclination of hatching lines – Spacing between hatching lines – Hatching of larger areas – Hatching of adjacent parts – sketch and explanation of full section, Half sections – types, Partial or local sections, Revolved or super unposed sections, Removed sections and offset sections.

UNIT II

LIMITS, FITS AND TOLERANCES

3hrs

Introduction – Definition of various terms used in limits – Hole basis system – Shaft basis system – Types of fits – Selection of fits and applications – types of tolerances – form and position – Indication of tolerances and fits on the drawing.

UNIT III

KEYS AND SURFACE FINISH

3hrs

Introduction – Types of keys – taper keys – Parallel or feather keys – wood druff keys – Empirical relation between diameter of the shaft and width & thickness of key for the above types of keys. Definition – Nominal surface – roughness – waviness – lay – productions methods and surface quality – symbol for lay – Indication of surface roughness for various machining operations.

UNIT IV

SCREW THREADS AND THREADED FASTENERS

6hrs

Introduction – Nomenclature of screw threads – Basic profiles and forms of screw threads – Left hand and right hand threads – Internal and external threads – Drawing of Vee and square threads – Application of threads – Bolts and Nuts – Drawing of Hexagonal bolt and Nut – Drawing of square head bolts – Riveted head – Types.

UNIT V

Machine Drawing & CAD DRAWINGS

Auto CAD Theory and Practice :

Introduction – open-save-save as-exit-Limits, Units-Line command-Abs coordinate System-Relative Polar-Different toolbars in screen-explanation
Draw commands-Circle-Arc-Ellipse-Rectangle-Spline-pline-Donut
Editing Commands-Array-mirror-break-copy-rotate-chamfer-fillet-move-offset-scale-trim-extend-stretch-plineedit-pedit-xplode.
Isoplane-isocircle-ortho-osnap-grid-snap
Display commands-Zoom-pan-oops-regen-viewres.
Layer – Properties-create Layer-laytrans-matchprop
Text Command-text-mtext-textedit-mtextedit
Dimensioning commands- DimLinear, Dimaligned, Dimradius, Dimdia, Dimangular, Dimbaseline, Dimcontinuous, Dimstyle, Dimedit,
Make BLOCK, Insert block, Divide, Measure, Bmatch
Attdef, attedit,
Pagesetup, Plot preview, plot

Machine Drawing Concept Practice

15 Hrs

(Manual Drawing Practice only not for Exam.)

1.	Auto cad Theory and Practice	10Hrs
2.	Isometric Drawing	6 Hrs
3.	Sleeve and cotter joint	3Hrs
4.	Socket and spigot cotter joint	4Hrs
5.	Gib and cotter joint	3Hrs
6.	Knuckle joint	3Hrs
7.	Flange coupling – protected type	3Hrs
8.	Universal coupling	4Hrs
9.	Bushed bearing	4Hrs
10.	Plummer block	3Hrs
11.	Swivel bearing	3Hrs
12.	Simple eccentric	3Hrs
13.	Machine vice	4Hrs
14.	Screw Jack	3Hrs
15.	Test	4Hrs
Total		60 Hrs

Text Books:

1. N. D. Bhatt, Machine Drawing, Edn. 37, Charotar Publishing House, Opp. Amul Dairy, Court Road, Anand 388 001, India – 2002.
2. K. R. Goplakrishnan, Engineering Drawing, Dhanalakshmi Publishers, M97-B, 30th Cross Street, 7th Avenue, Besant Nagar, Chennai 600 090.
3. R.C.Parkinson, Engineering Drawing published by English University Press, London – 1986.

Reference Book:

- A. C. Parkinsan, A First year Engineering Drawing. First Rep 1982, A.H. Wheeler & Company (P) Ltd., 15, L. B. Shastri Marg, Allaghabed – 211 001.

MEB350 STRENGTH OF MATERIALS AND FLUID MECHANICS LAB

4 Hrs/Week
16Weeks/Sem
Total Hrs : 64 hrs

OBJECTIVES:

- Determine stress strain relations for steel and cast iron.
- Determine hardness of materials.
- Perform torsion, bending, impact and shear tests.
- Determine coefficient of discharge of venturimeter and orifice meter.
- Determine the friction in pipes.
- Verify Bernoulli's theorem.
- Conduct performance test on centrifugal and reciprocating pump.
- Conduct performance test on impulse and reaction turbine.
- Design and make fluid power circuits.

I - STRENGTH OF MATERIALS LAB

1. Test on Ductile Materials:

Finding Young's Modulus of Elasticity, yield points, percentage elongation and percentage reduction in area, stress strain diagram plotting, tests on mild steel and cast iron.

(Equipment : UTM)

2. Hardness Test:

Determination of Rockwell's Hardness Number for various materials like mild steel, high carbon steel, brass, copper and aluminium.

(Equipment : Rockwell's Hardness Testing Machine)

3. Torsion test:

Torsion test on mild steel – relation between torque and angle of twist-determination of shear modulus-determination of elastic constants for mild steel.

(Equipment : Torsion testing machine)

4. Bending and deflection tests:

Determination of Young's Modulus for steel by deflection test.

(Equipment : Deflection testing arrangement)

5. Impact test:

Finding the resistance of materials to impact loads by Izod test or Charpy test.

(Equipment: Impact testing machine)

6. Tests on springs of circular section:

Determination of modulus of rigidity, strain energy, shear stress by load deflection method- Comparison and tension test (Closed coil spring only)

(Equipment: Tension testing arrangements)

7. Shear test:

Shear test on M.S. bar

(Equipment: Shear testing machine)

8. Compression Test:

Determination of compressive strength of concrete cube.

(Equipment: compression testing machine)

9. Test on wood:

Determination of strength of the given wood specimens under the following types of loading
Compression parallel to the grain. Compression Perpendicular to the grain, tension, bending.

II - FLUID MECHANICS LAB:

1. Verifying the Bernoulli's Theorem

(Equipment: The Bernoulli's Apparatus)

2. Determination of Coefficient of discharge of a Venturimeter (or) Orifice meter.

(Equipment: A Centrifugal pump having the discharge line with Venturimeter or Orifice meter arrangement)

3. Determination of the Friction Factor in a Pipe

- (Equipment: An arrangement to find friction factor)
4. Performance test on a reciprocating pump and draw the characteristic curves.
(Equipment: A reciprocating pump with an arrangement for collecting data to find out the efficiency and plot the characteristic curves)
5. Performance test on a centrifugal pump and draw the characteristic curves.
(Equipment: A centrifugal pump with an arrangement for collecting data to find out the efficiency and plot the characteristic curves)
6. Performance test on an impulse turbine
(Equipment: An impulse turbine with an arrangement for collecting data to find out the efficiency)
7. Performance test on a reaction turbine
(Equipment: A Reaction Turbine With An Arrangement For Collecting Data To Find Out The Efficiency)
8. Determination of Coefficient of discharge of a small orifice (or) an external mouthpiece by constant head method.
(Equipment: An open tank fitted with a small orifice (or) an external mouthpiece and a collecting tank with piezometer)
9. Determination of Coefficient of discharge of a small orifice (or) an external mouthpiece by variable head method.
(Equipment: An open tank fitted with a small orifice (or) an external mouthpiece and a collecting tank with piezometer)
10. Making a suitable Pneumatic (or) Hydraulic circuit connection with DCVS, flow control valve and check valve to show the reciprocating motion of a double acting cylinder with metering-in control circuit.
(Equipment: Pneumatic trainer kit with air compressor (or) Hydraulic trainer kit with hydraulic power pack)
11. Making a suitable Pneumatic (or) Hydraulic circuit connection with DCVS, flow control valve and check valve to show the reciprocating motion of a double acting cylinder with metering-out control circuit.
(Equipment: Pneumatic trainer kit with air compressor (or) Hydraulic trainer kit with hydraulic power pack)

SCHEME OF EXAMINATION:

Mechanics of Materials Lab(any one exercise) :	35 marks(1½ Hrs)
Fluid Mechanics Lab(any one exercise) :	35 marks(1½ Hrs)
Viva – voce :	05 marks
Total :	75 marks

**MEB360 WORKSHOP – I
(SMITHY, FOUNDRY & WELDING)**

4 Hrs/Weeks
16 Weeks / Sem
Total Hrs : 64

OBJECTIVES:

- Identify the tools used in foundry.
- Identify the tools and equipments used in welding.
- Prepare sand moulds for different patterns.
- Perform welding operation to make different types of joints.
- Identify the different welding defects.
- Appreciate the safety practices used in Smithy and welding.
- Make components in smithy.

SMITHY

Syllabus:

1. Introduction to safety in smithy shop
2. Introduction of hand tools and equipments
3. Operations in smithy
4. Identify the defects in smith forged components

Exercises:

1. Round rod to hexagonal rod
2. Round rod to square rod
3. Round rod to square headed bolt
4. Round rod to 'S' Shape
5. Round rod to flat with 25mm

Material: Dia 12mm X 100mm Length.

FOUNDRY

Syllabus

1. Introduction of tools and equipments
2. Types of patterns
3. Types of sand
4. Preparation of sand moulds
5. Furnaces- crucible furnace and tilting furnace
6. Melting of non ferrous metal
7. Core sands, preparation of cores

Exercises:

Preparation of sand mould:

1. Solid pattern
 - a. Stepped Pulley
 - b. Bearing top
 - c. Gear Wheel
 - d. T-pipe

2. Split pattern
 - a. Bent Pipe
 - b. Dumbles

3. Loose Piece Pattern- Dowtail
4. Cylindrical core making
5. Melting and casting– (Not for Examination, only for class exercises)

WELDING

Syllabus

1. Introduction of safety in welding shop
2. Introduction to hand tools and equipments
3. Arc and gas welding equipments
4. Types of joints

Exercises:

1. Arc welding
 - Lap joint (Material: 25mm x 3mm Ms Flat)
 - Butt joint (Material: 25mm x 6mm Ms Flat)
 - T-joint (Material: 25mm x 3mm Ms Flat)
 - Corner joint (Material: 25mm x 3mm Ms Flat)
2. Gas Welding
 - Lap joint (Material: 25mm x 3mm Ms Flat)
 - Butt Joint (Material: 25mm x 6mm Ms Flat)
3. Gas cutting: Profile cutting.
4. Spot welding-Lap joint(18/20swg)
5. Demonstration of Soldering and brazing
6. Study of TIG and MIG welding

SCHEME OF EXAMINATION:

Foundry	:	45 marks (2 hours)
Smithy / Welding (by lot)	:	25 marks (1 hour)
Viva-voce	:	05 marks
Total	:	75 marks

B0003 COMPUTER APPLICATIONS -PRACTICAL

4 Hrs/Week
16 Weeks /Sem.
Total Hrs : 64

RATIONALE

The application of Computer knowledge is essential to the students of all disciplines of Engineering in addition to their respective branch of study. The Computer Application Practical course facilitates the necessary knowledge and skills regarding creating, working and maintaining the documents, analyzing the data with charts manipulation of databases and presentation of documents with audio visual effects in a computer.

The learning of internet provides students with unprecedented opportunities to obtain information engage in discussion and liaise with individuals, organizations and groups world-wide. It provides the latest tools and technologies in helping the students to fetch better employment.

OBJECTIVES

On completion of the following exercises, the students must be able to

- Understand the Windows operating systems
- Familiarize and customize the desktop
- Use the different facilities available in the word processor
- Analyze the data sheet
- Create and manipulate the database
- Prepare PowerPoint presentation
- Understand Internet concepts and usage of e-mail

GUIDELINES:

- All the eighteen experiments given in the list of experiments should be completed and all the experiments should included for the end semester practical examination.
- The end semester practical examination question paper contains two questions-the first question from section-I and the second question from section-II. Each question carries 35 marks and viva voce carries 5 marks.
- The computer systems should be 1:2 ratio for practical classes

ALLOCATION OF MARKS

1. Internal Assessment – 25 Marks

DESCRIPTION	MARKS ALLOTTED
Record with Printout	10
Assignment	5
Attendance	5
Model Examination	5
Total	25 MARKS

2. Board Examinations – 75 Marks

Content	Max. Marks	
	Section I	Section II
Writing steps	15	15
Execution of exercise	15	15
Result with Printout	5	5
Viva voce	5	
Total	75 Marks	

LAB EXERCISES
SECTION – I

WINDOWS

Introduction- History of Windows- screen saver and monitor resolution – Wallpaper setting- Folder manipulation – properties of a folder – Recycle bin – Short cuts – Sorting Folder – Switching between Application – Copying in CD/DVD settings – Recording Audio files.

Exercises

1. a. Installing screen saver and change the monitor resolution by
1280X960 b. Setting wall papers
- c. Creating, moving, deleting and renaming a
folder d. Copy, paste and cut a folder/file
- e. Displaying the properties for a file or folder

2. a. Restoring files and folders from
Recycle bin b. Creating short cuts for folder/file
- c. Finding a file or folder by name

- d. Selecting and moving two or more files/folders using
mouse e. Sorting folders/files.

3. a. Create CD/DVD
- b. Switching between applications
- c. Making the taskbar wider and hiding the
taskbar d. Recording and saving an audio file
- e. Set/Change the date and time.

WORD PROCESSING

Introduction – Menus – Tool bar – Create – Edit – Save – Alignment – Font Size – Formatting – Tables – Fill Colors – Mail Merge – Page Setup - Preview – Water marking – Header – Footer – Clip art.

Exercises

4. Create the following table and perform the operations given below

ABC PVT. LTD.

Chennai

Production Summary of various Units in every Quarter

	Unit - I	Unit - II	Unit - III	Unit - IV	Unit - V
Q1	56	142	213	125	143
Q2	234	236	541	243	152
Q3	50	126	216	127	138
Q4	74	175	60	250	80
Total	125	251	43	136	45

- Arrange Unit name as left align and other columns as right align.
- Use doubled Border to the Summary Title and fill with 15% gray colour.
- Implement merging and splitting two or more cells
- Give alternative fore colour for columns.
- Print the above table.

5. Create a standard covering letter and use mail merge to generate the customized letters for applying to a job in various organizations. Also, create a database and generate labels for the applying organizations.

6. Create a news letter of three pages with two columns text. The first page contains some formatting bullets and numbers. Set the document background colour and add 'confidential' as the watermark. Give the document a title which should be displayed in the header. The header/ footer of the first page should be different from other two pages. Also, add author name and date/ time in the header. The footer should have the page number.

SPREADSHEET

Introduction – Menus – Tool bar – Create – Edit – Save – Formatting cells – Chart wizard – Fill Colors – Creating and using formulas – Sorting – Filtering.

Exercises

7. Create a result sheet containing Candidate's Register No., Name, Marks for six subjects. Calculate the total and result. The result must be calculated as below and failed candidates should be turned to red.

Result is Distinction if Total ≥ 70 % First
Class if Total ≥ 60 % and < 70 % Second
Class if Total ≥ 50 % and < 60 % Pass if
Total ≥ 35 % and < 50 %
Fail otherwise

Create a separate table based on class by using auto filter feature.

8. Create a table of records with columns as Name and Donation Amount. Donation amount should be formatted with two decimal places. There should be at least twenty records in the table. Create a conditional format to highlight the highest donation with blue colour and lowest donation with red colour. The table should have a heading.
9. Prepare line, bar and pie chart to illustrate the subject wise performance of the class for any one semester.

SECTION – II

DATA

BASE

Introduction – Menus – Tool bar – Create – Edit – Save – Data types – Insert – Delete – Update – View – Sorting and filtering – Queries – Report – Page setup – Print.

Exercises

10. Prepare a payroll for employee database of an organization with the following details:

Employee Id, Employee name, Date of Birth, Department and Designation, Date of appointment, Basic pay, Dearness Allowance, House Rent Allowance and other deductions if any.

Perform simple queries for different categories.

11. Design a pay slip for a particular employee from the above database.

PRESENTATION

Introduction – Menus – Tool bar – Create – Edit – Save – Slide transition – Insert image – Hyper link – Slide numbers – View slide show with sound – Photo album – Clip art.

Exercises

12. Make a marketing presentation of any consumer product with at least 10 slides. Use different customized animation effects on pictures and clip art on any four of the ten slides.

13. Create a Presentation on “Communication Skills” with three different slide transitions with sound effect.

INTERNET

Introduction – Browsers – Open a website – Email: Send, receive and delete – Email with Attachments

Google docs – Search Engines – Searching topics

Exercises

14. Create an e-mail id and perform the following

- Write an e-mail inviting your friends to your Birthday Party.
- Make your own signature and add it to the e-mail message.
- Add a word attachment of the venue route

□□

Send the e-mail to at least 5 of your friends.

15. Find out the direction and distance about road travel from Delhi to Agra using the Internet search.

Also make a report of the Map and other details like place to stay and visit at Agra.

16. Design a HTML page describing your profile in one paragraph. Design in such a way that it has a heading, a horizontal rule, three links and your photo. Also, write three HTML documents for the links. Include facilities for forward, backward and HOME.

17. Make out a brief bio-data of yours and code it as an HTML page. You can consider using tables to show your academic history.

MODEL QUESTION PAPER

Sem: II / III		Subject: COMPUTER APPLICATIONS PRACTICAL		Code:
all		the		questions Max.Ma
	Q - I	line, bar and pie chart to illustrate the subject wise performance of the class for the semester.		
	Q - II	<p>an e-mail id and perform the following</p> <p style="text-align: center;">Write an e-mail inviting your friends to your Birthday Party.</p> <p style="text-align: center;">Make your own signature and add it to the e-mail message.</p> <p style="text-align: center;">Add a word attachment of the venue route</p>		

LIST OF EQUIPMENTS AND THE QUANTITY REQUIRED FOR A BATCH OF 30 STUDENTS

SOFTWARE REQUIREMENTS

Operating System	Windows XP or Windows Vista or Windows 7 / Linux
Office Package	Microsoft office 2000 or Office 2003 or Office 2007/Open Office

HARDWARE REQUIREMENTS

Desktop Computer System with latest configuration	30 Nos
Power Backup (UPS)	10 KVA
Laser Printer	3 Nos

SAFETY PRECAUTIONS TO BE FOLLOWED BY STUDENTS

- Do not touch, connect or disconnect any plug or cable without teacher's permission
- Don't attempt to touch any live wires
- Systems should be shutdown properly after completion of work

REFERENCES

TITLE	AUTHOR	PUBLISHER	Year of Publication
Computer Applications Practical Manual	Dr.V.Karthikeyan Mr.D.Arulselvan	Learning Resource Centre, Rajar Polytechnic College, Salem- 636 005	2012
Windows 7 in easy steps	Harshad kotecha	Tata McGrawHill ,New Delhi	2011
Best Course in Computer 2003	Sanjay Sasena	Vikas Publications, New Delhi	2009
MS Office – 2003	Ramesh Bangia	Kanna Book Publication, New Delhi	2005
Introduction to Computers with MS-Office 2000	Alexis Leon & Matthews Leon	Tata McGraw-Hill, New Delhi	2002
Mastering Microsoft Office 2000	Bini Courter & Annette Marquis	BPB Publications, New Delhi	1999

MEB410 ENGINEERING THERMODYNAMICS

6Hrs/week

16 weeks /sem

Total hours : 96

OBJECTIVES:

- Explain the basics of systems and laws of thermodynamics and thermodynamics processes.
- Apply steady flow energy equation for nozzles and condensers.
- Explain different Air Cycles.
- Familiarize the parts, functions and types of Air compressors and determine their efficiency.
- Explain different type of fuels and their combustion phenomenon.
- Explain the types and functions of IC engines.
- Explain the performance tests on IC engines.
- Compare the modes of heat transfer and evaluate the heat transfer by various modes.

TOPICS AND ALLOCATION

UNIT	TOPICS	TIME(Hrs)
I	Fundamentals And Applications Of Thermodynamics	18
II	Second Law Of Thermodynamics, Entropy And Air Cycles	18
III	Air Compressors And Gas Turbines	18
IV	Fuels & Combustion Of Fuels And Internal Combustion Engines	18
V	Performance Of I.C Engines and Heat transfer	18
	Revision and test	6
	Total	96

UNIT I

FUNDAMENTALS AND APPLICATIONS OF THERMODYNAMICS

18hrs

(I) FUNDAMENTALS OF THERMODYNAMICS

Introduction – definitions and properties – units – temperature, conditions – heat – specific heat constants – work – power – energy – thermodynamics systems – types – intensive and extensive properties – thermodynamics process – cycle – point and path function – equilibrium – zeroth and first laws of thermodynamics – problems

Expansion of gases -Perfect gases – law of perfect gases – enthalpy – change in enthalpy – entropy – change in entropy – general equation for change in entropy. Thermodynamic processes – P.V diagrams and T.S diagrams, work done, change in internal energy, heat transfer, change in enthalpy, change in entropy for various processes – problems.

(II)APPLICATIONS OF FIRST LAW OF THERMODYNAMICS

Steady flow systems – Law of conservation of energy- continuity equation – control volume – steady flow energy equation – steam boiler – condenser – nozzles – steam and gas turbines – reciprocating and rotary compressors – non flow energy equation – problems.

UNIT II

SECOND LAW OF THERMODYNAMICS, ENTROPY AND AIR CYCLES

18hrs

I) SECOND LAW OF THERMODYNAMICS

Definition – Kelvin planks and clausius sttements of second law – reversibility, irreversibility and conditions – Carnot theorem – corollaries of Carnot theorem- heat engine – heat pump – COP – problems. Entropy – concepts of entropy – clausius theorems - availability and unavailability– simple problems.

(II) AIR CYCLES

Air cycles – assumptions – air standard efficiency – Carnot cycle – Otto cycle – Joule cycle – Diesel cycle – ideal and actual P.V diagrams of Diesel cycles – comparison – problems – Dual combustion cycle (Description only)

UNIT III

AIR COMPRESSORS AND GAS TURBINES

18hrs

I) AIR COMPRESSORS

Air compressor – uses of compressed air – classifications of compressor – working principle of a compressor – single stage reciprocating compressor – compression processes – power required to drive the compressor – problems – clearance volume and its effects – volumetric efficiency - power required to drive the compressor with clearance volume – problems – multi stage air compressor – intercooler - perfect inter cooling work input on multi stage compressor – condition for minimum work input in multi stage compressor with perfect inter cooling – ratio of cylinder diameter for minimum work input – problem – rotary compressors.

II) GAS TURBINES

Introduction – classifications – advantages and disadvantages of gas turbines – constant pressure gas turbine – gas turbine with regenerator – intercooler – reheater – effects – closed cycle gas turbines – merits and demerits of open and closed cycle gas turbine – turbojet engines – turbo propeller engines – comparison of air craft and industrial gas turbines.

UNIT IV

FUELS & COMBUSTION OF FUELS AND INTERNAL COMBUSTION ENGINES 18 hrs

I) FUELS & COMBUSTION OF FUEL

Classifications of fuels - merits and demerits – requirements of a good fuel – combustion equations – stoichiometric air required for complete combustion of fuels – excess air – products of combustion – problems – analysis of exhaust gases- Orsat apparatus - calorific value of fuels – higher and lower calorific values – Dulong’s formula – problems – determination of calorific value – Bomb and Junker’s calorimeter – problems -Internal combustion engines.

I) IC ENGINES

Introduction – classifications of I.C engines – I.C engine components – working principles of four stroke and two stroke petrol and diesel engines – comparison of valve timing and port

timing diagrams – fuel supply system – working principle of simple carburetor – types – diesel fuel pump and injectors – working principles – lubrication and cooling of I.C engines.

UNIT V

PERFORMANCE OF I.C ENGINES AND HEAT TRANSFER

18hrs

I) PERFORMANCE OF I.C ENGINES

Performance of IC engines – testing – thermodynamic and commercial tests – indicated power – brake power – friction power – efficiencies of I.C engines – brake thermal, mechanical and relative efficiencies - Morse test - procedure – heat balance sheet – problems.

II) HEAT TRANSFER

Basic concepts – modes of heat transfer - conduction heat transfer – resistance concept – heat conduction through a cylinder - heat conduction through a sphere – convective heat transfer – simple definitions – simple problems – radiation heat transfer - introduction.

REVISION AND TEST

6 hrs

TEXT BOOKS:

1. Nag P.K, “ Engineering Thermodynamics”, Tata McGraw –Hill, New Delhi.
2. R.S.Khurmi “ Engineering Thermodynamics “ , S.Chand & Co., Ram Nagar, New Delhi – 2002

REFERENCES:

1. Arora C.P, “Thermodynamics”, Tata McGraw –Hill, New Delhi.
2. R.K.Rajput, “Thermal Engineering”.
3. P. L. Ballaney, “Refrigeration and Air –Conditioning”, Edn.4, Published by 24 Kanna Publishers, New delhi.

Model Question paper ENGINEERING THERMODYNAMICS

Time: 3 Hours

Max Marks: 75

- [Note: 1) Answer all questions choosing any two divisions from (a) and any one from (b).
2) All questions carry equal marks.
3) Each division in (a) carries 4 marks and in (b) carries 7 Marks]

- | | | | | |
|---|---|---|---|---|
| I | a | 1 | Derive an expression for work done during Isothermal process. | 4 |
| | | 2 | A cylinder contains 3kg of oxygen at 5-bar pressure and temperature of 27°C. Determine the volume of the cylinder. | 4 |
| | | 3 | Calculate the air standard efficiency of an Diesel cycle having compression ratio 18 and expansion ratio 10. | 4 |
| | b | 1 | 0.25KG of air at a pressure of 140kN/m ² occupies 0.15m ³ and from this conditions it is compressed to 1.4MN/m ² according to the law $Pv^{1.25} = C$. Determine (i) Change in Internal energy (ii) Work transfer | 7 |

		(iii)	
		Heat transfer iv) Change in Entropy. Assume $C_p=1.005\text{kJ/jg.k}$ and $C_v=0.718\text{kJ/kg.k}$.	
		Air expands from 3 bar to 1 bar in a nozzle. The initial velocity is 90 m/s and temperature 150 degree c. estimate the final velocity.	7
		$C_p = 1.005\text{kJ/kg.k}$	
II	a	1 States the II law of thermodynamics and explain the application of the same.	4
		2 What is the maximum percentage of heat that can be converted into work by a heat engine, when the heat available at 127 deg. C and the atmospheric temperature is 27 deg. C.?	4
		3 Draw the p-v diagram and T-S diagram of Carnot cycle and mention various processes.	4
	b	1 (i) In an Otto cycle the compression ratio is changed from 4.5 to 8.5. Determine the increase in A.S.E of the cycle.	7
		2 (ii) Find the A.S.E of a Diesel cycle engine if the cut off is 6% of the stroke and the clearance is $1/13^{\text{th}}$ of the stroke take $\gamma = 1.4$. A Carnot engine working between 650k and 310k produces 159kj of work. Find (i) thermal efficiency and (ii) heat added during the process.	7
III	a	1 What are the uses of compressed air?	4
		2 How turbines are classified?	4
		3 State the differences between aircraft gas turbines and industrial gas turbines.	4
	b	1 Explain with sketches the construction and operation of a) Roots blower b) Centrifugal compressor.	7
		2 Find the percentage saving in work by compressing air in two stages from one bar to seven bars instead of in one stage. Assume compression index as 1.35 in both cases and complete intercooling in two-stage compression.	7
IV	a	1 Draw the typical valve timing diagram for a four stroke cycle diesel engine.	4
		2 What are the properties of a good lubricant?	4
		3 Distinguish between fossil and non-fossil fuels.	4
	b	1 Explain the neat sketch the working of inline fuel injection pump used in Diesel Engine.	7
		2 In a boiler trial, the analysis of the coal by weight indicates as follows: C - 60%, H ₂ - 4.5% , O ₂ - 7.5% remainder incombustible. The dry flue gas has the following composition by volume : CO ₂ = 9% CO = 1% N ₂ = 80% O ₂ =10%. Determine (a) The weight of air supplied per kg of coal burnt. (b) The percentage of excess air .	7

- | | | | | |
|---|---|---|--|---|
| V | a | 1 | What are modes of heat transfer? | 4 |
| | | 2 | What is heat exchanger and mention the types of heat exchangers? | 4 |
| | | 3 | Describe the Morse test and state its significance | 4 |
| | | | The following data were obtained during a trial on an oil engine. Brake power=73.5kw. Fuel consumed=1kg 16.5kg/hour calorific value of fuel=45200Kj/kg. Mechanical efficiency = 82%. Find i) Brake Thermal efficiency ii) indicated Thermal efficiency iii) Indicated power. | |
| | b | 1 | | 7 |
| | | 2 | Draw and explain the construction and working principle of counter flow heat exchanger. | 7 |

MEB420 MANUFACTURING TECHNOLOGY - II

5 Hrs/Week

16 Weeks /Sem.

Total Hrs : 80 hrs

OBJECTIVES:

- Explain the working of machine tools planer, shaper and slotter.
- Compare various work holding devices
- Explain the working of machine tools drilling machine and milling machine.
- Distinguish various types of milling cutter.
- Classify the different types of grinders and grinding wheels.
- Explain the broaching operation and boring operation and their applications.
- Explain the milling procedure for spur, helical and bevel gears.
- Explain the various types of gear generating processes
- Compare the various types of jigs and fixtures.
- Explain the different types of press working operations.
- Appreciate the use of non-conventional machining processes.

TOPICS AND ALLOCATION

UNIT	TOPICS	TIME(Hrs)
I	Planer, Shaper and Slotter	15
II	Drilling Machines and Milling Machines	15
III	Grinding, Broaching, Boring and Jig Boring	15
IV	Gear manufacturing Practice – Forming and Generating	15
V	Jigs & Fixtures, Press working & Non-Conventional Machining process.	15
	Revision and test	5
	Total	80

UNIT-I

PLANER, SHAPER AND SLOTTER

15 Hrs

Planer: Types of planers-description of double housing planer-specifications-principles of operation-drives-quick return mechanism-feed mechanism- work holding devices and special fixtures-types of tools-various operation.

Shaper: Types of shapers-specifications-standard-plain-universal-principles of operations-drives-quick return mechanism-crank and slotted link-feed mechanism-work holding devices-Special fixture-various operations.

Slotter: Types of slotters-specifications-method of operation-Whitworth quick return mechanism-feed mechanism-work holding devices-types of tools.

UNIT -II

DRILLING MACHINES AND MILLING MACHINES

15 Hrs

Drilling machines:

Drills-flat drills-twist drills-nomenclature-types of drilling machines-bench type-floor type-radial type-gang drill-multispindle type-principle of operation in drilling-speeds and feeds for various materials-drilling holes-methods of holding drill bit-drill chucks-socket and sleeve-drilling-operation-reaming-counter sinking-counter boring-spot facing-tapping-deep hole drilling.

Milling machines:

Types-column and knee type-plain-universal milling machine-vertical milling machine-specification of milling machines-principles of operation-work and tool holding devices-arbor-stub arbor-spring collet-adapter-milling cutters-cylindrical milling cutter-slitting cutter-side milling cutter-angle milling cutter-T-slot milling cutter-woodruff milling cutter-fly cutter-nomenclature of cylindrical milling cutter-milling process-conventional milling-climb milling-milling operations-straddle milling-gang milling-vertical milling attachment

UNIT-III**GRINDING, BROACHING, BORING AND JIG BORING****15 Hrs****Grinding machines:**

Types and classification-specifications-rough grinding – pedestal grinders- portable grinders-belt grinders-precision grinding-cylindrical grinder-center, centerless type – surface grinder-planetary grinders-principles of operations-grinding wheels-abrasives-natural and artificial diamond wheels-types of bonds-grit, grade and structure of wheels-wheels shapes and sizes-standard marking systems of grinding wheels-selection of grinding wheel-mounting of grinding wheels-Dressing and Truing of wheels-Balancing of grinding wheels.

Broaching:

Types of broaching machine-horizontal vertical and continuous broaching-principles of operation-types of broaches-classification-broach tool nomenclature-broaching operations-simple examples.

Boring and Jig boring:

Boring machines-horizontal and vertical types-fine boring machines-boring tools-jig boring machine-measuring system-hole location procedure-deep hole boring.

UNIT-IV**GEAR MANUFACTURING PRACTICE – FORMING AND GENERATING****15 hrs****Gear manufacturing practice-Forming and Generating processes:**

Gear forming process in milling-dividing head-principles of operation-indexing-linear indexing-simple-differential and angular indexing-problems-gear milling, cutter selection-module-pressure angle-milling procedure for spur, helical and bevel gears-problems.

Generating process-gear shaper-gear hobbing-principle of operation only-gear finishing processes-burnishing-shaving-grinding and lapping-gear materials-cast iron, steel, alloy steels, brass, bronze, aluminium, nylon.

UNIT-V**JIGS & FIXTURES, PRESS WORKING & NON-CONVENTIONAL MACHINING PROCESS 15 hrs****Jigs and Fixtures:**

Definitions and concept of Jig and fixture-Advantages of jigs and fixtures-elements of jigs and fixtures-locating devices-'V' locators-fixed stop locators-adjustable stop locators-clamping devices-strap clamp, screw clamp-cam action clamp-types of jigs-box drill jig-indexing drill jig-types of fixtures-keyway milling fixture-string milling fixture.

Press working:

Types of presses-mechanical and hydraulic presses-press tools and accessories-press working operations-bending operations-angle bending-channel bending -curling-Drawing-shearing operations - blanking, piercing trimming-notching-lancing-shaving-parting off.

Non-Conventional Machining process:

Construction and working of Ultrasonic machining-chemical machining-electro chemical grinding-electrical discharge machining-plasma arc machining-LASER machining-Advantages – Disadvantages-Applications-of the above processes.

Revision and Test

5 Hrs

Text Books:

1. Hajra Choudry & Battacharya, Elements of Workshop Technology-Vol. I & II, Edn. 11, published by Media Promoters and Publishers Pvt. Ltd., Seervai Buildings `B', 20-G, Noshir Bharucha Marg, Mumbai 400 007 - 2007
2. Jain & Gupta, Production Technology, Khanna Publishers, 2-B, North Market, Naisarak, new Delhi – 110 006 – 2006.

Reference Books:

1. HMT, Production Technology, Edn. 18, published by Tata McGraw Hill Publishing Co. Ltd., 7, West Patel Nagar, New Delhi 110 008.
2. Myro N Begman, Manufacturing process, Edn. 5, Tata McGraw Hill Publishing Co. Ltd., 7, West Patel Nagar, New Delhi 110 008.
3. WAJ. Chapman, Workshop Tech Vol I,II, III, published by Viva Books Pvt. Ltd., 4262/3, Ansari Road, Daryaganj, New Delhi 110 002.
4. NITTTR, Production processes published by . 5, Tata McGraw Hill Publishing Co. Ltd., 7, West Patel Nagar, New Delhi 110 008.

**Model Question paper
Machine Shop Technology - II**

Time: 3 Hours

Max Marks: 75

[Note: Answer all questions. Selecting any two from (a) and any one from (b).
All questions carry equal marks]

- | | | | | |
|---|---|---|--|---|
| I | a | 1 | Explain with a neat sketch machining of angular surface in a Shaper. | 4 |
| | | 2 | What are the specifications of a planer? | 4 |
| | | 3 | State the difference between shaper and planer | 4 |
| | b | 1 | What are the various work holding devices used in shaper? | 7 |

			Give few examples to illustrate the use of these devices.	
		2	Explain how belt drive is used for the quick return motion of the planer table. State the advantages of hydraulic drive.	7
II	a	1	What are the specifications of a milling machine?	4
		2	Differentiate between the gang milling and straddle milling operations.	4
		3	Explain how deep holes are drilled.	4
	b	1	What are the common operations that can be done on a drilling machine ? Explain any three of them	7
		2	With the help of a line sketch, explain the nomenclature of a plain milling cutter.	7
III	a	1	Explain with a neat sketch the mounting of a grinding wheel.	4
		2	What are the different feed used in centreless?	4
		3	Explain boring head and facing head with line sketch	4
	b	1	Explain in detailed the various factors considered in selecting a grinding wheel	7
		2	With simple sketches illustrate the various operations done on a vertical boring machine	7
IV	a	1	Write the step by step procedure for manufacturing of spur gear in a milling machine	4
		2	List out the gear finishing processes. Explain any one gear finishing processes.	4
		3	Explain the method of cutting gear by a formed single point cutting tool.	4
	b	1	Find out the indexing movement for milling 73 teeth spur gear on a gear blank	7
		2	What are the various materials used for Manufacturing gears?. Explain any three of them briefly	7

v	a	1	Differentiate between the blanking tool and piercing tool	4
		2	What are the advantages of electrical discharge Machining?	4
		3	Explain with sketch the working of 'air operated chuck '	4
	b	1	Explain with sketch the working of single spindle swist type automatic screw machine.	7
		2	Name five locators and explain any two with neat sketches.	7

MEB430 RENEWABLE ENERGY SOURCES

5 Hrs/Week

16 Weeks /Sem.

Total Hrs : 80 hrs

Unit	Name of the Topic	Hours
I	<p>FUNDAMENTALS OF ENERGY</p> <p>Introduction to energy – energy consumption and standard of living – classification of energy resources – consumption trend of primary energy resources – importance of renewable energy sources – energy chain – common forms of energy – advantages and disadvantages of conventional energy sources – salient features of non conventional energy sources – environmental aspects of energy – energy for sustainable development – energy density of various fuels – availability of resources and future trends. Energy scenario in India – overall production and consumption – availability of primary energy resources: Conventional, Non – Conventional – Estimated potential and achievement – Growth of energy sector and its planning in India – energy conservation: Meaning and importance.</p>	15Hrs
II	<p>SOLAR ENERGY</p> <p>Introduction – Solar radiation at the earth’s surface – Solar Radiation measurements – estimation of average solar radiation. Solar energy collectors- classifications- Flat plate collectors – Concentrating collectors – comparison. Solar water heaters – Solar industrial heating system – Solar Refrigeration and Air – Conditioning Systems – Solar cookers – Solar furnaces – Solar greenhouse – Solar distillation – Solar pond Electric power plant – Distributed Collectors – solar thermal electric power plant. Principles of photovoltaic conversion of solar energy – types of solar cells – solar photo Voltaic applications.</p>	15Hrs
III	<p>WIND ENERGY</p> <p>Introduction – Basic principles of wind energy conversion: Nature of the wind, power in the wind, forces on the blades and wind energy conversion – wind data and energy estimation – site selection – classification of wind energy conversion systems – advantages and disadvantages – types of wind machines – Horizontal axis machine – Vertical axis machine – Generating system – energy storage – application of wind energy – safety and environmental aspects.</p>	15Hrs
IV	<p>BIO – ENERGY</p> <p>Introduction – photo synthesis – usable forms of bio mass, their composition and fuel properties – biomass resources – Bio mass conversion technologies – Urban waste to energy conversion - Bio mass gasification – Bio mass liquification – Bio mass to ethanol production - biogas production from waste Bio mass – types of bio gas plants- applications – bio diesel production - Bio mass energy programme in India.</p>	15Hrs
V	<p>OCEAN AND GEOTHERMAL ENERGY</p> <p>Ocean energy resources – principles of ocean thermal energy conversion (OTEC) – Methods of ocean thermal electric power generation – energy utilisation – basic principle of tidal power – components and operations of tidal power plant – energy and Power forms of waves – Wave energy conversion devices. Geothermal Energy – Geothermal Sources – Prime movers for Geothermal energy conversion – advantages and disadvantages - applications – material selection for geothermal power plants – geothermal exploration operational and Environmental problems – prospects of geothermal energy in India.</p>	15Hrs

Revision and Test

5 Hrs

Text Books:

- 1) Non Conventional Energy Sources – G. D. Rai – Khanna Publishers, New Delhi, 1999.
- 2) Non Conventional Energy Sources and Utilisation – R. K. rajput – S. Chand & Company Ltd., 2012.
- 3) Renewable Energy Sources – Twidell ,J. W. and Weir.A – Efn Spon Ltd., 1986.
- 4) Non – Conventional Energy Resources – B. H. Khan- Tata Mc Graw Hill, 2nd Edn, 2009.

**Model Question paper
Renewable Energy Sources**

Time: 3 Hours

Max Marks: 75

- [Note: 1) Answer all questions choosing any two divisions from (a) and any one from (b).
2) All questions carry equal marks.
3) Each division in (a) carries 4 marks and in (b) carries 7 Marks]

I	a)	1	Classify the various energy resources.	4
		2	What are the advantages and disadvantages of conventional energy sources?	4
		3	Describe about the availability of primary energy resources.	4
	b)	1	Explain in detail the importance of renewable energy sources? (or)	7
		2	Describe the growth of energy sector and its planning in India.	7
II	a)	1	Explain the box type solar cooker.	4
		2	Describe about the solar energy collectors.	4
		3	What is a Solar cell? What are the types of solar cells? (i) How do you estimate average solar radiation? (3 marks)	4
	b)	1	(ii) Explain flat plate collectors. (4 marks) (or)	7
		2	Describe about the solar water heaters.	7
III	a)	1	What are the applications of wind power?	4
		2	What are the advantages and disadvantages of wind energy conversion systems.	4
		3	Explain the horizontal axis wind machine.	4
	b)	1	Explain site selection consideration for wind power generation.	7

		(or)	
		2 Explain horizontal axis wind machine.	7
IV	a)	1 What is Bio – mass? What are the usable forms of Bio –mass?	4
		2 What is biomass gasification and bio mass liquification?	4
		3 What is present status of development of Bio –mass energy resources in India?	4
	b)	1 Explain Urban waste to energy conversion.	7
		(or)	
		2 Describe the process of Bio –mass Ethanol production.	7
V	a)	1 Explain the principles of ocean thermal energy conversion.	4
		2 Describe principles of Tidal Power.	4
		3 State advantages and disadvantages of geothermal energy.	4
	b)	1 What are the Methods of Ocean thermal electric power generation and explain.	7
		(or)	
		2 Explain the prime movers for Geo – thermal energy conversion.	7

MEB440 ELECTRICAL AND ELECTRONICS ENGINEERING

6 Hrs/Week

16 Weeks /Sem.

Total Hrs : 96hrs

OBJECTIVES:

- Define Voltage, Current, Resistance, Power and energy.
- State Ohm's law, Kirchoff's law and Faraday's laws of electromagnetic induction.
- Explain the fundamentals of alternating current.
- Describe the construction and working of DC machines.
- Describe the construction and working of transformer and alternator.
- Explain the working of various types of AC motors.
- Describe the construction and working of stepper motor.
- Appreciate the use of safety practices in electrical safety.
- State the characteristics of semiconductor diode.
- Explain the construction and working of PNP and NPN transistor.
- Explain the principle and working of thyristors.
- State the features and benefits of PLC.
- Compare PLC circuits and hardware circuits.
- Design ladder logic for operating motors.

TOPICS AND ALLOCATION

UNIT	TOPICS	TIME(Hrs)
I	DC and AC Circuits and Batteries	18
II	DC Generator, DC Motor, Transformer and Alternator	18
III	AC Motors and Electrical Safety	18
IV	Basic Electronics and logic gates	18
V	Programmable Logic Controller	18
	Revision and test	6
	Total	96

UNIT I

DC AND AC CIRCUITS AND BATTERIES

18 hrs

Definitions – Electric current, voltage and resistance – Ohm's Law and Kirchoff's Laws – Resistance in series, parallel and series parallel – Simple problems – Electromagnetism (Definitions only), Magnetic flux, Flux density, Magnetic field Intensity, MMF, permeability, reluctance, Faraday's laws of electro magnetic Induction.

Fundamentals of AC voltage and current – Peak, average, RMS value of sine wave, Frequency, time period, amplitude, power, power factor (Definition only) Ac circuits RLC in series star, Delta Connections - relationship between phase and line voltages, current in star and Delta connections.

Batteries – classification of cells – construction of ni – iron and cadmium cell concept of recharging cells – lead acid cell – construction - indication of full charged cells defects, and remedies, applications.

UNIT II

DC GENERATOR, DC MOTOR, TRANSFORMER AND ALTERNATOR

18 hrs

DC Generator Construction – Principles of operation, types and applications.

DC Motor construction – Principles of operation, types and applications.

Necessity for starter – three point, four point starter.

Transformer – principle of operation and construction EMF equation – losses in a transformer – efficiency – autotransformer – three phase transformer – applications.

Alternator construction – principle of operation – types and applications.

UNIT III

AC MOTORS AND ELECTRICAL SAFETY

18 hrs

AC motors:

Principle of operation of single phase capacitor start induction motor – applications – three phase induction motors – squirrel cage and slip ring IM (construction and working principle only) – applications – speed control of three phase induction motor – necessity of starter – DOL and star delta starter.

Special motor:

PMDC, Stepper motor – construction, working principle and application.

Electrical Safety – importance of earthing – electric shock – first aid for electric shock – precautions against shock – cause of accidents and their preventive measures – energy conservation – star rating values of electrical machines- energy efficiency.

UNIT IV

BASIC ELECTRONICS AND LOGIC GATES

18 hrs.

Semiconductor materials – N type and P type – PN Junction – forward and reverse bias, characteristics of PN functions diode – Half wave rectifier, full wave rectifier, bridge rectifier, zener diode and avalanche break down, characteristics of zener diode – application of zener diode.

Transistor – construction of NPN and PNP types – basic bias requirements (common emitter configuration only)

Thyristors – principle and working of SCR – characteristics – applications.

Introduction of integrated circuits – classification and packages only – applications.

Logic Gates – positive and negative logic, definition, symbol, truth table, Boolean expression for OR, AND, NOT, NOR, NAND, EXOR and EXNOR gates. Simple introduction to Microcontroller.

UNIT V

PROGRAMMABLE LOGIC CONTROLLER

18 hrs.

PLC definition – features and benefits of PLC – - PLC vs Computer - Systems and its elements – input and output elements – PLC memory system – PLC circuit verses hard wired circuits – sensors – types of sensors – limit switch, reed switch, photo electric sensor, inductive proximity sensor – capacitive proximity sensor - types of contacts normally open (NO) contact, normally closed (NC) contract – ladder logic symbol – AND logic OR logic , truth table –Design of ladder circuit for direct operation of motor using DOL starter – PLC scan input Programme scan and output scan – design ladder diagram for operation of motor using AND and OR logic.

Design ladder logic diagram for ON delay control of a motor and OFF delay control of a motor.

REVISION AND TEST

6 Hrs

Text Books:

1. B.L. Theraja, Fundamentals of Electrical and Electronics Engineering, S.Chand & Co.
2. T. Thiyagarajan, Fundamentals of Electrical and Electronics Engineering, Scitech Publicatiuons (India) Pvt.ltd.

Reference Books:

1. Mikell P. Groover, Automation, Production System and Computer Integrated Manufacturing, Edn. 2 published by Pearson Education (Singapore) Pte. Ltd., Indian Branch, 2842 F.I.E., Patparganj, Delhi 110 002, India.
2. KB Raina & S.K.Battachariya, Electrical Design Estimating and Costing, Edn. 6, Tata McGraw Hill Publishing Co., 7, West Patel Nagar, New Delhi 110 008.
3. Gary Dummy, Introduction to Programmable logic controls, Thomson Debnar learning second edition second reprint 2003.
4. B.L.Theraja & A.K. Theraja, Electrical Technology Vol. I & II, Edn. 23, published by S.Chand & Co. Ltd., Ram Nagar, New Delhi 110 055.

Model Question paper
ELECTRICAL AND ELECTRONICS ENGINEERING

Time: 3 Hours

Max Marks: 75

[Note: Answer all questions. Selecting any two from (a) and any one from (b).
All questions carry equal marks]

I	1	a	When two resistors are connected in series the effective resistance is 10 ohms and when they are reconnected in parallel the effective resistance is 2 ohms. Find the value of two resistors.	4
		b	What are the applications of lead acid cell	4
		c	What are the indications of fully charged cell?	4
	2	a	With a neat sketch explain the construction and working of attraction type Moving iron instrument.	7
		b	Explain in detail about the construction and working principle of Dynamometer type Wattmeter.	7
II	1	a	Write the principle of operation of DC motor.	4
		b	State and explain Kirchoff's law.	4
		c	Explain the principle of operation of single phase transformer.	4
	2	a	Explain the constructional features of Alternator with suitable diagram	7

		b	Write in detail how will you control the speed of three phase induction motor	7
III	1	a	Write the types of single phase induction motors and write any two application for each.	4
		b	Write the working principle of stepper motor.	4
		c	Write any four applications of single phase induction motors	4
	2	a	Write in detail how will you control the speed of three phase induction motor.	7
		b	Write the principle of operation of single phase capacitor srart induction motor with suitable sketch.	7
IV	1	a	Draw the basic circuit of half wave rectifier using diode and write its principle of operation.	4
		b	Explain avalanche break down and zener break down	4
		c	Explain what is mean by positive and negative logic	4
	2	a	Draw the basic diagram for common emitter configuration with proper biasing and explain.	7
		b	Write the principle and working of SCR along with its characteristic	7
V	1	a	Develop the ladder diagram for on delay timer and write its truth table.	4
		b	Develop a ladder diagram for starting a three phase induction motor using DOL starter using PLC	4
		c	What are the different types of sensors used in automation industry using PLC	4
	2	a	Develop the ladder diagram for OFF delay timer control of motor using PLC.	7
		b	Design and develop ladder logic for semi automatic starter for starting of three phase induction motor using PLC	7

MEB450 THERMAL ENGINEERING LABORATORY

4 Hrs/Week

16 Weeks /Sem.

Total Hrs : 64 hrs

OBJECTIVES:

- Determine the flash and fire point and viscosity of oil.
- Identify the parts of petrol engine and their functions.
- Identify the parts of diesel engine and their functions.
- Draw the valve timing diagram.
- Draw the port timing diagram.
- Conduct performance test on petrol and diesel engines.
- Prepare heat balance sheet for an IC engine.
- Identify the parts of a high pressure boiler and their applications.
- Concept of Heat transfer.

Study Exercise: (Not for examinations)

1. Study of petrol engine and diesel engine and its components.
2. Study of high pressure boiler.
3. Study of boiler mountings and Accessories.

List of Experiments:

1. Determine flash and fire point of the given oil using open cup apparatus.
2. Determine flash and fire point of the given oil using closed cup apparatus.
3. Determine the absolute viscosity of the given lubricating oil using Redwood viscometer.
4. Determine the absolute viscosity of the given lubricating oil using say bolt viscometer.
5. Port timing diagram two stroke engines.
6. Valve time diagram for four stroke engines.
7. Load test (Performance test) on Petrol Engine.
8. Load test (Performance test) on diesel Engine.
9. Morse test on multi Cylinder petrol engine.
10. Heat balance test on IC engine.
11. Volumetric efficiency of Air Compressor.
12. Thermal conductivity measurement by guarded plate.
13. Effectiveness of parallel/ counter flow heat exchangers.

SCHEME OF EXAMINATION:

Experiment	:70marks (3Hrs)
Viva Voce	:05marks
Total	:75marks

MEB450 ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY

4Hours / Week

16 Weeks/Sem.

Total Hours : 64 Hrs.

OBJECTIVES:

- Verify Ohm's law.
- Estimate power and power factor in single phase circuit.
- Determine the efficiency of single phase transformer.
- Find the efficiency of DC shunt motor and induction motors.
- Determine the VI characteristics of PN diode and SCR.
- Construction and testing of half wave and full wave rectifier.
- Use bridge rectifiers to convert AC into DC.
- Verify the different logic gates AND, OR, NOT, NOR, NAND, EXOR, EXNOR.

LIST OF EXPERIMENTS :

1. Verification of Ohm's Law.
2. Measurement of power and power factor in single phase circuit.
3. Open circuit and short circuit test on a single phase transformer to find the losses and efficiency.
4. Starting a three-phase induction motor by DOL starter and noting the no load current and speed.
5. Load test on DC shunt motor to find the efficiency.
6. Load test on a three-phase induction motor at various loads to find the efficiency.
7. Starting a three phase induction motor by Star / Delta starter and noting the no load current and speed.
8. Load Test Single-Phase transformer.
9. VI Characteristics of a PN Junction diode.
10. VI Characteristics of a SCR.
11. Construct a Half wave Rectifier without filter and measure AC input and DC output voltage.
12. Construct a Full wave rectifier without filter and measure AC input and DC output voltage.
13. Construct a bridge Rectifier with filter and measure AC input and DC output voltage.
14. Verification of truth table for AND, OR, NOT, NOR, NAND, EXOR and EXNOR gates.
15. Study of PLC & Small PLC Experiments by using AND , OR , Ladder Logic Gates

SCHEME OF EXAMINATION:

Electrical Experiment	: 35 marks (1½ Hrs)
Electronics Experiment	: 35 marks (1½ Hrs)
Viva-Voce	: 05 marks
Total	: 75

**MEB470 WORK SHOP-II
(Turning and Drilling)**

4 Hrs/Week
16 Weeks /Sem.
Total Hrs : 64

OBJECTIVES:

- Identify the parts of a center lathe, & drilling machine and their functions.
- Use tools and instruments for turning, & drilling .
- Identify the work holding devices
- Hold the work in proper work holding devices.
- Set the tools for various operations.
- Operate the lathe & drilling machine machine
- Machine a component using lathe, & drilling machine
- Follow safety practices while machining.

LATHE & DRILLING MACHINES

Syllabus:

1. Introduction of safety in operating machines.
 2. Introduction to lathe, drilling machine and its parts.
 3. Introduction to work holding devices and tool holding devices.
 4. Types of tools used in lathe work, drilling
 5. Types of measuring instruments and their uses.
 6. Setting of work and tools.
 7. Operation of lathe, drilling
 8. Practice on a lathe, drilling machine
- Note:** The dimensions may be modified according to the materials specified.
Enclosure: Sketches of Lathe, drilling Exercises.

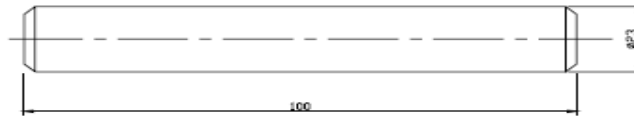
Scheme Of Examination:

Lathe exercise :	45 marks (2 hours)
Drilling by lot :	25 marks (1 hour)
Viva-Voce :	05 marks
Total :	75 marks

LATHE

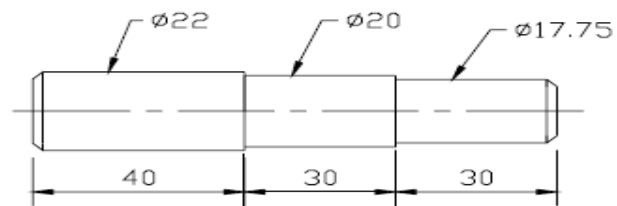
1.0 LATHE

EX.NO.1 PLAIN TURNING

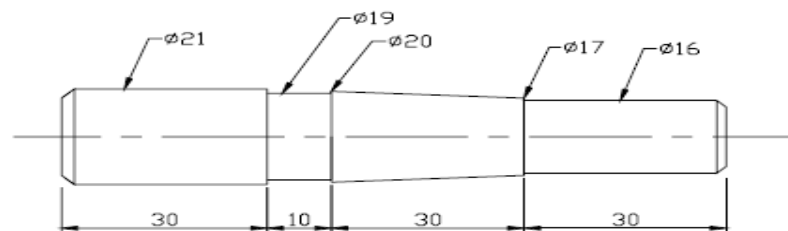


MATERIAL:M.S. OF SIZE DIA
25X105mm.

EX.NO.2 STEP TURNING

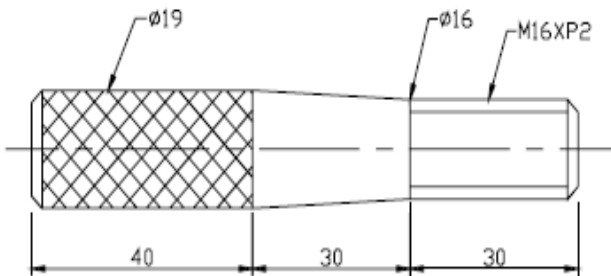


EX.NO.3 TAPER TURNING



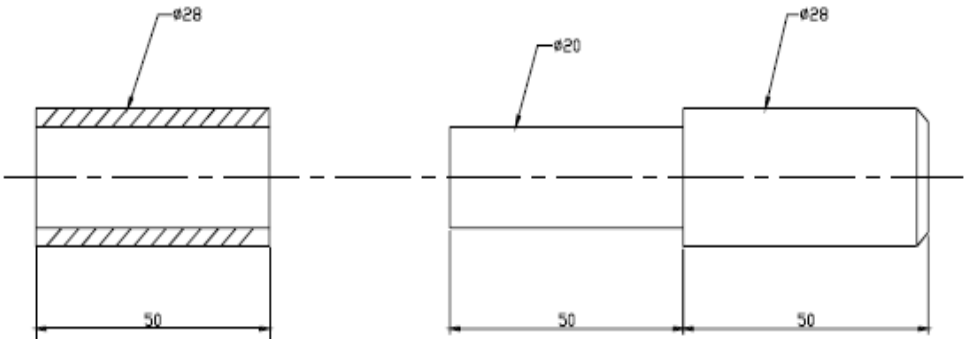
EX.NO.4

THREAD CUTTING AND KNURLING



EX.NO.5

BUSHING

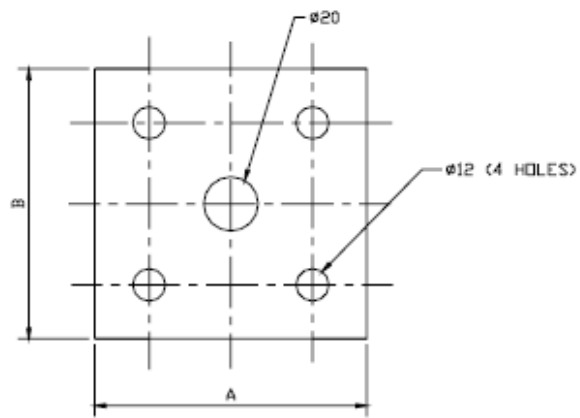


DRILLING

2.0 DRILLING

EX.NO.1

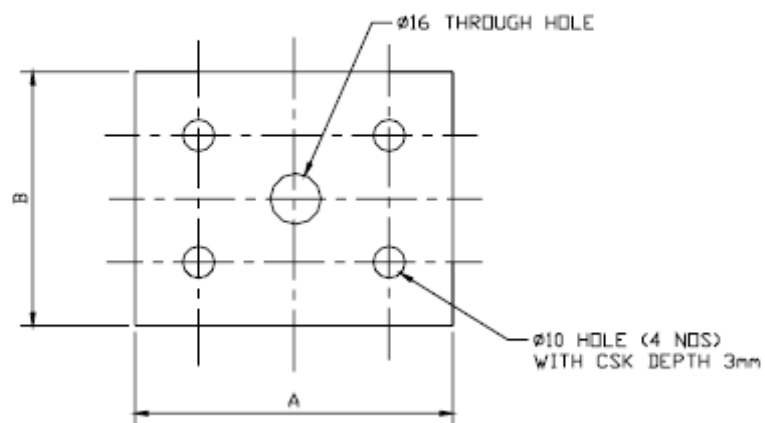
THROUGH HOLE DRILLING



MATERIAL:M.S. OF SIZE 75X50X6mm.

EX.NO.2

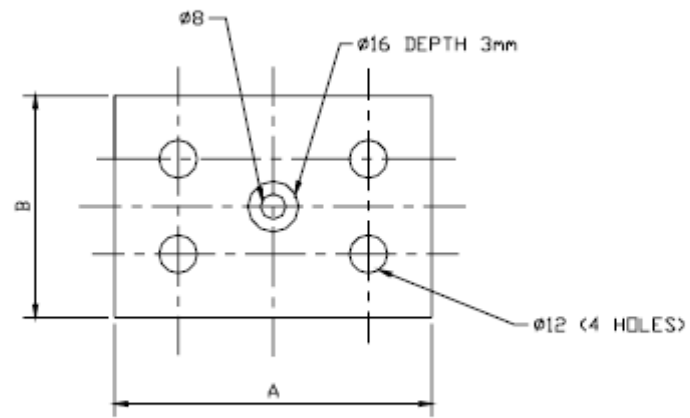
THROUGH HOLE DRILLING WITH COUNTER SUNK



MATERIAL:M.S. OF SIZE 75X50X6mm.

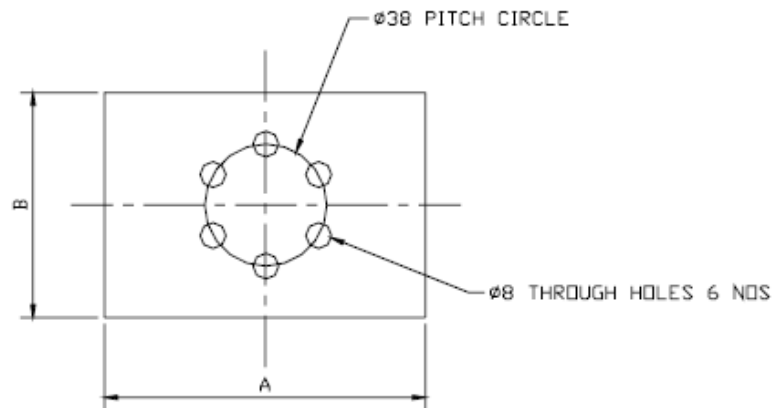
EX.NO.3

PART DRILLING



MATERIAL:M.S. OF SIZE 75X50X6mm.

EX.NO.4 THROUGH HOLE DRILLING (ON PITCH CIRCLE)



MATERIAL:M.S. OF SIZE 75X50X6mm.

MEB510 DESIGN OF MACHINE ELEMENTS

6 Hrs/Week
16 Weeks / Sem.
Total Hrs : 96 hrs

OBJECTIVES:

- Select Engineering materials for specific applications.
- Explain the design consideration of machine parts.
- Design shafts, keys and couplings for power transmission.
- Compare the different types of couplings.
- Design belts and pulleys for power transmission.
- Differentiate the various types of bearings and their applications.
- Design gears for power transmission.
- Design hand lever, foot lever and crank lever

TOPICS AND ALLOCATION

UNIT	TOPICS	TIME(Hrs)
I	DESIGN OF JOINTS AND FASTENERS	18
II	DESIGN OF SHAFTS, COUPLINGS AND KEYS	18
III	DESIGN OF FRICTION DRIVES (Flat belts and V-belts)	18
IV	DESIGN OF BEARINGS	18
V	DESIGN OF LEVERS AND SPUR GEARS	18
	Revision and test	6
	Total	96

UNIT I

DESIGN OF JOINTS AND FASTENERS

18 hrs

Names of engineering materials - Factors affecting selection of material –BIS designation of Ferrous materials – Preferred number-Factor of safety and allowable stress - Procedure for designing machine elements – Types of failures – Problems on tension, compression, shear and bearing.

Joints: Design of- sleeve and cotter joint - knuckle joint-welded joint.

Fasteners: Design of bolted joints - eye bolts - cylinder cover with bolts, studs – pins.

UNIT II

DESIGN OF SHAFTS, COUPLINGS AND KEYS

18 hrs

Shafts: Design of shafts subjected to – twisting moment – bending moment – combined twisting and bending moments – fluctuating loads – design of shafts based on rigidity.

Keys: Types of keys - design of sunk keys only - Effect of keyways on shaft-problems.

Couplings: Requirements of good couplings – types - design of – rigid protected type flange couplings - marine couplings – pin type flexible coupling (Description only)

UNIT III

DESIGN OF FRICTION DRIVES (Flat belts and V-belts)**18 hrs**

Flat Belts: Types of belts - materials for belt -- types of belt drives – Speed ratio – effect of slip - length of flat belts –Tension Ratio $T_1/T_2 = e^{\mu\theta}$ - centrifugal tension - power transmitted – condition for maximum power - transmission – Initial Tension - problems - design procedure of flat belts - design of flat belt based on manufacturer's data only – problems.

V-Belts: V-belt drive - comparison with flat belt drive - designation of Vbelts – length of belt - power transmitted – Design of V-belt using manufacturer's data only.

Pulleys: Material - Types – Speed Cones or Stepped pulleys – belt tensioning devices – manual – short center drive – gravity idler – pulley method – design of cast iron and steel pulleys - problems.

UNIT IV**DESIGN OF BEARINGS****18 hrs**

Bearings: Classifications of bearings – sliding contact and rolling contact bearings - radial and thrust bearings - roller bearing – types – Designation of ball bearings - materials used for bearings - journal bearings – heat generated - heat dissipated - cooling oil requirement – problems – design of journal bearings –Problems.
Design based on approved data books only.

UNIT V**DESIGN OF LEVERS AND SPUR GEARS****18 hrs**

Levers: Types of levers – applications - mechanical advantage – leverage - displacement ratio - design of-hand lever-foot lever-cranked lever - problems.

Spur gears: Gear drives - merits and demerits over belt drive – Classification of gears - gear materials - spur gear terminology - design of spur gears based on Lewis & Buckingham equation - Problems – speed reducer – types –(Approved data books only).

Revision and Test**6 hrs****List of Assignments:****ASSIGNMENT -1**

- 1 Assignment on selection of materials for given applications [atleast five applications should be covered] using design data book. List the mechanical properties of material selected.
- 2 Problems on design of simple machine parts like Cotter Joint, Knuckle Joint, Bell Crank Lever, Turn Buckle, Off – Set link, Arm of Pulley (One example on each component) and draw the components as per designed dimensions.

ASSIGNMENT -2

1. Design Project No. 1 Observe the system where transmission of power takes place through shaft, Keys, coupling, pulley and belt drive. Get the required information regarding power transmitted (power output by motor or engine etc.). By selecting suitable materials, design the shaft, key and coupling. Also select suitable Ball Bearing from Manufacture's catalogue. Prepare design report and assembly drawing indicating overall dimensions, tolerances, and surface finish. Also prepare bill of materials. (Activity should be completed in a group of five to six students)

ASSIGNMENT -3

- 1 Design Project No. 2 Observe the System where transmission of power takes place through belt drives, selecting suitable materials design screw, nut and different simple

components in assembly. Prepare design report and assembly drawing indicating overall dimensions, tolerances and surface finish. Also prepare bill of materials. (Activity should be completed in a group of five to six students)

2 Assignments on design of Screwed joints, Welded joints [one each] with free hand sketches.

Learning Resources:

1. Books:

SNo.	Author	Title	Publication
1	V.B.Bhandari	Introduction to Machine Design	Tata Mc- Graw Hill
2	R.K.Jain	Machine Design	Khanna Publication
3	Pandya & Shah	Machine design	Dhanpat Rai & Son
4	Joseph Edward Shigley	Mechanical Engg. Design	Mc- Graw Hill
5	PSG Coimbtore	Design Data Book	PSG Coimbtore
6	Abdulla Shariff	Hand Book of Properties of Engineering Materials & Design Data for Machine Elements	Dhanpat Rai & Sons
7	Hall, Holowenko, Laughlin	Theory and Problems of Machine Design	Mc- Graw Hill
8	G R Nagpal	Machine Design	Kanna Publication

2. IS/ International Codes

- a) IS 4218: 1967 ISO Metric Threads
- b) IS 2693: 1964 Cast Iron Flexible Couplings
- c) IS 2292: 1963 Taper keys & Keyways
- d) IS 2293: 1963 Gib Head Keys & Keyways
- e) IS 2389: 1963 Bolts, Screws, Nuts & Lock Nuts
- f) IS 4694: 1968 Square threads
- g) IS 808: 1967 Structural Steel
- h) SKF Catalogue for Bearings

**ME 510 DESIGN OF MACHINE ELEMENTS
MODEL QUESTION PAPER**

Time: 3 Hours

Max. Marks: 75

[NOTE: - 1. Answer all questions by choosing either (a) or (b) of each question.
2. Each question carries 15 marks.
3. Approved Design data book is permitted.]

- 1 a. i)** Write the procedure for design of machine elements. **(05)**
ii) Design a sleeve and cotter joint to withstand a tensile load of 60 kN. All parts of the joint are made of the same material and the permissible stresses in tensile, crushing and shear are 60 N/mm², 125 N/mm² and 70 N/mm² respectively. **(10)**
or
- b. i)** An eye bolt is used for lifting a load of 50 kN. Find the nominal diameter of bolt, if the tensile stress is not to exceed 100 N/mm². If the bolt extends 50mm in to the component, what will be the shear stress in the threaded portion of the bolt? **(08)**
ii) A tangential force of 5 kN is applied to the taper pin which fits on 40 mm diameter of the shaft. Determine the diameter of the taper pin assuming the permissible shear stress as 275 N/mm² for pin. **(07)**
- 2 a.** Design a shaft to transmit power from an electric motor to a lathe headstock through a pulley by means of a belt drive. The pulley weighs 300 N and is located at 200 mm from the centre of the bearing. Diameter of the pulley is 200 mm. Maximum power transmitted is 1500 W at 120 rpm. Angle of lap of the belt is 180° and $\mu=0.3$. Shock factor in bending and twisting is 1.5 and 2.0 respectively. Allowable shear stress in the shaft material is 35 N/mm². **(15)**
or
- b.** Design a C.I. rigid flange coupling to transmit 15 kW at 90 rpm from an electric motor to a compressor. The service factor is 1.35. The following permissible stresses may be used.
Shear stress for shaft, bolt and key material = 40N/mm²;
Crushing stress for bolt and key = 80N/mm²;
Shear stress for C.I. = 8 N/mm². **(15)**
- 3. a. i)** Sketch and name the different types of belts used in engineering field. **(03)**
ii) Design a fabric belt to transmit 12 kW at 420 rpm of an engine to a line shaft at 1200rpm. Engine pulley diameter is 550mm and centre distance is 2m. **(12)**
or
- b.** Design a V-belt drive and calculate the actual belt tensions and average stress from the following data: Diameter of driven pulley = 500mm; Diameter of driving pulley = 150 mm; Centre distance = 925 mm; Speed of driven pulley = 300 rpm; Speed of driving Pulley = 1000 rpm; Power transmitted = 7.5 kW. **(15)**
- 4. a. i.** Explain how a ball bearing is designated with an example. **(05)**
ii. A 80 mm long bearing supports a load of 2800 N on a 50 mm diameter shaft. The bearing has a radial clearance of 0.05 mm and the viscosity of oil is 21 cp at the operating temperature. If the bearing is capable of dissipating 80 W, determine the maximum safe speed. **(10)**
or
- b.** Design a journal bearing for a centrifugal pump from the following data: Load on the journal is 12.5 kN; Speed of the journal is 1440 rpm; Diameter of the journal = 75 mm; Bearing characteristics number = 30×10^{-6} ; Permissible bearing pressure 0.7 to 1.4 N/mm²; Ambient temperature = 30°C; L/D = 2; Temperature of oil = 70° C; Assume the bearing heavily constructed and temperature rise as 6°C. **(15)**

- 5. a.** A cranked lever has the following dimensions:-
Length of the handle is 320 mm;
Length of the lever arm is 450 mm;
Overhang of the journal is 120 mm.
The lever is operated by a single person exerting a Maximum force of 400 N at a distance 1/3rd the length of the handle from its free end. The permissible bending stress for the lever is 50 N/ mm² and shear stress for the shaft material is 40 N/mm² **(15)**

or

- b.** A pair of straight teeth spur gear having 20° involute full depth teeth is to transmit 15 kW at 250 rpm of the pinion. The speed ratio is 3:1. The allowable static stresses for gear of C.I. and pinion of steel are 56 MPa and 105 MPa respectively. Number of teeth on pinion = 16. Face width = 14 times module. Design spur gear drive and check for wear.
Assume the following:-
(i) Type of load and service: steady load 8-10 hours per day.
(ii) Velocity factor $CV = 4.5 / (4.5 + V)$, where V – velocity in m/sec.
(iii) Surface endurance limit $\sigma_{es} = 630N/mm^2$.
(iv) E for steel = 2×10^5 N/mm².
(v) E for Cast Iron = 1×10^5 N/mm².
(vi) Assume deformation factor, $C = 320kN/m$. **(15)**

MEB 520 THERMAL ENGINEERING

6 Hrs/Week
/Sem. Total Hrs : 96
OBJECTIVES:

16 Weeks

- Define various types of steam.
- Explain the of boiler
- Compare various types of boilers.
- Familiarize boiler mountings and accessories.
- Describe various circuits used in the steam power plant.
- Explain working of a nuclear power plant.
- Compare conventional energy sources with non conventional sources of energy
- Appreciate the application of refrigeration and air- conditioning
- Define the various parameters used in psychometry
- Compare the different types of refrigeration & air- conditioning system.

TOPICS AND ALLOCATION

UNIT	TOPIC	TIME (Hours)
I.	Steam and Expansions of Steam	18
II.	Steam Boilers and performance of boilers	18
III.	Thermal power plant	18
IV.	Refrigeration and Air Conditioning	18
V.	Renewable Energy-Solar Energy-Wind Energy	18
	Revision Test	6
	Total	96

UNIT - I: STEAM AND EXPANSIONS OF STEAM:

18hrs

Introduction-formation of steam-t-h diagram-t-v-diagram-t-s-diagram-phase diagram-critical conditions-enthalpy of water-enthalpy of evaporation-conditions of steam-wet, dry and superheated steam-advantages of superheated steam-dryness fraction-enthalpy of wet, dry and superheated steam-specific volume of water and steam-density of steam-external work of evaporation-internal latent heat-internal energy of steam-entropy of water and steam-steam tables-Mollier chart-problems.

Expansion processes of steam-constant volume, constant pressure, constant temperature, hyperbolic, isentropic, polytropic and throttling processes-problems.

Steam calorimeters-bucket, combined separating and throttling calorimeters-problems.

UNIT - II: STEAM BOILERS AND PERFORMANCE OF BOILERS:

18hrs

Classification of boilers-high pressure boilers-Lamont and BHEL high pressure boilers-advantages of high pressure boilers, boiler mountings-function, construction and working-

boiler accessories-function, construction and working-comparison of mountings and accessories-feed water treatment-methods-starting boiler from cold condition- safety precautions in boiler operation-Indian boiler act.

Performance of boilers-actual, equivalent and factor of evaporation-boiler efficiency-Factors influencing boiler efficiency-boiler power-problems-efficiency of economiser and super heater-problems-boiler trail-heat losses in a boiler-heat balance sheet-problems.

UNIT - III: THERMAL POWER PLANT:

18hrs

Layout of thermal power plant -fuel and ash circuit -water and steam circuit - air and flue gas circuit - cooling water circuit -merits and demerits of thermal power plant - air pollution by thermal power plants -pollutant and effects of pollution-pollution control-cyclone separator-wet scrubber-electrostatic precipitator-control of No₂ and SO₂.

Steam turbine-steam power cycle-Carnot, Rankine and modified Rankine cycles-classification of steam turbine-necessity of compounding-Industrial turbines.

Steam condensers - elements of condensing plant-classification of condensers-jet condenser types-surface condensers-types-merits and demerits of surface condensers-sources of air in condenser vacuum-vacuum efficiency-condenser efficiency-mass of cooling water required-mass of air present-number of tubes-problems.

UNIT - IV: ENERGY ENGINEERING AND MANAGEMENT:

18hrs

Nuclear fuels-requirements-fissile and fertile fuels-Nuclear fission and fusion-chain reaction-radio activity-layout of nuclear power plant-merits and demerits-Nuclear reactors-classification-components of nuclear reactor-reactor core-moderators-control rods-coolant-reflectors-biological shield-pressurised water reactor-boiling water reactor-Candu type reactor-fast breeder reactor-effect of nuclear radiation-disposal of nuclear wastes-comparison of nuclear power plants with thermal power plants.

Conventional sources of energy-layout of hydel and diesel power plants-merits and demerits.

Non-conventional sources of energy- solar-wind-tidal-geothermal and gobar gas plant

UNIT - V: REFRIGERATION AND AIR CONDITIONING:

18hrs

Refrigeration-refrigerators and heat pumps-types and applications of refrigeration-vapour compression refrigeration system-vapour absorption system-comparison-refrigerating effect-capacity of refrigerating unit-C.O.P-actual C.O.P-power required-mass of ice produced-problems-C.O.P of reversed Carnot cycle-Bell-Coleman cycle- problems-refrigerants-desirable properties-classification of refrigerants.

Air conditioning-psychrometric properties-dry air-moist air-water vapour-saturated air-dry bulb temperature-wet bulb depression-dew point depression-dew point temperature-humidity-specific and relative humidity-psychrometric chart-psychrometric processes-sensible heating and cooling-humidification-dehumidification-simple problems using psychrometric chart-air

conditioning-classification and applications of air conditioning system-room air conditioning - central air conditioning-comparison-differences between comfort and industrial air conditioning-factors to be considered in air conditioning-loads encountered in air conditioning systems.

Revision and Test

6Hrs

Text Books:

1. P.L.Ballaney, Thermal Engineering, Edn. 24, Khanna Publishers, 2B, North Market, Naisarak, New Delhi 110 006.
2. R.S.Khurmi and J.K.Gupta, Thermal Engineering, Edn. 18, published by S. Chand & Co., Ram Nagar, New Delhi 110 055.

Reference Books:

1. R.K.Rajput, Thermal Engineering
2. B.K.Sarkar, Thermal Engineering, Edn. 3, 1998, published by Dhanpat Rai & Sons, 1982, Naisarak, New Delhi 110 006.
3. S.Domkundwar, A.V.Domkundwar S.C.Arora, Power plant Engineering
4. Nagpal, Power plant Engineering, Edn. 8, published by by 24, Khanna Publishers, 2B, North Market, Naisarak, New Delhi 110 006.
5. P.C.Sharma, Power plant Engineering
6. G.D.Rai, Non Conventional Energy sources, Edn.4, Published by 24, Khanna Publishers, 2B, North Market, Naisarak, New Delhi 110 006.
7. P.L.Ballaney, Refrigeration and Air condition, Edn. 4, published by by 24, Khanna Publishers, 2B, North Market, Naisarak, New Delhi 110 006.
8. Manohar Prasad, Refrigeration and Air-condition, 1993, Edn. Published by H.S.Popali for Wiley Eastern Ltd., 4835/24 Ansari Road, Daryaganj, New Delhi 110 053.

**Model Question paper
THERMAL ENGINEERING**

Time: 3 Hours

Max Marks: 75

[Note: Answer all questions. Selecting any two from (a) and any one from (b). All questions carry equal marks]

- | | | | | |
|---|---|---|---|---|
| I | 1 | a | Describe about the phase diagram. | 4 |
| | | b | Dry saturated steam at a particular pressure has a total heat of 2750kJ/kg. If it is superheated until its total heat at that pressure is 3780kJ/kg, find the rise in temperature of steam. Assume specific heat of super heated steam as 2.1227kj/kgK. | 4 |
| | | c | Describe the method of finding the dryness fraction of steam by bucket calorimeter. | 4 |

		Determine the entropy of 3kg of steam at a pressure of 12bar when the steam is (a) wet having dryness fraction 0.8, (b) dry saturated and (c) superheated to 300°C. Take specific heat of superheated steam as 2.1kJ/kgK.	7
		The following observations were made during dryness fraction experiment using a combined separating and throttling calorimeter. Mass of steam condensed =26kg; mass of water collected =1.5kg; pressure before throttling = 10bar; pressure after throttling = 1.4bar; temperature after throttling = 115°C and Cp for steam is to be taken as 2.1kJ/kgK. Find the dryness fraction of steam.	7
II	1	a Name the three high pressure boilers. What are the essential features of a high pressure boiler?	4
		b Name the impurities present in water. What are the effects of impurities?	4
		c What are the various sources of heat losses in a boiler?	4
	2	a Explain the working of fusible plug with a neat sketch.	7
		b Explain heat balance sheet as applied to a high pressure boiler.	7
III	1	a State the advantages and disadvantages of thermal power plants.	4
		b Draw the p-V and T-s diagram of modified Rankines cycle and indicate various processes.	4
		c What is steam condenser? How it is classified?	4
	2	a Describe with a line diagram the circulating cooling water circuit of a steam power plant.	7
		The vacuum in a condenser dealing with 9000kg of steam/hour is found to be 72cm of Hg. (Barometer 76cm of Hg) and the temperature is 25°C. The air leakage amount to 2kg for every 5000kg of steam. Determine the capacity of a suitable dry air pump in cubic meter/ min required for the condenser.	7
IV	1	a What are the different nuclear fuels? Differentiate fissile and fertile fuels.	4
		b Explain the functions of moderator and coolant in nuclear power plant.	4
		c Describe about the non conventional sources of energy.	4
	2	a Describe the various types of radioactivities.	7
		b Explain with a line diagram the working of a typical gobar gas plant.	7
V	1	a Mention the applications of refrigeration.	4
		b What is meant by psychrometry? Name the psychometric processes.	4
		c Differentiate between unitary systems of air conditioning over central air conditioning.	4
	2	a A carnot refrigerator requires 1.25kW per ton of refrigeration to maintain the temperature of -30°C. find:- (1) C.O.P of the refrigerator, (2) temperature at which heat is rejected and (3) heat rejected in kJ/ton of refrigeration.	7
		b Explain any one type of air conditioning system suitable for a theatre in Chennai.	7

MEB530 INDUSTRIAL ENGINEERING AND MANAGEMENT

5 Hrs/Week
16Weeks/Sem.
Total Hrs : 80

OBJECTIVES:

- Explain the different types of layout and compare them.
- Appreciate the safety aspects and its impacts on an organization.
- Compare different productivity improvement technique.
- Explain different work measurement techniques.
- Estimate standard time for a job.
- Explain production planning and control and its functions.
- Study the role of PPC as a tool for cost control.
- Prepare process control charts.
- Explain the principles of management and function of management.
- Compare different organizational structure.
- Explain the selection and training of staff.
- Analyse Inventory control system and the tools used in stock control.
- Familiarize different types of companies and their financial aspects.

TOPICS AND ALLOCATION

UNIT	TOPIC	TIME (Hrs)
I.	Plant Engineering and Plant safety	15
II.	Method study and Work measurement	15
III.	Production Planning and Control	15
IV.	Management and Quality Control	15
V.	Personnel Management, Financial Management and Material Management	15
VI.	Revision Test	5
TOTAL		80

UNIT – I

PLANT ENGINEERING AND PLANT SAFETY

15 hrs

Plant Engineering :

Plant – Selection of site of industry – Plant layout – Principles of good layout – types –process, product and fixed position – techniques to improve layout – Principles of material handling equipment – Plant maintenance – importance – Break down maintenance, preventive maintenance and scheduled maintenance.

Plant Safety:

Importance – accident – cost and causes of accident – accident proneness – Planning for accident prevention – Industrial disputes – settlement of industrial disputes.

UNIT – II

METHOD STUDY AND WORK MEASUREMENT

15hrs

Productivity – Standard of living – method of improving productivity – Objectives – Importance of good working conditions.

Method Study:

Definition – Objectives – Selection of a job for method study – Basic procedure for conduct of method study – Tools used – Operation process chart, Flow process chart, two handed process chart, Man machine chart, String diagram and flow diagram.

Work Measurement:

Definition – Basic procedure in making a time study – Employees rating factor – Application of time allowances – Rest, Personal, Process, Special and Policy allowances – Calculation of standard time – Problems – Basic concept of production study – Techniques of work measurement.

UNIT – III

PRODUCTION PLANNING AND QUALITY CONTROL

15 hrs

Production Planning and Control:

Introduction – Major functions of production planning and control – Pre planning – Methods of forecasting – Routing and scheduling – Dispatching and controlling – Critical path method (CPM) No problems. Production – types – Characteristics – Economic Batch Quantity (EBQ) – Principles of product and process planning – make or buy decision – problems.

Quality Control:

Definition – Objectives – Types of inspection- Statistical Quality Control – Types of measurements – Method of variables – Method of attributes- Statistical Process Control – process capability – 7 QC tools - Control Limits – Tolerance Limits - sources of errors - $\sum X$, R chart, p – chart- Operating Characteristics curve (O.C curve) – Sampling inspection – Single and double sampling plan.

UNIT – IV

PRINCIPLES OF MANAGEMENT AND PERSONNEL MANAGEMENT

15 hrs

Principles of Management:

Definition of management – Administration – Organization - W. Taylor's and Henry Fayol's Principles of Management – Functions of Manager – Types of organization – Line, Staff, Taylor's Pure functional types – Line and staff and committee type – Directing – Leadership – Styles of Leadership – Qualities of a good leader – Motivation – Positive and negative motivation - Just in time – Total Quality Management(TQM) – Quality circle – Zero defect concept – 5S concepts - Management Information Systems – GEMBA - KANBAN system - Ethics – Professional ethics.

Personnel Management:

Responsibility of human resource management – Selection procedure – Training of workers – Apprentice training – Job evaluation and merit rating – objectives and importance – wages and salary administration – Components of wages – Wage fixation – Type of wage payment – Halsey's 50% plan, Rowan's plan and Emerson's efficiency plan – Problems.

UNIT – V

FINANCIAL MANAGEMENT AND MATERIAL MANAGEMENT

15 hrs

Financial Management:

Fixed and working capital – Resources of capital – Shares preference and equity shares – debentures – Type of debentures – Public deposits, Factory costing – Direct cost – Indirect cost – Factory overhead – Selling price of a product – Profit – Problems. Depreciation – Causes – Methods – Straight line, Sinking fund and percentage on diminishing value method – Problems.

Material Management:

Objectives of good stock control system – ABC analysis of inventory – Procurement and consumption cycle – Economic order quantity problems – Supply chain management – Introduction – Purchasing procedure – Store keeping – Bin card.

Revision and Test

5 hrs

Text Book:

1. O. P. Khanna, Industrial Engineering and Management, Revised Edition – 2004, Dhanpat Rai Publications (P) Ltd., 67/4 Madras House, Daryaganj, New Delhi 110 002.
2. T. R. Banga & S. C. Sharma, Engineering Economics and Management, Edn. 2 - 2001, published by McGraw Hill, New Delhi.

Reference Books:

1. Heinz Wehrich, Harold Koontz, Management, A global perspective, 10th edition, McGraw Hill international edition 1994.
2. Joseph L. Massie, Essentials of Management, 4th Edition, Prentice-Hall of India, New Delhi 2004.

**Model Question paper
Industrial Engineering And Management**

Time: 3 Hours

Max Marks: 75

[Note: Answer all questions. Selecting any two from (a) and any one from (b). All questions carry equal marks]

- | | | | | |
|----|---|---|---|---|
| I | a | 1 | State any five objectives of scientific layout. | 4 |
| | | 2 | What is accident proneness? | 4 |
| | | 3 | Explain briefly Breakdown maintenance | 4 |
| | b | 1 | What are the different types of plant layout? Explain any two with neat sketches. | 7 |
| | | 2 | Explain the various personal protective devices with sketches. | 7 |
| II | a | 1 | Briefly explain any three methods of improving productivity. | 4 |
| | | 2 | Write down any three objectives of method study | 4 |
| | | 3 | Write short notes on Synthesis from standard data | 4 |
| | b | 1 | With a neat sketch, explain Man type flow process chart. | 7 |
| | | 2 | What is operation process chart? Explain with an example. State guidelines for preparing the chart? | 7 |

III	a	1	Differentiate inspection & quality control.	4
		2	Write short notes on (i) Double sampling plan	4
		3	State any three advantages of sampling inspection	4
	b	1	What is forecasting? Explain the different techniques of forecasting.	7
		2	What is production planning & control? Explain the main function.	7
IV	a	1	State and briefly explain the various components of Wages	4
		2	A worker completes a job in 6 hrs. The allowed standard time for the job is 8 hrs. His Wage rate is Rs.5 per hr. Calculate the total earnings of the worker under the following system of payment (i) Halsey's 50% plan	4
		3	Write down any three functions of human resource management	4
	b	1	What are the advantages and disadvantages of KANBAN system?	7
		2	Discuss the recruitment and selection procedure done by human resource management.	7
v	a	1	What are the resources of fixed capital. Briefly explain.	4
		2	Explain the various resources of fixed capital	4
		3	Write short notes on Bin cards	4
	b	1	Explain by means of a block diagram how the selling price of a product is arrived at.	7
		2	Explain how cost of inventory can be controlled by "ABC Analysis" technique.	7

MEB541 REFRIGERATION AND AIR CONDITIONING

5 Hrs/Week
16 Weeks /Sem.
Total Hrs: 80 hrs

OBJECTIVES:

- Explain the working of open and closed air system of refrigeration.
- Describe the working and construction of compressors used for air conditioning.
- Explain vapour compression refrigeration system.
- Explain vapour absorption refrigeration system.
- Compare the properties and applications of various refrigerants.
- Define the parameters used in psychrometry.
- Use of Psychrometry chart
- Describe the equipment used for air conditioning.
- Estimate the cooling load for the given requirement.
- Explain the industrial application of refrigeration.

TOPICS AND ALLOCATION

UNIT	TOPIC	TIME (Hrs)
I.	Refrigeration system and Refrigeration equipments	15
II.	Vapour compression refrigeration system ,Vapour absorption refrigeration system and Cryogenic Refrigeration Systems	15
III.	Refrigeration flow controls, refrigerants and lubricants and Applications of refrigeration	15
IV.	Psychometrics and comfort air conditioning systems	15
V.	Cooling load calculations and Duct Design , Energy conservation Techniques	15
VI.	Revision Test	5
TOTAL		80

UNIT I

Refrigeration system **15 hrs**

Thermodynamic state of a pure substance, modes of heat transfer –laws of heat transfer - mechanisms of production of cold - unit of refrigeration –types of refrigeration –reversed Carnot cycle - C.O.P of heat engine-heat pump- refrigerating machine – principle of working of open and closed air system of refrigeration – advantages and disadvantages – and its application of air cycle-problems

Refrigeration Equipments:

Compressor – principle of working and constructional details of reciprocating and rotary compressors, hermetically and semi hermetically sealed compressors- condensers-principle of working and constructional details of air cooled and water cooled condensers, evaporative condensers- advantages and disadvantages - natural and forced draught cooling towers. Evaporators- natural circulation and forced circulation type – principle of working constructional details.

UNIT II

Vapour Compression Refrigeration Systems

15 hrs

Principle of working of vapour compression system – analysis of vapour compression cycle using T-s diagram and p-H diagram- refrigerating effect- compression work - C.O.P - effect of superheating and under cooling – effect of evaporative pressure and condenser pressure-problems – liquid vapour refrigeration heat exchangers - advantages and disadvantages of superheating and under cooling –use of flash chamber and accumulator.

Vapour Absorption Refrigeration Systems

Simple absorption system – Electrolux system - solar absorption refrigeration system-absorption system comparison with mechanical refrigeration system.

Cryogenic Refrigeration Systems

Refrigerators for above 2 K- Philips Refrigerator--Giffered McMahon refrigerator- refrigerators for below 2 K - Magnetic refrigeration systems.

UNIT III

Refrigerant flow controls, refrigerants and lubricants

15 hrs

Capillary tube-automatic expansion valve-thermostatic expansion valve-electronic expansion valve-solenoid valve-evaporator pressure regulator –suction pressure regulator-classification of refrigerants-selection of a refrigerant-properties and applications of following refrigerants SO_2 , CH_4 , F_{22} , and NH_3 –CFCs refrigerants- equivalent of CFCs refrigerants (R-123a,R-143a,R-69S)- blends of refrigerants(R400 and R500 Series) - lubricants used in refrigeration and their applications.

Applications of refrigeration:

Slow freezing –quick freezing- cold storage-frozen storage-freeze drying –dairy refrigeration –ice cream cabinets-ice making – water cooler, milk cooler, bottle cooler-frost free refrigeration.

UNIT IV

PSYCHROMETRY AND COMFORT AIR CONDITIONING

15 hrs

Psychrometry properties - adiabatic saturation of air by evaporation of water- psychrometric chart and its uses – psychrometric processes – sensible heating and cooling - humidifying and heating - dehumidifying and cooling - adiabatic cooling with humidification - total heating or cooling processes -sensible heat factor - by pass factor – adiabatic mixing – evaporative cooling - problems – governing optimum effective temperature – comfort chart-design consideration.

Air Conditioning Systems:

Equipment for air conditioning and insulation factors – air purification – temperature control – humidity control – dry and wet filters- centrifugal dust collector – air washer humidifier – dehumidifier - fans and blowers – grills and registers – summer and winter air conditioning, window and split air conditioners — properties of ideal insulator, types of insulating materials .

UNIT V

Cooling load calculations:

15 hrs

Different heat sources – conduction heat load – radiation load of sun – occupants load – equipment load - infiltration air load – miscellaneous heat sources –fresh air load - problems. Classification of duct systems - Duct design – equal friction method – velocity reduction method – problems. Chilled water Systems -Air handling Units.

Energy conservation Techniques

Energy conservation and design decisions - heat reclaim – thermal storage – ice builder – ice harvester – variable refrigerant flow (VRF) – variable primary flow (VPF).
Revision and Test 5 Hrs

Text books :

1. P.L . Ballaney, Refrigeration and air conditioning, Khanna Publishers, 2B, North Market, Naisarak, New Delhi 110 006.
2. V.K. Jain, Refrigeration and air conditioning
3. Wilbert F. Steocker “Industrial Refrigeration Hand Book”.

Reference Books:

1. Domkundwar, A course in refrigeration and air conditioning
2. Dossat , Principles of refrigeration
3. Audels, Home refrigeration and air conditioning, 1996 Edn., published by Theo. Audel & Co. publisher, 49, West 23rd Street, New York. - 1998
4. C.P Arora, Refrigeration and air conditioning
5. Randell Fd Barron “cryogenic systems” .

**Model Question paper
Refrigeration And Air Conditioning**

Time: 3 Hours

Max Marks: 75

[Note: Answer all questions. Selecting any two from (a) and any one from (b).
All questions carry equal marks]

- | | | | | |
|----|---|---|--|---|
| I | 1 | a | Explain the working of evaporative condensers with neat sketch. | 4 |
| | | b | Define conduction convection and radiation modes of heat Transfer. | 4 |
| | | c | Explain the working of any one type of cooling towers. | 4 |
| | | | A refrigeration system works between the temp limits of 37 degree celsius and -13 degree celsius. Find the amount of ice that will be produced per Kwh at 260k from water available at 27 degree celsius. Take cp of ice and water as $c_{pi}=2.09\text{kJ/kg-k}$ and $c_{pw}=4.197\text{kJ/kg-k}$ and $h_s=335\text{kJ/kg}$. | |
| | 2 | a | A 15 ton refrigeration system working on the simple air refrigeration cycle takes 0.6kg/sec of air from the main compressor. From the given values obtained the cop and the power needed and the amount of fluid to be evaporated per hour if the enthalpy charge is 260kJ/kg. $P_1=1.05\text{ bar}$ $P_2=5.25\text{ bar}$ $P_{\text{cabin}}=1.02\text{bar}$ $T_1=288\text{k}$ $\eta_{\text{mp}}=0.8$, cooling turbine efficiency= 0.76 . air leaves the cabin at 30 degree celsius, heat exchanger effectiveness= 0.75 . | 7 |
| | | b | | 7 |
| II | 1 | a | With the neat sketch explain the working of solar absorption refrigeration system. | 4 |
| | | b | Give some five differences between the VCR system and VAR system. | 4 |
| | | c | Explain about flash chamber with a neat sketch | 4 |
| | 2 | a | Explain with the neat sketch the working of vapour compression refrigeration system. | 7 |

		b	Explain with sketch the working of Electrolux refrigeration system.	7
III	1	a	What are the factors to be considered for the selection of a refrigerant.	4
		b	List out the affects caused by using various refrigerants to the environment	4
		c	Explain the working of slow freezing and quick freezing refrigeration system.	4
	2	a	Explain the working of automatic expansion valve with a neat sketch	7
		b	What is mean by quick freezing? Explain any one method of quick freezing in detail.	7
IV	1	a	Define the terms dry bulb temp., wet bulb temp., dew point temp., specific humidity and absolute humidity.	4
		b	Define the term psychrometer an psychrometry	4
		c	What is meant by psling psychrometer. Explain the process of cooling and dehumidification and heating and humidification with the use of psychometric chart.	4
	2	a	The values obtained from a sling psychrometer are $t_{lb}=30$ degree celsius and $t_{wb}=20$ degree celsius. The barometric reading is 740mm of Hg. Calculate (i) dew point temp and relative humidity.(ii) degree of saturation (iii) specific humidity (iv)specific volume (v) specific enthalpy.	7
		b	The values obtained from a sling psychrometer are $t_{db}=30$ degree celsius and $t_{wb}=20$ degree celsius. The barometric readings is 740 mm of Hg. Calculate (i) dew point temp and relative humidity (ii)degree of saturation (iii) specific humidity (iv) specific volume (v)specific enthalpy.	7
V	1	a	With the neat sketch explain the working of centrifugal dust collector.	4
		b	State the working of air blowers with the neat sketch.	4
		c	Explain the material used and working of dry and wet filters.	4
	2	a	With the neat sketch explain the working of a centralized air conditioning system.	7
		b	Name the different methods of air distribution system and explain the overhead air distribution system with a neat sketch.	7

MEB542 METROLOGY AND QUALITY CONTROL

5 Hrs/Week
16 Weeks /Sem.
Total Hrs: 80 hrs

objectives:

Students will be able to:

- 1 Define accuracy, precision, calibration, sensitivity, repeatability and such relevant terms in metrology.
- 2 Select appropriate instrument/s for specific measurement.
- 3 Analyze and interpret the data obtained from the different measurements processes and present it in the graphical form, statistical form.
- 4 Construct and draw the control charts.
- 5 Understand ISO certification procedure and quality system.

TOPICS AND ALLOCATION

UNIT	TOPIC	TIME (Hrs)
I.	Introduction to metrology	15
II.	Screw thread Measurements – Gear Measurement and Testing	15
III.	Testing Techniques	15
IV.	Quality Control	15
V.	Elementry Statistics & it's application in quality control	15
VI.	Revision Test	5
TOTAL		80

UNIT –I

Introduction to metrology

1.1 Metrology Basics-

Definition of metrology, Categories of metrology, Scientific metrology, Industrial metrology, Legal metrology, Need of inspection, Precision, Accuracy, Sensitivity, Readability, Calibration, Traceability, Reproducibility, Sources of errors, Factors affecting accuracy, Selection of instrument, Precautions while using an instruments for getting higher precision and accuracy.

1.2 Standards and Comparators-

Definition and introduction to line standard, end standard, Wavelength standard, Slip gauge and its accessories, Length bars. Definition, Requirement of good comparator, Classification, use of comparators, Working principle of comparators, Dial indicator, Sigma comparator, Pneumatic comparator, Electrical, Electronic, Relative advantages and disadvantages.

1.3 Limits, Fits ,Tolerances and Gauges –

Concept of Limits, Fits, And Tolerances, Selective Assembly, Interchangeability, Hole And Shaft Basis

System, Taylor's Principle, Design of Plug, Ring Gauges, IS919-1993 (Limits, Fits & Tolerances, Gauges) IS 3477-1973, concept of multi gauging and inspection.

1.4 Angular Measurement – Concept, Instruments For Angular, Measurements, Working And Use of Universal Bevel Protractor, Sine Bar, Spirit Level, Principle of Working of Clinometers, Angle Gauges (With Numerical on Setting of Angle Gauges).

UNIT II

2.1 Screw thread Measurements –

ISO grade and fits of thread, Errors in threads, Pitch errors, Measurement of different elements such as major diameter, minor diameter, effective diameter, pitch , Two wire method, Thread gauge micrometer, Working principle of floating carriage dial micrometer.

2.2 Gear Measurement and Testing –

Analytical and functional inspection, Rolling test, Measurement of tooth thickness (constant chord method), gear tooth vernier, Errors in gears such as backlash, runout, composite .

UNIT III

Testing Techniques -

3.1 Measurement of surface finish –

Primary and secondary texture, Sampling length, Lay, terminology as per IS 3073- 1967, direction of lay, Sources of lay and its significance, CLA, Ra, RMS, Rz values and their interpretation, Symbol for designating surface finish on drawing, Various techniques of qualitative analysis, Working principle of stylus probe type instruments.

3.2 Machine tool testing –

Parallelism, Straightness, Squareness, Coaxiality, roundness, run out, alignment testing of machine tools as per IS standard procedure.

UNIT IV

4.1 Quality Control

A) Quality : Definitions, meaning of quality of product & services, Quality characteristics, Quality of design, Quality of conformance, Quality of performance, Concept of reliability, Cost, Quality assurance, Cost of rework & repair, Quality & Inspection, Inspection stages.

B) Total Quality Management :

1) Principles of total quantity management.

i) Customer focus.

ii) Commitment by top management.

iii) Continuous improvement – PDCA, Quality Circles.

iv) Employee empowerment (JIDoKA).

2) Quality Audit : Concept of audit practices, lead assessor certification.

3) Six sigma : Statistical meaning, methodology of system Improvement , DMAIC cycle, Yellow belt, Green belt, Black belt certification.

C) ISO 9000 Series & other standards –

Concept , ISO 9000 series quality standards, QS14000,Standards in general, Its evaluation & Implications, necessity of ISO certification, other Quality systems

UNIT V

Elementary Statistics & it's application in quality control

5.1 Statistical quality control – Meaning and importance of SQC, Process capability of machine, determination of statistical limits, different possibilities, Rejection area, Statistically capable and

incapable processes, Cp, Cpk.

5.2 Acceptance Sampling – Concept, Comparison with 100% inspection, Different types of sampling plans, with merits and demerits, OC curve, It's importance and significance, Producers risk, Consumer's risk, AQL, AOQL, IQL, LTPD

Learning Resources:

1. Books

Sr. No.	Author	Title	Publisher and address
1	R. K. Jain	Engineering metrology	Khanna Publisher, Delhi.
2	J.F.W. Galyer and C. R. Shotbolt	Metrology for Engineers	ELBS
3	K. J. Hume	Engineering Metrology	Kalyani publishers
4	I.C. Gupta	A text book of Engineering metrology	Dhanpat Rai and Sons,
5	M. Adithan and R. Bahn	Metrology Lab. Manual	T.T.T.I. Chandigarh.
6	M. Mahajan	Statistical Quality Control	Dhanpat Rai and Sons ,
7	T.T.T.I. Chennai	Quality control	Tata McGraw Hill,
8	Juran U.M. and Gryna	Quality planning and analysis	Tata McGraw Hill,
9	National productivity council	Inspection and quality control	N.P.C., New Delhi.
10	N. Logothetis	Managing for Total Quality	Prentice – Hall, Delhi.
11	Lauth Alwan	Statistical Process analysis	Tata McGraw Hill.

2. IS/ International Codes :

- IS 919 – 1993 Recommendation for limits, fits and tolerances
- IS 2029 – 1962 Dial gauges.
- IS 2103 – 1972 Engineering Square
- IS 2909 – 1964 Guide for selection of fits.
- IS 2921 – 1964 Vernier height gauges
- IS 2949 – 1964 V Block.
- IS 2984 – 1966 Slip gauges.
- IS 3139 – 1966 Dimensions for screw threads.
- IS 3179 – 1965 Feeler gauges.
- IS 3455 – 1966 Tolerances for plain limit gauges.
- IS 3477 – 1973 Snap gauges.
- IS 6137 – 1971 Plain plug gauges.
- IS 3651 – 1976 Vernier Caliper
- IS 4218 -Isometric screw threads
- IS 4440 – 1967 Slip gauges accessories
- IS 5359 – 1969 Sine bars

IS 5402 – 1970 Principle and applications of sine bars
IS 5939 – 1970 Sine angles, sine tables.

Model Question paper
Metrology and Machine Tool Testing

Time: 3 Hours

Max Marks: 75

[Note: Answer all questions. Selecting any two from (a) and any one from (b).
All questions carry equal marks]

- | | | | | |
|-----|---|---|--|---|
| I | 1 | a | Distinguish between Line standard & End standard. | 4 |
| | | b | Define Precision and Accuracy | 4 |
| | | c | Name the various types of errors . | 4 |
| | 2 | a | Name the various methods of measurements and explain any three of them with suitable examples. | 7 |
| | | b | Explain the measuring of external angle of a component using any one type of precision measuring device with suitable sketch. | 7 |
| II | 1 | a | State the principles of optical measuring instruments. | 4 |
| | | b | Explain measurement of Tapper Shaft. | 4 |
| | | c | What are the advantages & disadvantages of electrical comparator. | 4 |
| | 2 | a | State the principle of floating carriage micrometer explain briefly the construction and use of floating carriage micrometer with a neat sketch. | 7 |
| | | b | State the principle of a gear tooth vernier caliper. Sketch a gear tooth vernier caliper and name its various parts. | 7 |
| III | 1 | a | What is meant by geometric testing.
Explain the term | 4 |
| | | b | (i) Ra value | 4 |
| | | | (ii) Rz value | |
| | | c | Explain measurement of concentricity. | 4 |
| | 2 | a | Describe the working principle of stylus probe type surface measurement instruments? Explain any one with details. | 7 |
| | | b | Explain the procedure of 'alignment tests' to be done on a lathe. | 7 |
| IV | 1 | a | Explain the term "Quality Assurance Function" | 4 |
| | | b | Explain PDCA | 4 |
| | | c | Distinguish clearly between quality of design and quality of conformance. | 4 |
| | 2 | a | Explain the need of quality assurance system in industries. Describe briefly the ISO 9000 series standards. | 7 |

	b	Explain the TQM operations in brief.	7	
V	1	a	What is meant by SQC	4
		b	State different types of sampling methods	4
		c	Differentiate between AQL and AOQL	4
	2	a	Explain the characteristics of OC curve.	7
		1.	State and explain the advantages and limitations of acceptance sampling over 100 % inspection.	
		b		7
		2.	Compare random sampling and stratified sampling.	

B0002 COMMUNICATION AND LIFE SKILLS PRACTICAL

4 Hrs/Week

16 Weeks /Sem.

Total Hrs: 64 hrs

Topics and Allocation of Hours:

Sl.No	Section	No. of Hours
1	Part –A: Monodic Communication	16
2	Part –B: Dyadic Communication	16
3	Part – C: Professional Communication	16
4	Part – D: Life Skill	16
	Total	64

RATIONALE

Nowadays, effective and error free communication is a basic need. Communication through English is the order of the day for entry and survival in any corporate. Training in Monodic communication (one man communication) Dyadic communication (a pair communication) and Professional communication (may be Monodic, Dyadic or Group communication) is attempted through these practical modules. One can improve one's communication skills by enriching one's vocabulary, particularly active vocabulary and standard everyday expressions and using them in various contexts. Practice alone, both on the campus and outside the campus, can help a learner to grow proficient in the art of Communication.

Language is the most commonly used and effective medium of self-expression in all spheres of human life- personal, social and professional. A student must have a fair knowledge of English language use and various communicative functions. He/she must be able to pursue the present course of study and handle the future jobs in industry. The objective of the course is to assist the diploma holders to acquire proficiency in monodic, dyadic and professional communication skills and selective but most important life skills. At the end of the course, the student will be able to communicate his ideas fear free and error free, in social and professional spheres of life and imbibe life skills.

SPECIFIC INSTRUCTIONAL OBJECTIVES

Communication is crucial as it influences every aspect of one's personal development. Having a sound grounding in reading and writing techniques allows a student to progress on to higher level literacy skills. Many students struggle because their basic decoding is so inaccurate that advanced comprehension is difficult for them. Because of their poor exposure and poor use of English language in various spheres of life they suffer proper communication. They also tend to be 'afraid' of words and in turn they are not able to develop their personal vocabulary. In other words, without solid literacy skills, the student's prospects and life chances are limited. It is a fact that Communication skills and Life Skills shape one's personality.

MONODIC COMMUNICATION

The student is able to:

1. Practise using departmental words and terminology in sentences.
2. Prepare and perform oral presentations.
3. Introduce one self and others.
4. Deliver welcome address and vote of thanks.
5. Compare a program.
6. Describe the visuals.
7. Take notes, answer very short questions.

8. Comprehend an auditory/oral passage.

DYADIC COMMUNICATION

The student is able to:

1. Adopt various communicative functions.
2. Prepare and perform a dialogue.
3. Adopt the basics of telephone etiquette.

PROFESSIONAL COMMUNICAITON

The student is able to:

1. Prepare a resume.
2. Take part in a group discussion.
3. Communicate through body language.
4. Adopt the interview skills with professional presence.
5. Perform mock interview.

LIFE SKILLS

The student is able to:

1. Prepare for and deal with change.
2. Adopt motivation, goal-setting and self-esteem.
3. Adopt Team works kills.
4. Adopt Time management.
5. Adopt Emotional intelligence skills.
6. Assert Positively.
7. Adopt Interview etiquette.
8. Plan career.
9. Understand Strength, weakness (long term, short term).

LEARNING STRUCTURE

To enable the students to practise monodic communication, dyadic communication professional Communication and imbibe life skills through various modes of practical learning and assignments.

PROCEDURE	MONODIC COMMUNICA TION	DYADIC COMMUNICATION	PROFESSIONAL COMMUNICATION	LIFE SKILLS
PRINCIPLES	Identifying various platforms	Exposure to dialogue situation, expose to telephone etiquette	Exposure to resume writing, discussion, interviews.	Exposure to selective life skills/problem solving skills.
CONCEPTS	Sharing options, feelings, with or without audience	Understanding the basic communicative functions. Conversing with a neighbour.	Writing resume, performing group discussion, facing interview.	Imbibe and practise the selective life skills

FACTS	Oral presentation, art of introduction, enhancing the list of active vocabulary, listening skills, note taking skills, describing skills.	Audio tapes, Compact disks, mikes, various contexts.	FAQ, Resume models, Audio tapes, Compact disks, mikes.	Stories, anecdotes, incidences, case studies and assignments.
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COMMUNICATION AND LIFE SKILLS PRACTICAL SYLLABUS

PART A: MONODIC COMMUNICATION

(16hours/periods)

- a) **Vocabulary enrichment:** recording important words and terminology alphabetically connected to the concerned department –playing antakshari.
- b) **Introducing oneself:** using greeting phrases – opening and closing with courteous notes –supplying personal information.
- c) **Introducing others:** using greeting phrases – opening and closing with courteous notes – with information.
- d) **Welcome address, vote of thanks and compering a program:** keeping notes – and personal information of the dignitaries–concerned.
- e) **Making an Oral Presentation:** Preparing the presentation - Talking about people, animals and places – Keywords technique and the rehearsal – Presentation outline – Performing the presentation–answering the questions.
- f) **Oral description:** a picture from an English magazine –a visual ad–a natural scene.
- g) **Auditory/Oral comprehension** – small passage – small dialogue –very short story – note – taking skill.
- h) **News Caption:** giving caption for a news item from an English daily.

PART B: DYADIC COMMUNICATION: COMMUNICATIVE FUNCTIONS

(16hours/periods)

- a) **Dialogue:** preparing and performing - Meeting people, exchanging greetings and taking leave – Giving instructions and seeking clarifications – Thanking someone and responding to thanks minimum seven exchanges including the courteous openings and closings – ten common contexts – asking questions and eliciting answers (Yes or No type and ‘wh’ questions).
- b) **Telephonic dialogue:** telephonic etiquette - Answering the telephone and asking for someone – Dealing with a wrong number – Taking and leaving messages – Making enquiries on the phone ordering for supply-bookings and arrangements-handling the complaints – calling for appointment.

PART C: PROFESSIONAL COMMUNICATION

(16hours/periods)

- a) **Group Discussion-** Taking part in a Group Discussion– focus on team spirit.
- b) **Interview** – Frequently asked questions in an interview –Mock interview- Body language.
- c) **Resume Writing** –components.

PART D: LIFESKILLS

(16hours/periods)

- a) Preparing for and dealing with change.
- b) Motivation, goal-setting and self-esteem.
- c) Team works kills.
- d) Time management
- e) Emotional intelligence skills
- f) Career planning.
- g) Assertive Skills.
- h) Interview skills.

References:

1. Malcolm Goodale, Professional Presentations with VCD, Cambridge University Press
2. B.Jean Naterop and Rod Revell, Telephoning in English with 2 Audio CDs Cambridge University Press
3. Priyadarshi Patnaik, Group Discussion and Interview Skills with VCD, Cambridge University Press
4. Kamalesh Sadanand and Susheela Punitha, Spoken English: A Foundation Course for Speakers of Tamil, Orient Black Swan.
5. S.P. Dhanavel, English and Soft Skills, Orient BlackSwan
6. Robert Sherfield and et al, Developing Soft Skills, Pearson Education.
7. Poly Skills: A course in communication skills and Life skills, Cambridge University Press.
8. English and Communication Skills for Students of science and Engineering by S.P.Dhanavel, Orient BlackSwan.
9. Speak Well, edited by Kandula Nirupa Rani, Jayashree and Indira, Orient BlackSwan.
10. Fifty ways to improve your telephoning and teleconferencing Skills by Ken Taylor-

COMMUNICATION AND LIFE SKILLS PRACTICAL

Model Question Paper-1

Time: 3 hrs

MaxMarks:75

PART-A (35 Marks)

Monodic Communication:

1. Introduce oneself (5)
2. Use the mentioned words orally in sentence
(2x2½=5)
3. Prepare and present a welcome address for your college annual day programme. (5)
4. Listen to the passage readout from the English daily of the week of the examination.
Please note: No pre recorded passage
(10)
5. Write a news caption for the passage given from the English daily.
(5)
6. a) Describe orally the visual or the picture found in the English daily of the week of the examination.
(5)

(Or)

- b) Make an oral presentation about an animal.

PART-B (15Marks)

Dyadic Communication:

1. Play antakshari of five pairs of departmental words with your partner.
(5)
2. Prepare and perform a dialogue with your partner on the given situation (5)
(minimum five exchanges)

Or

- Prepare and perform a telephonic dialogue on a flight booking.
(minimum five exchanges)

3. Ask questions and elicit responses. (5)
(minimum three)

PART-C (25Marks)

Professional Communication:

1. Form a group of six members and perform a discussion on the given theme. (10)
2. Imagine you are V.Gokulraj, a diploma holder. Prepare a resume for the post of supervisor in Oberoi computers Ltd. Chennai. (10)
3. Professional appearance: Interview etiquette-dress code- Body language (5)

COMMUNICATION AND LIFE SKILLS PRACTICAL

ModelQuestionPaper-2

Time: 3 hrs

MaxMarks:75

PART-A (35 Marks)

Monodic Communication:

1. Introduce your friend S.Mohan an executive engineer to a group of audience. (5)
2. Use the mentioned words in sentence orally. (2x2½=5)
3. Prepare and present a Vote of thanks in your college sports day programme. (5)
4. Listen to the passage read out from the English daily of the week of the examination. Please note: No pre recorded passage (10)
5. Write a news caption for the passage given from the English daily. (5)
6. a) Describe the visual or the picture found in the English daily of the week of the conduct of the examination. (5)

(Or)

- b) Make an oral presentation about your polytechnic college.

PART-B (15Marks)

Dyadic Communication:

1. Play antakshari of five pairs of your departmental words with your partner. (5)
2. Prepare and perform a dialogue with your partner on the given situation (5)
(minimum five exchanges)

(Or)

Prepare and perform a telephonic dialogue on ordering the supply of a computer
(minimum five exchanges)

3. Ask questions and elicit responses. (5)
(minimum three)

PART-C (25Marks)

Professional Communication:

1. Form a group of six members and perform a discussion on the given theme. (10)
2. Imagine you are M.Kishore a diploma holder. Prepare a resume for the post of operating engineering REC Electricals Ltd, Madurai. (10)
3. **Professional appearance:** Interview etiquette-dress code- Body language (5)

NOTES OF GUIDANCE

Role of the media:

To equip a learner with vocabulary, particularly active vocabulary and standard everyday expressions, using English dailies and watching selective English T.V. channels both in the classroom and outside the classroom is focused. Such a provision is recommended for the students to establish familiarity with the English dailies and selective English T.V. channels.

Minimum two copies of two English dailies in the laboratory room (students can bring their own copies also). Minimum two systems with net connection for information collection in the laboratory itself.

Synopsis of the news item:

During every lab work day, students must choose a news item from the English daily or weekly or monthly, and write a synopsis of the chosen news item, in not more than five lines. The news item should be pasted on the left page and synopsis on the right page (the chosen news item should not be politically, socially or communally controversial). Students should exercise care in choosing the news items. Teachers have to advise them on this aspect. This can be done outside the class hours also but every record exercise should begin with the synopsis of news item of the date of the lab session.

For example, first lab exercise namely departmental vocabulary and antakshari is performed on 15/06/2013. The student should choose a news item from any English daily of 15/05/2013 and record the synopsis on the right page (in not more than 5 lines) under the caption **Synopsis of the news item of the day/date 15/05/2013.** There is no harm in repeating or copying the lines from the passage. The essence of the passage should be there. The cut out news item for presenting the synopsis should be pasted on the left page of the record notebook.

This is to be done with interest for developing one's personality. This work does not carry any marks but without which the record exercise should not be valued. This is the precondition for valuing the record exercise. Each record exercise follows the synopsis of the chosen news item. At the bottom of the synopsis, the student should record the dictionary meaning of at least one strange word found in the chosen news item. At the end of every month, a minimum of 10 Headlines of 10 different days i.e. one Headline a day from anyone English daily should be pasted on the right or left page of the Record Note Book. (This work does not carry marks but this is the precondition for marking the record exercises) External examiner, before signing the record notebook, should verify whether the Newspaper works were recorded/pasted in the record notebook.

Verbal communication in any language begins with sounds in isolation, union and word formation. Learning everyday words and expressions is the primary factor. Grammar comes next. One can enrich one's everyday vocabulary by reading English magazines and listening to or watching an English channel on television. So an English laboratory should be equipped with a minimum of two copies of two English dailies and English week lies or monthlies.

Watching English channels helps the students improve their vocabulary and expressions. If there is a provision, students may be permitted to watch selective, mind corruption free English channels (sports, education, news, animal channels and so on) for at least 15 min. during the English lab sessions. This will serve as motivation for the students and help them shed their inhibition.

What is antakshari? (Polar word game)

This game can be played on the stage by two or three students using the departmental words. Suppose Mr. A belongs to Dept. of Electrical and Electronics and he says his departmental word 'ampere' Mr. B has to supply a word beginning with the ending letter of Mr. A's word. The word ampere ends with the letter 'e' so Mr. B says 'electrical'. Mr. A has to continue with the letter 'l'. Like that five pairs of words are to be spoken. (Letter ending only, not sound ending.)

Suppose departmental words are not available in some English letters like ‘ x ‘ ‘ y ‘ ‘ z ‘ the students may be permitted to use common words.

ANTAKASHARI(Five Exchanges)

(Dept. of Mechanical Engineering.)

EXAMPLE:

Mr.A

1. Governor

2. Rack

3. Nut

4. Lathe

5.Naphtha

Mr. B

Reservoir

Kelvin

Tool

Emission

Anvil

Introducing oneself:

One is not expected to introduce one’s family. One or two sentences on his family will do. Care must be taken to include general proficiency, titles and merits, awards possessing or secured in academic activities like paper presentation, participation in inter polytechnic or intra polytechnic competitions, sports activity, forums like NCC,NSS, hobby, ambition, strengths and weaknesses. Introducing others –merits–credentials—one or two points on his family.

Vote of thanks / Welcome address. No doubt it should be all-covering but Focus should be on the important persons/invitees/chief guest and the message of the speaker.

Description (pictures from English weekly/daily) Pictures may be displayed through projector or Magazine cuttings may be used. Just five lines on the picture will do.

Auditory/oral comprehension: A Passage from any English daily of the week of the examination is to be read out for two to three minutes in the end examination. Display of recorded passages can be used as an addition in the classroom. The use of pre-recorded passage discouraged in the end examination.

Oral presentation: Students must be encouraged to use English magazines and internet for collecting information on the topic, noting keywords and use them in their presentation in his own language. One must be able to talk extempore for 2 min on any topic, given a time of two minutes for organizing his/her thoughts. The topics can be kept simple and general (current events of interest like sporting event for headline of the day).It must be totally an oral activity without the aid of any other media.

News Caption: A news item, without heading, of not more than ten lines from an English daily of the week of the conduct of Examination is to be given. The caption may be a passive construction or a catchy phrase on the given news item.

Face to face dialogue: Selective nine situations / topics are to be performed in the class room. (Minimum five exchanges with courteous openings and closings).

Telephonic dialogue: Selective five situations to be given.(Minimum seven exchanges).

Resume writing: cover letter—the components of a resume like sender’s address, recipient’s address, Career objective to be explained.

Group Discussion: Topics of common interest, avoiding controversial ones, are to be given for discussion. A group may consist of six members.

Students should be exposed to 44 phonemes (sounds) in English language and their symbols.

There shall be no question on this during the end examination.

COMMUNICATION SKILLS EXERCISES:

1. Departmental Vocabulary alphabetically (using it in sentence, antakshari).Using the words orally in sentences.
2. Introducing oneself and others
3. Vote of thanks/Welcome address
4. Description (pictures from English weekly/daily)

5. Auditory/oral comprehension
6. Oral presentation
7. Face to face dialogue
8. Telephonic dialogue
9. Resume writing
10. Group Discussion

Communication Skills:

Ten Marks for each exercise leading to a maximum of hundred marks in total.

The total marks to be reduced to an average of ten marks.

Texts of the performed activities to be recorded in the Record Note book. Synopsis of the news item of the day/date is mandatory at the beginning of every record exercise.

Life Skills:

- i. Preparing for and dealing with change.
- ii. Motivation, goal-setting and self-esteem.
- iii. Team work skills.
- iv. Time management
- v. Emotional intelligence skills
- vi. Career planning.
- vii. Assertive Skills.
- viii. Interview skills.

Life skills are to be intensely inculcated through lectures, quotes, anecdotes and case studies. An Excellent awareness of the eight essential life skills is to be created through continuous internal assessment. Five assignments in these topics are to be recorded in the record notebook.

- A minimum of five assignments on five different topics.
- Each assignment to be assessed for twenty marks.
- The total marks to be reduced to an average of ten marks.
- All the topics to be covered in the lab.

TIME MANAGEMENT IN THE END EXAM

For written part 30 min

- Written part of the examination should be the first/beginning of the examination, monadic oral Exam to start during the written exam.

Written Part exercises:

- Auditory/ oral comprehension.
- Resume writing.
- Giving news caption for the passage.
- During the written examination time of 30 minutes, monadic communication examination may also take place simultaneously.

MONODIC COMMUNICATION (ONE MAN COMMUNICATION)

Oral part –75 min.

Both internal and external examiners (simultaneously) are to examine the students.

Five minutes for each student.15 students for external & 15 students for internal and within 75 minutes both internal and external examiners complete the monadic communication exam.

DYADIC COMMUNICATION (ONE PAIR COMMUNICATION)

- 5 min for each pair.
- 15 pairs in total. 8 pairs for external and 7 pairs for internal examiner. (8x5=40min) within 40 min both internal and external examiners completes the dyadic communication exam.
- The students examined by the external for monadic exam are to be examined by the internal for dyadic and vice versa.

PROFESSIONAL COMMUNICATION

- 30min for group discussion.
- 6 members in each group.
- 5 min for discussion for each group.
- Both internal and external examiners to supervise/examine simultaneously one group each.
- With in fifteen minutes all the six groups to be examined.

LABORATORY REQUIREMENT

1. An echo-free room for housing a minimum of sixty students.
2. Necessary furniture and comfortable chairs
3. Public Address System.
4. A minimum of two Computers with internet access, with Audio for Listening Skill and related software packages.
5. A minimum of two different English dailies.
6. A minimum of one standard Tamil daily.
7. Head phone units-30Nos.with one control unit with a facility to play and record in Computer.
8. A minimum of Three Mikes with and without cords.
9. Colour Television (minimum size-29”).
10. DVD/VCD Player with Home Theatre speakers.
11. ClipChart, whiteboard ,smart board.
12. Projector.
13. Video camera.
14. Printer, Xerox, scanner machines desirable.
15. English Weeklies/monthlies/journals like ELTOI desirable.
16. Frozen thoughts-monthly journal for Life skills by Mr.Rangarajan /www.frozenthoughts.com

Mark Pattern

End Examination	-	75 Marks
Monodic Communication	-	35 Marks
Dyadic Communication	-	15 Marks
Profession Communication	-	20 Marks
Professional Appearance	-	5 Marks
Internal Assessment	-	25 Marks
Communication skills Record Notebook	-	10 Marks
Life skills assignments	-	10 Marks
Attendance	-	5 Marks

COMMUNICATION AND LIFE SKILLS PRACTICAL Allocation & Statement of Marks

Duration: 3Hrs.

Name of the Candidate

Reg.No.

A. Monodic communication: 35Marks

Introduction (5 mks)	Use in sentence (5mks)	Vote of thanks / welcome address (5 mks)	Auditory / Oral comprehension (10 mks)	Description / Oral presentation (5 mks)	News caption (5 mks)	Total (35 mks)

B. Dyadic Communication: 15 Marks

Antakshri (5 mks)	Dialogue (5 mks)	Asking Questions (5 mks)	Total (15 mks)

C. Professional Communication : 20 Marks

Group Discussion (10 mks)	Resume (10 mks)	Total (20 mks)

D. Internal Assessment : 25 Marks

Record notebook Comm. Skills (10 mks)	Assignments Life Skills(10 mks)s	Attendance (5 mks)	Total (25 mks)

Professional Appearance: 5 Marks

Total: 100 Marks

Internal Examiner
Examiner

External

FACE TO FACE DIALOGUE TOPICS

1. Between Friends (On any acceptable topic).
2. Between a conductor and a passenger.
3. Between a doctor and a patient.
4. Between a Shopkeeper and a Buyer.
5. Between a Teacher and a Student.
6. Between a tourist and a guide.
7. In a Bank.
8. At a railway enquiry counters.
9. Lodging a complaint.

Note: A resourceful teacher may add a few more topics of common interest.

TELEPHONIC DIALOGUE TOPICS

1. Placing an order.
2. Making Enquiries.
3. Fixing appointments
4. Making a hotel reservation.
5. Dealing with a wrong number.

6. Travel arrangements.
7. Handling complaints

MECHANICAL DEPARTMENTAL VOCABULARY FOR AN TAKASHARI AND USING IN SENTENCES

EXAMPLE:

A:

1. Anvil-made of cast Iron used in foundry shop.
2. Axle-A metal rod that connects two wheels.
3. Alloy-alloy is a mixture of two or more metals.
4. Addendum – distance between top of gear teeth and pitch circle.
5. Annealing –It is a heat treatment process for softening the metals.

B:

1. Bearing-it is which supports the shaft.
2. Bolt-it is a type of fastener. Combined with screw.
3. Brake-it is used to halt an auto mobile vehicle.
4. Beed – steel wiring used in tyres to with stand stress.
5. Baffles –it is used to reduce noise, filter dust particles in automobile.

C:

1. Cam-it is a lobe like structure, which actuates the valve.
2. Crown-the slope like structure in the piston.
3. Calipers' –they are measuring instruments.
4. Clutch-it is used to disengage and engage the fly wheel and main shaft.
5. Chamber- it is the distance between vertical line and tyre center line.

D:

1. Damper-it is a type of shock absorber, reduces the vibration.
2. Differential –it controls the speed of rotating wheel in the rear axis.
3. Diaphragm –it is used to separate two layers.
4. Detonation-it is the continuous knocking with serious effect on cylinder head.

E:

1. Evaporator-it absorbs heat to vaporize liquid into air
2. Engine-the place where fuel is burnt and heat energy is converted mechanical energy
3. Electrolyte-it is a liquid substance which is used to transfer current or any metal particle.
4. Emission - the release of burnt gas from automobile.
5. Elongation-the increase of dimension due to application of load.

F:

1. Filter – which is used to remove dust particles.
2. Friction-the resistance on wear occur due to rubbing of two metals.
3. Flywheel – the wheel like structure used to balance the uneven weight in engine.
4. Fuel-it is a substance that burns with oxygen in the air.
5. Factor of safety- it is the safety limit after which the material will break down.

G:

1. Governor –it is used to control the flow of fuel according to load.
2. Gear –it is used to transmit power from one place to another.
3. Generator-it is used to generate power.
4. Gasket – it prevents the leakage and to provide sealing effect.
5. Goggle –the protective device used to guard the eyes.

H:

1. Hub—it is the center part of wheel.
 2. Hammer—it is used to beat sheet metals.
 3. Hydraulics—it deals with fluid for various function.
 4. Hatching—it is used to highlight the parts in drawings.
 5. Headstock—it is the main function unit of lathe.
- I:
1. Ignition—it is the function by which fuel is burnt.
 2. Injection—it is the process of spraying fuel into engine block.
 3. Impeller – it is which converts kinetic energy into pressure energy.
 4. Inventory—it is the place where raw materials are stored.
 5. Idling – it is the condition at which the automobile engine at stationary state.
- J:
1. Jig—it guides the tool and hold the job.
 2. Jaw – it is teeth like structure used to hold work pieces.
 3. Jogmode – Jog mode is used to give manual feed for each axis continuously.
 4. Junk – it is known as waste material in industry.
 5. Journal—It is a type of bearing.
- K:
1. Keyway – it is a specific path made in shaft to joint parts.
 2. Knocking– the sound produced due to Burning of uncompleted burnt fuel.
 3. Kelvin—It is the degree of hotness.
 4. Knurling – it is the process of lathe done to work piece to improve the gripness.
 5. Knucklejoint – It is a type of joint used to connect two work pieces.
- L:
1. Lubrication – process of reducing heat by applying cooling substances.
 2. Layering – it is used to draw parts of a machine separately and combine together.
 3. Lever –it is a supported arm used to engage gears.
 4. Lathe—it is the father of machines used in turning operations.
 5. Leadscrew- it is the screw through which the carriage travels.
- M:
1. Manometer—it is used to measure the pressure of fluids.
 2. Milling—process of removing metal from work piece by rotating cutting tool.
 3. Manifold—it is a passage made for flow of fuel in automobile.
 4. Moulding—it is the process of passing hot liquid metal into mould made through sand.
 5. Module—it is a metric standard used to identify or specify pitch
- N:
1. Nozzle—it is used to reduce the pressure and increases the velocity.
 2. Nut—it is a type of fastener used to couple with screw.
 3. Nomenclature—Dimensional property of specific part on component is notified by nomenclature.
 4. Neck –Distance between drills body and shank.
 5. Naphtha—kind of in flammable oil.
- O:
1. Orthography –it is the three dimensional view of an object.
 2. Ovality –Elliptical shape of piston.
 3. Overhaul –it is the complete checking and servicing of a machine or vehicle.
 4. Optimum temperature—suitable temperature condition for certain process on working.
 5. Offset—itis by which the axis of certain job is defined.
- P:
1. Pinion—a small gear is called pinion.
 2. Pulley– A cylindrical object used to connect belt for transmitting power.

3. Pump—it is which transfers fluid from one place to another.
4. Piston—it is which transfer power from combustion chamber to connecting rod.
5. Port—it is the opening in two stroke engine for movement of fuel and exhaust.

Q:

1. Quilt—it is used to give automatic feed in machines.
2. Quality control – it is an inspection processl.

R:

1. Reaming—it is the operation used to finish inner surface of a hole.
2. Reservoir—it is used to store fuel or any liquid.
3. Rack –it is a spur gear with infinite radius.
4. Retainer—it is used to bring back to the original position.
5. Radiator—it is the part used in auto mobile for cooling water.

S:

1. Shackle—it is a rod connected to leaf spring.
2. Spring—it is a circular rod which compresses on load and retracts when released.
3. Strainer –it is used to remove micro particles.
4. Shock absorber-it is used to reduce vibration and give cushioning effect.
5. Suspension-it is used to absorb shocks and give cushioning effect.

T:

1. Tailstock—it is used in lathe to support the job.
2. Tool –it is a metal removal device.
3. Torque—it is the twisting load given on a work piece.
4. Trimming—it's the process of removing excess metal.
5. Turning—it is a metal cutting process used to reduce diameter.

U:

1. Universal joint- it is used to connect propeller shaft and differential unit.
2. Universal divider head-it is used to index various components.

V:

1. Valve–valve is the part used in automobile for flow of fuel and exhaust to cylinder head.
2. Vent hole –it is the hole made in casting for ventilation purpose.
3. Vulcanizing – it is the process of adding carbon to rubber.
4. Vibration – it is caused due to the movement in an uneven surface.
5. Velocity - rate of change of displacement.

W:

1. Wheel-it is a circular object which rotates and moves the vehicle.
2. Wiper-it is used in wind shield to remove water droplets.
3. Workpiece-it is the material in which various processes are done to make a component.
4. Wage-it is the amount paid to a worker for his work.
5. Washer – washer is a component used in fasteners to reduce gap.

Y:

1. Yawing – the turning of windmill towards direction of air is called yawing.
2. Yoke-it is which holds the other end of spindle in milling machine.
3. Yield stress-It is the stress above which it will attain the breaking stress.
4. Young's modulus-it is the ratio between stress and strain.

Pl. note: Suppose departmental words are not available in some English letters like

‘ x ‘ ‘ y ‘ ‘ z ‘ the students may be permitted to use common words. This is only an example. Another student of Mechanical Engineering can have different sets of words under each letter of the English alphabet. Like that there may be variety of sets. The most important point is that One is not supposed to murmur but speak the words intelligibly in an audible manner. Swallowing the words will deprive a student of winning a selection in an interview. In the same

way, students of other Departments can have different sets of words of their departments under each letter of the English alphabet.

TELEPHONE LANGUAGE AND PHRASES IN ENGLISH

Answering the phone

"Good morning/afternoon/evening, Madras Enterprises, Premila speaking."
"Who's calling, please?"

Introducing yourself

"This is Raghavan speaking."
"Hello, this is Raghavan from Speak International."

Asking for someone

"Could I speak to Mr. Raman, please?"
"I'd like to speak to Mr.Raman, please."
"Could you put me through to Mr Raman, please?"
"Could I speak to someone who ..."

Explaining

"I'm afraid Mr.Raman isn't in at the moment".
"I'm sorry, he's in a meeting at the moment."
"I'm afraid he's on another line at the moment."
"Putting some one on hold"
"Just a moment, please."
"Could you hold the line, please?"
"Hold the line, please."

Problems

"I'm sorry, I don't understand. Could you repeat that, please?"
"I'm sorry, I can't hear you very well. Could you speak up a little, please?"
"I'm afraid you've got the wrong number."
"I've tried to get through several times but it's always engaged."
"Could you spell that, please?"

Putting some one through

"One moment, please. I'll see if Mr.Raman is available."
"I'll put you through."
"I'll connect you."
"I'm connecting you now".

Taking a message

"Can I take a message?"
"Would you like to leave a message?"
"Can I give him/her a message?"
"I'll tell Mr. Raman that you called"
"I'll ask him/her to call you as soon as possible."
"Could you please leave your number? I shall ask him to get back to you."

Pl.note: The above ones are samples only. A resourceful teacher may add more.

DAY-TO-DAY EXPRESSIONS (For dialogues)

COMMON PARLANCE

How are you?
Fine. Thank you.
How are you?
Me too.
How do you do?
How do you do?
It's good to see you again.
Glad to meet you.
Thank you.
Thanks very much.
Welcome.

Hello! How is everything?
Just fine. Thanks. What's new?
Nothing much.

I'm pleased to meet you.
The pleasure is mine.
I've heard Paul speak about you often.
Only good things! I hope.

Look who's here!
Are you surprised to see me?

Sure. I thought you were in Chennai.
I was, but I got back yesterday.

Sorry, May I help you?
So kind of you.
That's so nice of you.
Nice talking to you.
Nice meeting you.
It's getting late, and I've to go now.
Certainly. Come back soon.
In that case, I'll be seeing you.
Fine.
Thank you.
Welcome
So long. See you later.
Take care. Bye.
Good-bye.

Could you tell me the time, please?
Certainly. It is 5.35 p.m.
My watch says 5.40 p.m.
Then your watch is five minutes fast.

Excuse me. Can you tell me the way to...?
May I come in?
How is the weather today?
It is pleasant./sunny/ rainy/warm/windy.

I am sorry, Can you repeat what you have said.

I am sorry, I can't hear you properly.
It is not audible. Can you please repeat it?
Beg your pardon; I don't get your words clearly.
How do you feel now?
Are you ok?
I am fine. And how about you?
I am fine. Thank you.

GROUP DISCUSSION

Let me begin with introducing this concept,
Well, this is to convey that
At the out set, I am here to convey
At this juncture, I would like to
May I intervene?

May I add?
Kindly permit me to say
If you could allow me to say
Let me add a few words
Let me first answer your question
Can you please allow me to convey
Excuse me; I would like to add further

On behalf of my colleagues,
On their behalf
Firstly/secondly/thirdly.
Finally/conclusively/ at the end/Summing up
Eventually/in the event of
In spite of /otherwise/although/though

Please Note:

- The above ones are samples only.
- A resourceful teacher may add more.
- A potential student may exhibit variety

ME561 REFRIGERATION AND AIR CONDITIONING LABORATORY

6 Hrs/Week

16 Weeks /Sem

Total Hrs : 96

OBJECTIVES:

- Identify the various tools used in R & AC.
- Demonstrate the construction and working of window air conditioner
- Demonstrate the construction and working of split type air conditioner.
- Set parameters for comfortable operation of an air conditioner.
- Determine the COP of an air conditioner.
- Determine the capacity of a window air conditioner.
- Describe the wiring of refrigerator and coolers.
- Perform servicing on air conditioning system.

1. BASIC REFRIGERATIONWORKSHOP OPERATION:

- (a) Copper tubing
 - To study the various sizes of copper tubing.
 - To study the various tools used for operations.
 - To become familiar with various operations on copper tubing –Flaring, swaging.
- (b) Soldering methods used in R& A.C

2. TO STUDY THE CONSTRUCTION FEATURES OF THE FOLLOWING :

- (a) Domestic refrigerators
- (b) Water coolers
- (c) Window Air Conditioner
- (d) Split type air conditioner

3. PROPER METHODS OF SETTING AND ADJUSTING OF

- (a) Thermostats
- (b) Low pressure and high pressure cut-outs
- (c) Thermostatic expansion valve
- (d) Automatic expansion valve

4. TEST PROCEDURES

1. To determine the refrigerating effect, C.O.P and the compressor capacity of open type system with
 - a. Thermostatic expansion valve
 - b. Capillary tube
 - c. Automatic expansion valve
2. To determine the C.O.P of sealed system by using electrical measurements
3. To determine the capacity of a window air conditioner.
4. To determine the efficiency of a cooling tower.
5. Wiring of refrigerator, water cooler, desert cooler, room air conditioner - packaged air conditioner, panel board etc.
6. Performance valuation of Thermo electric refrigeration system
7. Performance of Vapour absorption refrigeration system

5.SERVICE PROCEDURES

- i. To change refrigerant into service cylinder from storage cylinder.
- ii. To evaluate the entire system
- iii. To Pump down the system
- iv. To Purge air from the system
- v. To locate the leaks in a system.

- vi. To charge the system
- vii. To check the oil level in the compressor.
- viii. Tracing the common faults in R& A.C units and their remedies

SCHEME OF EXAMINATION:

One Question from Test Procedure	: 50 marks
One Question from Service Procedure	: 10 marks
One Question from Setting and adjusting methods	: 10 marks
viva - voce	: 05 marks
Total	: 75 marks

MEB562 METROLOGY AND QUALITY CONTROL LABORATORY

6 Hrs/Week
16 Weeks /Sem
Total Hrs : 96

OBJECTIVE

Metrology is the science of engineering measurements. It is concerned with the methods, execution, & estimation of accuracy of measurements & measuring instruments.

In an industrial organization, it is necessary to determine the process capabilities & ensure that these are better than the relevant component tolerances. In addition, it is necessary to determine the measuring instrument capabilities and ensure that they are adequate for their respective measurements.

Experiences in Metrology and Quality Control Laboratory will be useful to the Mechanical engineering Diploma holder in industries under various job situations such as,

1. Selection of appropriate measuring instrument for the measurement of a given job.
2. Handle the measuring instrument to judge the accuracy of the component.
3. Take care and maintenance of the measuring instruments.
4. Determine the dimensional accuracy of different machine tools.
5. Inculcate Quality mindedness at all levels of work.
6. Implement the Quality management systems at the work place.

This subject is related with other subjects as - manufacturing process for the measurements of jobs produced by various machining processes such as lathe, milling, grinding, honing, lapping also jobs produced by forging, casting and press work. In Mechanical engineering Drawing and machine design subject for the representation of tolerances, surface finish symbols and other geometrical symbols. In tool design and production engineering subject for the measurement of jigs, fixtures and dies. In CAD/CAM subject for the representation of various symbols in drawings, etc.

The curriculum document explicitly describes technical skills, social skills and attitudes to be developed in industries. While designing this subject; the principles under theories of learning have been used. The link diagram and graphical structure is provided, which helps the students to learn systematically and also helps the teachers to use different strategies for teaching.

Job description and role of technician
Curriculum objectives drawn from job analysis
Personal development domain
Social development
Life Long Learner
Industry related professional role
Curriculum areas to develop / achieve curriculum objectives
Graphical structure of the subject area
Teaching learning process at curriculum level
Approach student evaluation

KNOW YOUR LABORATORY

When the student enters the laboratory, he is expected to know different equipments in the laboratory. In metrology & quality control laboratory, following equipments are generally available; surface plate, angle plate, vernier caliper, vernier height gauge, vernier depth gauge,

inside & outside micrometer, snap gauges, ring gauges, plug gauges, feeler gauges, radius gauges, pitch screw gauges, slip gauge set, dial indicator, sine bar, angle gauge set, angle dekkor, floating carriage micro meter, optical flats, tool maker micro scope, optical profile projector, gear tooth vernier and surface finish measuring instrument.

Students should observe these instruments carefully and study the operation of each

instrument. Proper care should be taken while handling these instruments. The Metrology and Quality Control laboratory is expected to maintain at 20degree Celsius temperature conditions.

DEVELOPMENT OF SKILLS

Intellectual Skills :

- 1 To understand principle, construction and working of various measuring instruments
- 2 Selection of proper instruments for measurement
- 3 Calculation of least count of instrument
- 4 Take reading using the instrument
- 5 Interpret the observations & results
- 6 Collection & recording of data
- 7 Analysis of data

Motor Skills :

- 1 Setting the instruments for zero error adjustment
- 2 Proper alignment of the instrument with work-piece
- 3 Handling of instruments
- 4 Care & maintenance of instrument
- 5 Measure the dimensions from the instruments
- 6 Calibration of the instruments
- 7 Graphical representation of data

Syllabus:

Metrology:

- 1 Study basic measuring instruments: surface plate, angle plate, 'V' block, spirit level, combination set, straight edge, filler gauge, screw pitch gauge, radius gauge.
2. Use of vernier caliper & micrometer to measure dimensions of given jobs.
3. Use of Slip Gauges to find the unknown gap.
- 4 To find unknown angle of component using sine bar.
5. Study and use of optical flat for surface finish measurement.
6. Measurement of screw thread elements by using screw thread micrometer.
7. Measurement of screw thread elements by using floating carriage micrometer.
8. Measurement of screw thread elements by using Toolmaker's microscope.

9. Study and use of mechanical comparator, pneumatic comparators and GO-NO GO gauges.
- 10 Study & use of coordinate measuring Machine.
11. Measurement of gear tooth elements by using profile projector.
- 12 Measurement of gear tooth elements using Gear tooth vernier caliper.
- 13 Inspect metal for surface defects using liquid penetrant test.
- 14 Inspection of metals for surface defects with magnetic particle test
15. Testing of machine tools for flatness, parallelism, perpendicularity for lathe and drilling machine.

Quality Control:

- 16 Draw the frequency histogram, frequency polygon & ogive curve using given data.
- 17 To draw the normal distribution curve, standard deviation, variance for the measured data.
- 18 To draw & interpret the control charts for variables
19. To draw & interpret the control charts for attributes
- 20 Study of sampling techniques.

MEB570 WORK SHOP – III (Special Machines)

6 Hrs/Week
16 Weeks /Sem
Total Hrs : 96

Objectives:

At the end of the course the student will be able to :

- ◆ identify a shaping machine and its parts.
- ◆ identify a planing machine and its parts.
- ◆ identify a slotting machine and its parts.
- ◆ identify a milling machine and its parts.
- ◆ identify a cylindrical grinder, surface grinder and tool and cutter grinder.
- ◆ identify the tools and instruments.
- ◆ identify the work holding devices.
- ◆ hold the work in proper work holding devices
- ◆ set the tools in shaping, planing and slotting.
- ◆ mount the cutter in the milling machine arbour.
- ◆ operate the dividing head and index plate
- ◆ calculate the indexing for work
- ◆ hold the work in proper work holding device in cylindrical grinder, surface grinder and tool and cutter grinder.
- ◆ operate shaping, planing, slotting, milling and grinding machines.
- ◆ set tools in turret and capstan lathe.

Syllabus:

1. Introduction to shaping machine and its parts.
2. Introduction to planing machine and its parts.
3. Introduction to slotting machine and its parts.
4. Introduction to milling machine and its parts.
5. Introduction to grinding machine and its parts.
6. Introduction to turret and capstan lathe.
7. Introduction to work holding devices.
8. Types of tools used in shaping, planing and slotting machines.
9. Types of cutter used in milling machine.
10. Types of grinding wheels used in grinding machines.
11. Types of tools used in turret and capstan lathes.
12. Setting of work, tools and cutters in shaping, planing, slotting and grinding machines.
13. Operation performed in shaping, planing, slotting, milling and grinding machines.

14. Operation of shaping, planing, slotting, milling and grinding machines.

Examination Scheme :

		Marks
I.	Exercise	70
II.	Viva – Voice	5
III.	Record	25
	Total	100

Minimum Marks for Pass = 50%.

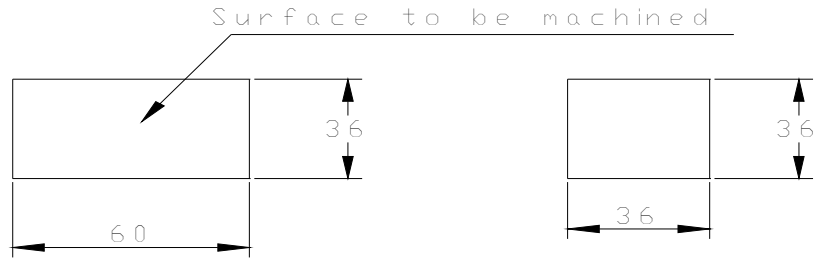
Note:

Dimensions of the component may be changed depending upon the availability of standard dimensioned material without omitting any operations.

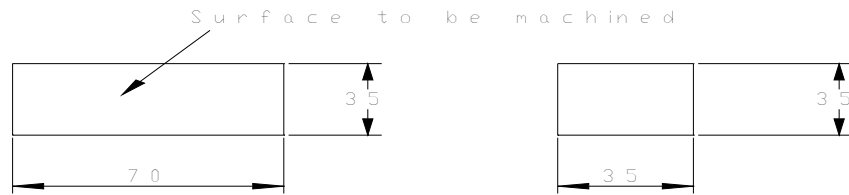
Enclosure : Sketches for Exercises in Special machines

MEB570 Workshop III Sketches

1. Study of Shaping machine and machine a flat surface

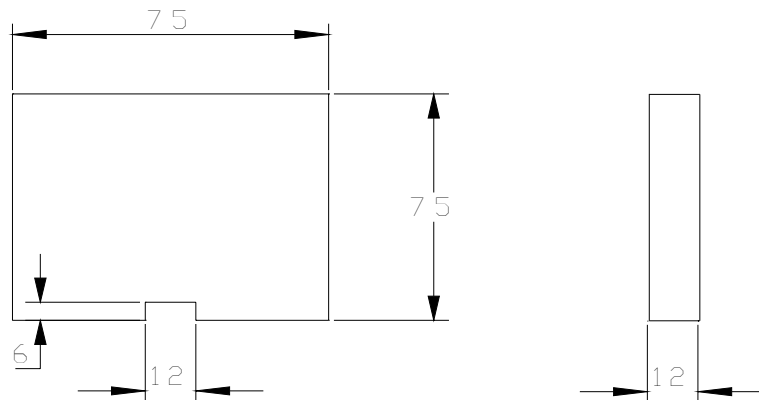


2. Study of Planing machine and machine a flat surface

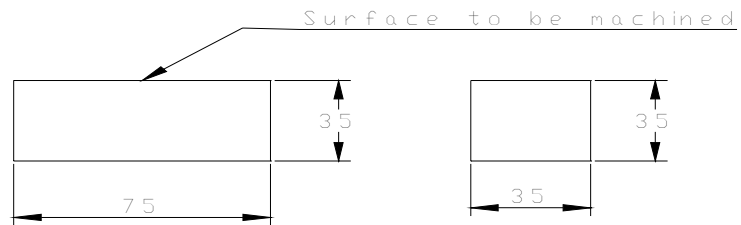


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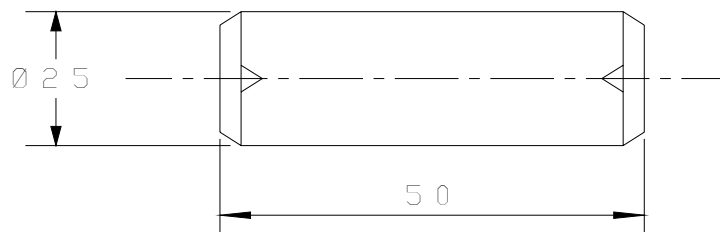
3. Study of slotting machine and machine a simple slot.



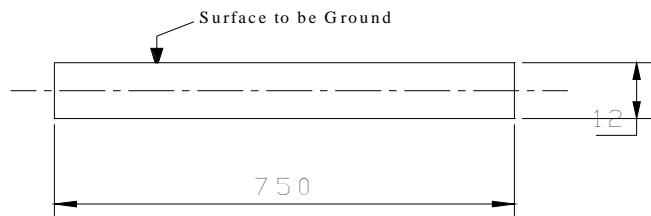
4. Study of Milling machine and machine a plane surface using plain milling cutter.



5. Study of Cylindrical grinder and grind a cylinder



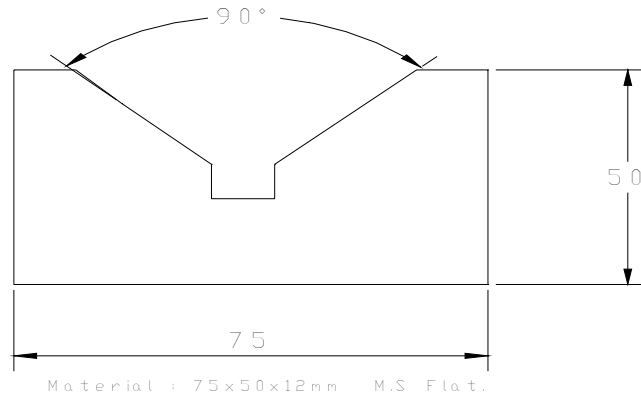
6. Study of surface grinder and grind a plane surface



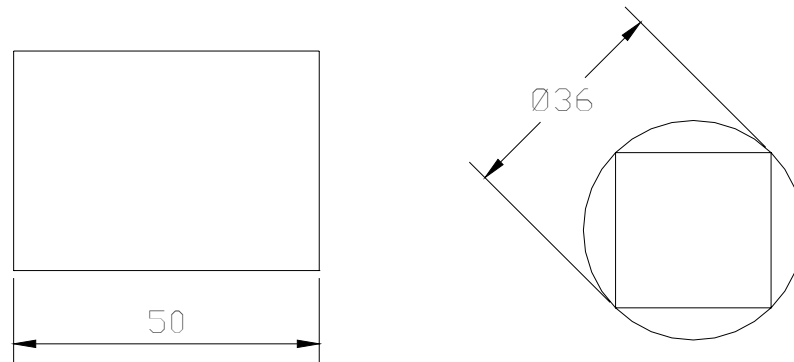
7. Study of tool and cutter grinder

8. Study of turret and capstan lathe and setting of tools to make simple component.

9. Shaping a V- Block



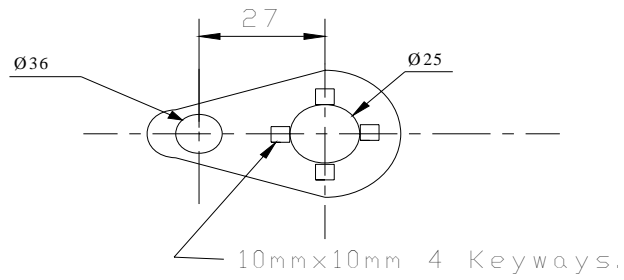
10. Planing a square



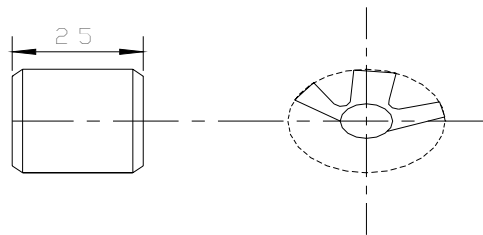
Material: $\text{Ø}36\text{mm} \times 50\text{mm}$ M.S Round Rod

11. **Slotting :**

Drilling holes in Radial drilling machine. Making internal keyway and machining an external profile

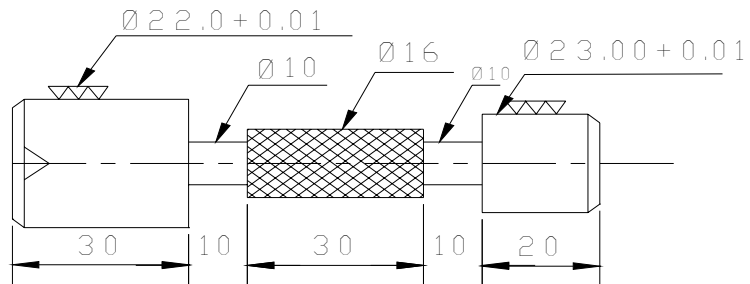


12. Gear Cutting in milling machine.



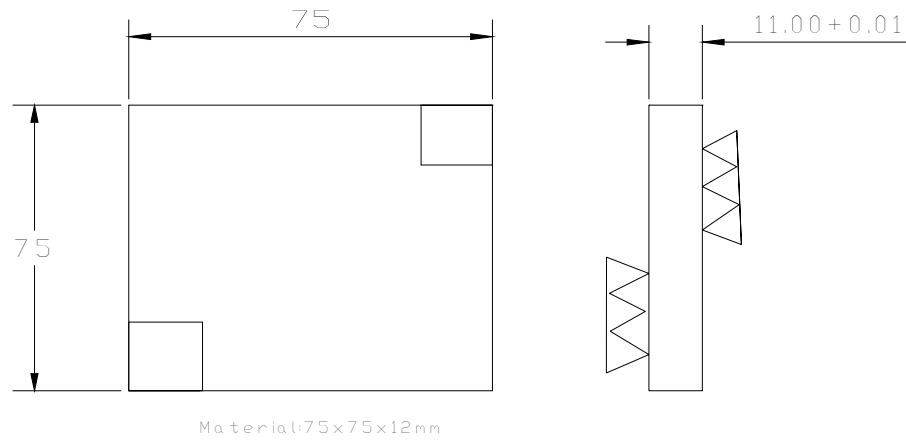
Spur Gear1. No. of Teeth-24 Module -2mm
 Spur Gear2. No. of Teeth-17 D.P -10

13. Grinding a cylinder in cylindrical Grinding machine.

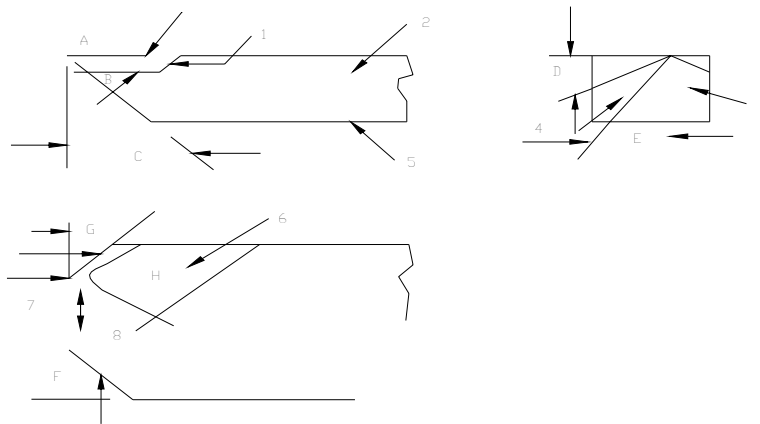


Material: $\varnothing 25 \times 100$ mm MS Round Rod.

14. Grinding a Flat surface in surface grinder



15. Grinding a single point cutting tool in tool and cutter grinder



A	-	Top rake angle	1 & 6	-	Face
B	-	Lip angle	2	-	Shank
C	-	Front clearance angle	3	-	Side flank
D	-	Side rake angle	4	-	End flank
E	-	End clearance angle	5	-	Base
F	-	Side cutting edge angle	6	-	End cutting edge
G	-	End cutting edge angle	7	-	Nose
H	-	Nose angle	8	-	Side cutting edge
			9	-	Nose radius

16. Setting of tools in turret lathe and capstan lathe with diagrammatic explanation. Drawing of tool layout for a component and set the tools for the manufacture of that component.

B0001 ENTREPRENEURIAL DEVELOPMENT

6Hrs/Week

16 Weeks

80 Hours

UNIT I

15HOURS

1. INTRODUCTION TO ENTREPRENEUR.

Meaning – Origin of the term – Definition – Application of the term in Business – Historical Development of the entrepreneur – Need, Role and importance of Entrepreneurship – scope of Entrepreneurial Development.

2. CHARACTERISTICS OF AN ENTREPRENEUR.

An introduction – Characteristics of an Entrepreneur – Features of Successful Indian Entrepreneur – Related terms – common myths on Entrepreneur.

3. CLASSIFICATION OF ENTREPRENEURS.

Types of Entrepreneurs – Innovative Entrepreneurs – Initiative or Adaptive Entrepreneurs – Fabian Entrepreneurs – Drone Entrepreneurs – Classification of Entrepreneurs – According to Type of Business – According to Technology – According to Motivation – According to Growth – According to the Stage of Development – According to the Chosen path.

UNIT II

15HOURS

1. THE ENTREPRENEURIAL SCENE IN INDIA.

The Past Scenario – Evolution of Indian Entrepreneurship – The advent of the East India Company – Swadeshi Campaign – Ideology of MahadmaGandhi on Entrepreneurship – The current Scenario – The future scenario – the Role of Entrepreneurship in Economic Development.

2. FACTORS INFLUENCING ENTREPRENEURSHIP.

Factors Influencing the Emergence of Entrepreneurship – Internal Factor – Family Atmosphere – Categories of Internal Factors – External Factor – Political Environment – Social and Cultural Environment – Economic Environment – Legal Environment – Lay off, Retrenchment and Closure – technological Environment – government and Non – Government policies, programmes and incentives – Barriers to Entrepreneurship.

UNIT III

15HOURS

1. ENTREPRENEURIAL GROWTH

Entrepreneurial Growth – Role of the Government and non-government agencies in promoting Entrepreneurship in India – Promotion role – Supportive role – Regulator Role – Role of various Agencies in Promoting Entrepreneurship.

2. PROMOTIONAL AND DEVELOPMENT INSTITUTIONS / AGENCIES. (Objectives, role and functions only)

Entrepreneurship Development programs (EDPS). – Industrial Estates – Khadi and village industries commission (KVIC) – Small industries service institutions (SISI) – State industries promotions corporations of tamil nadu (SIPCOT) – Self employment schemes – small industries development corporation (SIDCO) – Technical Consultancy Organisation (TCO) – Small Industry Extension Training Institute (SIETI) – The National Institute of Small industries Extension Training (NISIET) – National Small industries Corporation(NSIC) – Small Industries Development Organisation(SIDO) – District Industries Centre(DIC) – Micro, Small and Medium Enterprises (MSME).

3. FINANCIAL INSTITUTIONS(Objectives, Roles and Functions only).

Industrial Development Bank Of India (IDBI) – Industril Finance Corporation Of India (IFCI) – Industrial Credit Corporation of India(ICICI) – Industrial Investment Bank of India (IIBI) – Small Industries Development Bank Of India(SIDBI) – Tamil Nadu Industrial Investment Corporation(TIIC) – Commercial Banks

UNIT IV

15HOURS

1. WOMEN ENTREPRENEURS.

Women Entrepreneurs – Definition – problems of women entrepreneurs – Steps to encourage Women Entrepreneurs – business opportunities for Women Entrepreneurs – future of women Entrepreneurs – Rural Entrepreneurs – Definition – Problems.

2. SMALL SCALE INDUSTRIES.

Role of SSI to the growth of Indian Economy – Benefits to the SSI – Tax benefits – Seed Capital Assistance by IDBI and TIIC – Concessions – Subsidies to the SSI – Misuse of Concessions, Incentives and Subsidies – Problems of Small Enterprises – Sickness of SSI – Definition – Reasons for Sickness.

3. EXPORTS.

Small exporters – Export Promotion Measures – Any of Steps taken by the Government to Boost Exports – Export Procedures – Problems in Export – Import – Meaning – General introduction only.

UNIT V

15HOURS

1. STARTING OF AN ENTERPRISE (General Introduction Only).

Various Stages of Starting An enterprise – Business Idea Generation Techniques = Identification of Business Opportunities – Marketing Feasibility – Financial and Economic Feasibility – Technical Feasibility – Legal Feasibility – Managerial Feasibility – Locational Feasibility – Other Feasibilities.

2. PROJECT REPORT – (Brief introduction only)

Classification of projects - Meaning Of Project Report - Meaning Of Project Report – Cover Page – Table Of Content – Executive Summery – Industry and Company – Products and Services – market Research and Analysis – the Economies of Business – Marketing plan – Design and Development plans – Manufacturing and Operational Plan – Management Team – Overall Schedule – Risks and Problems – Financial plan – Proposed Company Offerings – Appendices. Project appraisal (Meaning only)

REVISION & TEST

5HOURS

REFERENCE BOOKS:

Entrepreunerial Development By Dr. Jayashree Suresh, Marghan Publications
Entrepreunerial Development By Dr. S.S. Khanka,S.Chand&Company
Entrepreneurship: By Alpana Trehan, Dreamtech Press

BO001 ENTREPRENEURIAL DEVELOPMENT

Max Marks : 75 Duration : 3 Hrs

Note : Answer all questions, choosing any two division from PART-A and one from division PART- B each sub –division in PART-A carries 4 marks and in PART-B carries 7 marks

Model Question Paper – I

PART – A Any 2

- 1 a) What is Entrepreneur and its origin.
b) Explain about any 2 common myths about Entrepreneurs
c) What are the functions of an Entrepreneur?
- 2 a) What is the role of Entrepreneurs in Indian economic development.
b) What are the benefits and contributions made by Entrepreneurs in Indian Economy.
c) List out the factors influencing the Entrepreneurship.
- 3 a) What are supportive role of Govt. & Non-Govt. agencies in Entrepreneurial Growth in India.
b) List out any 4 Financial Institutions / agencies for Entrepreneurial development.
c) What are the functions of Technical Consultancy Organisations?
- 4 a) What are the problems factors by the women Entrepreneurs?
b) Define “Sick industry”. What are the symptoms of sick industry.
c) What are the problems in export.
- 5 a) What are the contents to be given in the cover page of a project report?
b) What is business idea generation and briefly explain.
c) What is Technical feasibility and briefly explain.

PART – B

- 1 a) Explain about the historical Development of the term “Entrepreneurs”
(or)
b) Explain about the different types of Entrepreneurs.
- 2 a) Discuss about various Internal factors influencing Entrepreneurship.
(or)
b) Explain about the current scenario of Entrepreneurship in India.
- 3 a) Explain about the various schemes offered by TIIC.
(or)
b) Briefly explain about the role, functions Entrepreneurial Development programmes.

- 4 a) Discuss about various steps taken by the Govt. & Non-Govt. organisations to encourage women Entrepreneurs.
(or)
b) Briefly discuss about the problems of Rural Entrepreneurship.
- 5 a) What are the various stages of starting an Enterprise? Explain briefly.
(or)
b) What is project report? Mention its importance.

B0001 ENTREPRENEURIAL DEVELOPMENT

Max Marks : 75 Duration : 3 Hrs

Note : Answer all questions, choosing any two division from PART-A and one from division PART- B each sub –division in PART-A carries 4 marks and in PART-B carries 7 marks

Model Question Paper – II

- 1 a) What are the different roles of an Entrepreneur?
b) Explain about the scope and limitations of Entrepreneurial Development.
c) What are the reasons for classification of Entrepreneurs.
- 2 a) Discuss the Mahathma Gandhis views on Entrepreneurship.
b) What are the barriers to Entrepreneurship?
c) Make the Graphical model of factors influencing emergence of Entrepreneurship?
- 3 a) What are the promotional role of Govt. & Non-Govt. agencies in Entrepreneurial growth in India.
b) List out any 4 promotional and Development institutions agencies for the Entrepreneurial Development.
c) What are the objectives of SIPCOT?
- 4 a) Briefly explain about women Entreperneurs
b) What is the role of SSI to the growth of Indian economy?
c) What is rural Entrepreneurship? Mention about its problems.
- 5 a) What is the meaning of the project report?
b) Mention about the importance of marketing feasibility.
c) Explain briefly about project appraisal.

PART – B

- 1 a) Explain about the classification of Entrepreneurs
(or)
b) List out the common myths Entrepreneurs and explain about any 3.
- 2 a) Briefly write about the Evolution of Indian Entrepreneurship in India.

(or)

- b) Discuss about the various external factor influencing the Entrepreneurship.
- 3 a) Discuss about the role of commercial Banks in the Entrepreneurial Development.
- (or)
- b) Explain about the various schemes offered by the MSME for the Entrepreneurs.
- (or)
- 4 a) What are the benefits offered by the Govt. for SSI?
- (or)
- b) Briefly explain about Import-Export procedures.
- 5 a) List out the table of contents of the project report and explain briefly.
- (or)
- b) Briefly explain about the classification of the projects.

MEB620 COMPUTER AIDED DESIGN AND MANUFACTURING

5 Hrs/Week
16Weeks /Sem.
Total Hrs : 80 hrs

OBJECTIVES:

- Define CAD and list stages and benefits of CAD
- Explain CAD hardware and software
- Appreciate the uses of computer networking
- Define CAM and list its functions
- Explain CAPP, its structure and types
- Describe MRP and MRP-II, JIT
- Describe concept of rapid proto typing
- Differentiate between sequential engineering and concurrent engineering
- Compare NC, CNC and DNC
- Explain turning centers and machining centers and CNC EDM machines
- Describe coordinate measuring machines
- Explain spindle drives and slide ways
- Explain ATC
- Explain different feedback devices.
- Prepare NC part programs using G code and M code
- Describe conversational programming and APT programming
- Explain the concept of group technology, FMS and CIM
- Describe MICLASS and OPITZ systems
- Describe AGV and robots.

TOPICS AND ALLOCATION

UNIT	TOPIC	TIME (Hrs)
I.	Computer Aided Design and Geometric Modeling	15
II.	Computer Aided Manufacturing	15
III.	CNC Machines	15
IV.	CNC Components and Part Programming	15
V.	GT-FMS-CIM-AGV and Robotics	15
VI.	Revision Test	5
TOTAL		80

UNIT – I

COMPUTER AIDED DESIGN AND GEOMETRIC MODELING

15 Hrs

Introduction – CAD definition – Shigley’s design process – CAD activities – benefits of CAD – CAD hardware : Input / Output devices – CRT – raster scan & direct view storage tube – LCD, plasma panel, mouse, digitizer,

image scanner, drum plotter, flat bed plotter, laser printer – secondary storage devices : hard disks, floppy disks, CD, DVD, flash memory.

Types of CAD system: PC based CAD system – workstation based CAD system – graphics workstation – configuration and typical specification – CAD software packages – AutoCAM – computer networking: purposes – topology – types – OSI networking standards – protocols

(description only). Geometric modeling techniques: wire frame, surface, solid modeling – graphics standards: Need, GKS – IGES
– DXF. Introduction to finite element methods – procedure of finite element analysis (brief description only).

UNIT II

COMPUTER AIDED MANUFACTURING

15 Hrs

CAM definition – functions of CAM – benefits of CAM – integrated CAD/CAM organization – process planning – master data – structure of a typical CAPP – types of CAPP : variant type, generative type – advantages of CAPP - aggregate production planning – Master Production Schedule (MPS) – capacity planning – Materials

Requirement Planning (MRP) – introduction to enterprises resources planning – Manufacturing Resources Planning (MRP-II) – just in time manufacturing philosophy – cost involved in design changes – concept of Design for Excellence (DFX) – guide lines of Design for Manufacture / Assembly (DFM/A). Product Development Cycle – sequential engineering – concurrent engineering – rapid proto typing: concept and applications – 3D printing.

UNIT-III

CNC MACHINES

15 Hrs

Numerical control – definition – components of NC systems – development of NC – DNC – CNC and adaptive control systems – working principle of a CNC system – distinguishing features of CNC machines - advantage of CNC machines – difference between NC and CNC – types of turning centre: horizontal, vertical – types of machining centers: horizontal spindle, vertical spindle, universal machines – machine axis conventions – design considerations of NC machine tools. CNC EDM machine – Coordinate measuring machines: construction, working principles and specifications – maintenance of CNC machines.

UNIT-IV

CNC COMPONENTS AND PART PROGRAMMING

15 Hrs

Drives: spindle drive – hydraulic systems – direct-current motors – stepping motors – servo motors – AC drive spindles - slide ways – linear motion bearings – recirculation ball screw – ATC – tool magazine – feedback devices: encoders – linear and rotary transducers – in-process probing. NC part programming – manual programming – tape format : sequence number, preparatory functions and G

codes, miscellaneous functions and M codes – CNC program procedure – coordinate system – types of motion control: point-to-point, paraxial and contouring - NC dimensioning – reference points – machine zero, work zero, tool zero and tool offsets.

Part Program – tool information – speed – feed data – interpolation – macro – subroutines – canned cycles – mirror images – thread cutting – sample programs for lathe and milling – generating CNC codes from CAD models – post processing – conversational programming – APT programming.

UNIT- V

GT-FMS-CIM-AGV AND ROBOTICS

15 Hrs

Group Technology(GT) – concept of part family – parts classification and coding – coding structure – MICLASS – OPITZ – benefits of GT.FMS & CIM – introduction to FMS – types of manufacturing - FMS components – FMS layouts – types of FMS

: flexible manufacturing cell – flexible turning cell – flexible transfer line – flexible machine systems – benefits of FMS - concept of CIM – historical background -- CIM hardware – CIM software – CIM wheel - introduction to intelligent manufacturing system – virtual machining. Integrated material handling – AGV: working principle and benefits – Automatic Storage and Retrieval Systems (ASRS). ROBOT – definition – robot anatomy and classifications – robot configurations – industrial applications:

characteristics, material transfer, machine loading, welding, spray coating, assembly and inspection

Revision and Test

5 Hrs

Text Books:

1. CAD/CAM/CIM, R.Radhakrishnan, S.Subramanian, V.Raju, 2nd, 2003, New Age International Pvt. Ltd.
2. CAD/CAM, Mikell P.Groover, Emory Zimmers Jr. Indian Reprint Oct 1993, Prantice Hall of India Pvt., Ltd.
3. S.K.Sinha, NC Programming, I Edition, 2001, Galgotia Publications Pvt. Ltd.

Reference Books

1. Dr.P.N.Rao, CAD/CAM Principles and Applications, 2002, Tata Mc Graw Hill Publishing Company Ltd.
2. Ibrahim Zeid, Mastering CAD/CAM, Special Indian Edition 2007, Tata McGraw-Hill Publishing Company Ltd., New Delhi.
3. Mikell P. Groover, Automation, Production Systems, and Computer-Integrated Manufacturing, 2nd Edition, Reprint 2002, Pearson Education Asia.
4. Yoram Koren, Computer control of manufacturing systems, International Edition 1983, McGraw Hill Book Co

**Model Question paper
Computer Aided Design And Manufacturing**

Time: 3 Hours

Max Marks: 75

[Note: Answer all questions. Selecting any two from (a) and any one from (b).
All questions carry equal marks]

I	1	a	Define cad. What are the essentials of CAD?	4
		b	What is Lan? What are the types of Lan?	4
		c	What are the various types of modelling techniques?	4
	2	a	Explain any three output devices with simple sketches	7
		b	Discuss solid modelling with an example.state its merits and demerits	7
II	1	a	Write short notes on intelligent manufacturing system.	4
		b	Write short notes on capacity planning.	4
		c	Explain rapid prototyping	4
	2	a	What is MRP? explain how it works?	7
		b	Explain in detail the operation of typical CAPP system	7
III	1	a	Explain how cnc machines are integrated with CIM environment	4

		b	What is CMM?	4
		c	What are the benefits of adaptive control?	4
	2	a	Explain the working of CMM with neat sketch.	7
		b	Explain the working of EDM Machine with a neat sketch	7
IV	1	a	What are the data required for manual part programming?	4
		b	Explain fixed zero, floating zero	4
		c	Explain tool magazine and its requirements	4
	2	a	Explain the terms macros, subroutines and canned cycles used in CNC part programming.	7
		b	What is mirroring in CNC program?. Explain with an example.	7
V	1	a	State the benefits and applications of FMS.	4
		b	Explain the term group technology.	4
		c	What are the components of agv?	4
	2	a	What are the three elements of product design? Explain each of them in detail.	7
		b	Discuss in detail material handling and storage system in FMS.	7

MEB631 AUTOMOBILE TECHNOLOGY

5 Hrs/Week

16 Weeks /Sem.

Total Hrs : 80 hrs

OBJECTIVES:

- Explain about the constructional details of an IC engine including cooling and lubrication system.
- Describe fuel feed systems with all devices involved in it (Both for petrol and diesel engines).
- Explain the construction and functional features of the power transmission systems and various parts involved in it .
- Explain the functions of different types of steering and brake systems.
- Familiarize electrical and electronic equipments used in automobile.
- Describe the different types of chassis and their functions.
- Appreciate the techniques for automobile pollution control.

TOPICS AND ALLOCATION

UNIT	TOPIC	TIME (Hrs)
I.	Automotive Engines	15
II.	Fuel and Fuel Feed Systems	15
III.	Transmission and Power Trains	15
IV.	Automotive Chassis	15
V.	Automobile Electrical Equipment and Pollution Control	15
VI.	Revision Test	5
TOTAL		80

UNIT I

AUTOMOTIVE ENGINES

15 hrs

Basic Engine Components – Functions , types , materials and construction of – Cylinder block – Cylinder head – Gaskets – Crankcase – oil pan – cylinder liners – Comparison of liners – Piston – Expansion control in pistons – piston rings – types of compression and oil control rings – piston pin – Connecting rod – methods of connecting piston and Connecting rod – Crankshaft – flywheel – Cam shaft – methods of cam shaft drive arrangements – Valve and Valve arrangements - LIFT

Diesel engine – merits and demerits – Stages of Combustion – Delay period – Variables affecting delay period – Combustion chamber – Methods of generating air swirl in diesel engine combustion chamber – Types of combustion chambers – merits and demerits.

Cooling system – purpose – methods – merits and demerits of air and water cooling - pump assisted cooling systems – components – water pump, fan - thermostat – types - radiator – types – pressure cap – Expansion system – merits - vented and pressurised – expansion tank – troubles in cooling system – loss of coolant , overheating and over cooling – causes.

Lubrication system – purpose – types of lubricants - properties – additives – Service rating of oil – types of lubricating system - types of filters – methods of cylinder and piston lubrication –

High pressure system - oil pumps - Troubles in lubrication system - oil leakage , low oil pressure and excessive oil consumption - causes.

UNIT II

FUEL & FUEL FEED SYSTEMS

15 hrs

Requirements of an ideal petrol - Octane number - detonation - properties of a good diesel fuel - Cetane number - Diesel knock - methods of controlling diesel knock - fuel additives - Alternate fuels for petrol and diesel engines - Benzol , Methenol , Ethanol , Natural gas , LPG , Vegetable oils and Bio - Gas.

Layout of fuel feed system of petrol engine - types of fuel feed systems - A.C. Mechanical fuel pump - S.U. Electrical fuel pump - fuel filter - Air cleaners - types - Carburetion - Classification of Carburetors - Simple carburetor - Carburetor circuits - Solex Carburetor - Construction and operation - petrol injection - necessity - merits and demerits.

Layout of diesel fuel feed system - single acting fuel feed pump - injection pumps - Construction and working of distributor type pump - fuel injectors - purpose - types - Single & Multi hole - pintle and pintaux - governors - necessity - types of Governors - Mechanical and Pneumatic - fuel filters - primary and secondary filters - location & importance

UNIT III

TRANSMISSION AND POWER TRAINS

15 hrs

General arrangement of power transmission system - Arrangement of front engine drive - rear engine rear drive - four wheel drive - applications - clutch - function - Components - Types - Single plate , multiple wet and dry clutches and diaphragm spring clutch - fluid coupling - Clutch troubles and their causes.

Gear box - purpose - various resistance to motion - types of gear boxes - sliding mesh , constant mesh and synchro mesh - floor shift and steering column gear change - gear box troubles and their causes.

Drive line - propeller shaft - Universal joint - Cross type only - slip joint - final drive - function - types of gear arrangement - straight & spiral Bevel , Hypoid , Worm and Worm Wheel - merits , demerits and application - Hotch kiss drive - Torque tube drive - radius rod.

Differential - purpose - Construction and operation - Self locking and non slip differential - Differential troubles and their Causes - forces in the rear axles - Rear axles - Semi floating , three quarter floating and full floating axle - Axle housing - types.

UNIT IV

AUTOMOTIVE CHASSIS

15 hrs

Front axle - Types - Stub axle - Types - Steering system - Ackermann Principle of Steering - Wheel alignment - Factors - Camber , Caster , King pin inclination , Toe in and Toe out on turns - Steering linkages - Steering gears - Cam and double roller , recirculating ball type , Rack and Pinion - Steering troubles and causes - power steering - Necessity - types - Layout of any one type.

Suspension system - Functions - Type of springs - Leaf , coil and Torsion bar - Front suspension systems - independent front suspension - merits and de merits - types - rear end suspension - Air suspension (brief description only) - shock absorber - purpose - telescopic type - construction and working.

Brake system - functions - classification of brakes - drum brakes - leading shoe and trailing shoe - Self energizing action - hydraulic brake - brake bleeding - Air assisted hydraulic brakes - Air brake - layout , functions of each component and application only - disc brakes - construction and working - comparison of disc and drum type - brake troubles and their causes.

Wheels - Disc wheel , wire wheel , spilt wheel and light alloy cast or forged wheels - brief description and applications - tyres - function - construction of tyres - cross and radial ply tyres - comparison - properties of tyres - tyre wear and tyre service.

UNIT V

AUTOMOBILE ELECTRICAL EQUIPMENT & POLLUTION CONTROL**15 hrs**

Battery – lead acid battery – Nickel alkaline battery – construction – battery rating – charging - testing – starting system – circuit - construction and operation of starter motor – starting motor drives – over running clutch and Bendix drive – construction and operation – solenoid switch - Charging system – circuit – alternater construction and operation – regulators – Dynamo.

Ignition system – Types – battery coil ignition system – circuit -High tension magneto – Principle of operation of fly wheel magneto – electronic ignition – Ignition system troubles and remedies.

Lighting system – circuit – Head light – Aiming adjustment – sealed beam head lights – directional signal circuits – Horn circuits – Wind screen wiper.

Pollution – Pollutants – source of pollutants – pollution control techniques for petrol and diesel engines emission – controlling crank case emission (PCV) – controlled evaporative emission (VRS , VSS , VRR , ECS and EES) – Treatment of exhaust gas (Catalytic converter , EGR) .

**Model Question paper
Automobile Technology**

Time: 3 Hours

Max Marks: 75

[Note: Answer all questions. Selecting any two from (a) and any one from (b).
All questions carry equal marks]

I	1	a	What are the factors influence the ignition delay periods C.I. Engines	4
		b	Draw and explain the acceleration and starter circuit in solex carburetor	4
		c	Explain function of oil rings.	4
	2	a	Explain with neat sketch the pump assisted cooling system.	7
		b	Explain various stages of combustion in diesel engine	7
	II	1	a	Draw the neat sketch of A.C. mechanical pump
b			Explain the methods of connecting piston and connecting rod	4
c			What is ethanol?	4
2		a	Name the different types of nozzle and state its function	7
		b	With neat diagram explain working of mechanical governor	7
III		1	a	Draw the neat sketch of full floating axles
	b		Draw a sketch of propeller shaft.	4
	c		Explain with sketch working of fluid coupling	4
	2	a	Explain the necessity of a differential of an automobile. Discuss in detail the construction and operation of the differential with sketch	7
		b	With a simple sketch explain construction and working of multi-plate clutch.	7
	IV	1	a	Explain clearly the requirements of automobiles brakes

	b	Explain Caster angle.	4	
	c	Describe Radial Ply Tyres.	4	
2	a	Discuss in detail the rack and pinion type manual steering gear type by means of a simple sketch and discuss its advantages	7	
	b	Draw the schematic diagram showing the layout of complete air pressure system of brakes and explain the working of brake valve with the help of a neat diagram.	7	
V	1	a	Discuss in detail the requirements of an ignition system of an internal combustion engine.	4
		b	Explain working of solenoid switch.	4
		c	Explain major parts of a lead acid battery	4
	2	a	Explain the construction and operation of a transistor assisted ignition system.	7
		b	Show with a neat sketch, the construction and working of lead-acid battery.	7

MEB632 MECHATRONICS

5 Hrs/Week

16 Weeks/Sem

Total Hrs : 80

OBJECTIVES:

- Define Mechatronics and state its role in industries.
- Compare the different types of sensors/transducers
- Describe the basic actuation systems and their importance.
- Describe various basic Mechanical and Electrical actuation systems.
- Explain the various basic pneumatic and hydraulic actuation systems.
- Construct the basic mechanical system building blocks.
- Construct a basic electrical system building blocks.
- Construct a basic fluid system building blocks.
- Explain the basic system models used in engineering
- Explain the structure of PLC and its functions.
- Write PLC program for simple applications.
- Differentiate traditional versus mechatronics design.
- Apply Mechatronics design to real life case studies.

TOPICS AND ALLOCATION

UNIT	TOPIC	TIME (Hrs)
I.	Introduction, Sensors & Transducers	15
II.	Actuation Systems (Mechanical, Electrical, Pneumatic & Hydraulic)	15
III.	Basic System Models, input/output Systems	15
IV.	Programmable Logic Controller (PLC)	15
V.	Design Examples & Advanced Applications in Mechatronics	15
VI.	Revision Test	5
TOTAL		80

UNIT-I

INTRODUCTION, SENSORS & TRANSDUCERS

15 Hrs

Introduction – Systems – Measurement Systems – Control Systems – Microprocessor Based Controllers Examples – Mechatronics approach.

Measurement System terminology – Displacement, Position & Proximity Sensors – Velocity and Motion Sensors – Force Sensors – Fluid Pressure Sensors – Flow Sensors – Liquid Level Sensors – Temperature Sensors – Light Sensors – Selection of Sensors.

UNIT-II

ACTUATION SYSTEMS (MECHANICAL, ELECTRICAL, PNEUMATIC & HYDRAULIC)

15 Hrs

Mechanical Actuation Systems – Types of motion – Freedom and constraints – Loading – Gear Trains – Pawl & Ratchet – Belt & Chain drive – Bearing – Selection – Ball & Roller bearings –

Mechanical aspects of motor selection. Electrical Actuation Systems – Switches & Relays – Solenoids – D.C Motors – A.C.Motors – Stepper Motors – Specification and control of stepper motors – Servomotors: D.C Servomotor and A.C Servomotor. Pneumatic & Hydraulic Systems – Power supplies – DCV – PCV – Cylinders – Rotary actuators.

UNIT-III

BASIC SYSTEM MODELS, INPUT/OUTPUT SYSTEMS

15 Hrs

Mathematical Model – Introduction to mathematical model - Mechanical System building blocks – Electrical System building blocks – Fluid System building blocks – Thermal System building blocks. System Model – Engg. Systems – Rotational-Translational Systems – Electro-Mechanical System – Hydro - Mechanical System.

Interfacing - Input/Output ports - Interface requirements: Buffers, Handshaking, Polling and interrupts, Serial interfacing - Introduction to PIA - Serial communications interface - Example of interfacing of a seven-segment display with a decoder.

UNIT-IV

PROGRAMMABLE LOGIC CONTROLLER (PLC)

15 Hrs

Definition – Basic block diagram and structure of PLC – Input/Output processing – PLC Programming: Ladder diagram, its logic functions, latching and sequencing – PLC mnemonics – Timers, internal relays and counters – Shift registers – Master and jump controls – Data handling – Analog input/output – Selection of PLC.

UNIT-V

DESIGN EXAMPLES & ADVANCED APPLICATIONS IN MECHATRONICS

15 Hrs

Design process stages - Traditional Vs Mechatronics designs - Possible design solutions: Timed switch, Windscreen wiper motion, Bath room scale - Case studies of mechatronics systems: A pick-and-place robot, Car park barrier, Car engine management system, Automatic Camera and Automatic Washing Machine only.

Sensors for condition monitoring systems of production systems - Examples of monitoring methods: Vibration monitoring, Temperature monitoring, Wear behavior monitoring - Mechatronics control in automated manufacturing: Monitoring of manufacturing processes, On-line quality monitoring, Model-based systems, Hardware-in-the-loop simulation, Supervisory control in manufacturing inspection, Integration of heterogeneous systems.

Revision and Test

5Hrs

Text Books:

1. W.Bolton, Mechatronics, 2nd Edition 2001, Pearson Education, New Delhi.
2. R.K.Rajput, A Text Book of Mechatronics, 1st Edition 2007, S.Chand & Co. Ltd., New Delhi.

Reference Books:

1. HMT, Mechatronics, 1st Edition 1998, Tata McGraw Hill, New Delhi.
2. Devdas Shetty & Kolk, Mechatronics System Design, 1st Reprint, 2001, PWS Publishing Co., Boston.
1. James H.Harter, Electromechanics, 1st Edition 2003, Prentice-Hall of India, New Delhi.
2. M.D.Singh & J.G.Joshi, Mechatronics, 1st Edition 2006, Prentice-Hall of India, New Delhi.

**Model Question paper
Mechatronics**

Time: 3 Hours

Max Marks: 75

[Note: Answer all questions. Selecting any two from (a) and any one from (b).
All questions carry equal marks]

I	1	a	Draw the diagram of potentiometer sensor.	4
		b	What are the parameters to be considered while selecting sensor.	4
		c	Explain briefly about diaphragm type fluid pressure sensor.	4
	2	a	Explain closed loop controlled system with example.	7
		b	Explain Engine management system with neat diagram.	7
	II	1	a	What is the Basic Principle of DC Motor?
b			Explain the various types of Belt with neat diagram.	4
c			Briefly explain gear train.	4
2		a	Explain the working principle of stepper motor with specification.	7
		b	Explain the working principle of directional control valves.	7
III		1	a	Write the difference between parallel and serial Interface.
	b		Briefly explain three state buffer	4
	c		Draw rack and pinion diagram of rotational translation system.	4
	2	a	Describe mathematical model for Thermal System.	7
		b	Explain interfacing a seven Segment display with a decoder with a neat diagram.	7
	IV	1	a	Draw the ladder diagram for counter.
b			Design ladder diagram for timing circuit that switch ON output for 2 second then OFF for 10 seconds	4
c			Draw ladder diagram for 4bit shift operation.	4
2		a	Draw the ladder diagram for code converter.	7
		b	Draw Internal Architecture of PLC and explain each block.	7
V		1	a	What are the features of supervisory control system?
	b		Explain car park barrier with neat diagram.	4
	c		What is the difference between CAM operated time switch and PLC operated Time switch.	4
	2	a	Explain car engine management system with neat diagram.	7
		b	Explain a pick and place Robot with any one application.	7

MEB640 COMPUTER AIDED DESIGN AND MANUFACTURING PRACTICAL

6 Hrs/Week

16 Weeks /Sem.

Total Hrs : 96

OBJECTIVES:

- Practice on CAD commands for 3D drawings.
- Draw 3D CAD drawings using solid modeling.
- Practice on Solid rendering.
- Differentiate incremental System with absolute system
- Prepare a part program, edit and execute in CNC lathe.
- Prepare a part program, edit and execute in CNC milling machine.
- Produce parts in CNC lathe and milling machine.

PART-1 CAD Practical (51 Hours)

3D CAD Drawing – Solid Modeling & Lisp Programming (10 Hours)

1. Predefined 3D objects – converting 2D plan into a 3D model – 3Dmesh – 3Dface - 3Dpoly – creating surfaces – Rulsurf – Revsurf – Tabsurf – Edgesurf – isolines - 3DView – viewports – Vpoint – hide – dview – modelspace - paper space.
2. 3D solid primitives - creating region – pedit – extrude – revolve - combining object – union – subtract –intersect – Align – Fillet – chamfer - Advanced 3D editing techniques – align - 3D array –Mirror 3D -Rotate3D.
3. Working with UCS – 3D coordinate system – DDUCS – Plan – UCS icon
Solid Rendering – material attaching and detaching – shade with color – slice and sectioning – script – 3D orbit – calculating mass properties
1. Developing LISP program – constructing a list – input/output functions – control structures – arithmetic operations – trigonometric functions – special functions.

3D solid modeling and LISP programming practice (41 Hours)

- i) Geneva Mechanism
- ii) Cast Iron Block
- iii) Bearing Block
- iv) Bushed Bearing
- v) Gib and Cotter joint
- vi) Screw Jack
- vii) Universal Coupling
- viii) Simple LISP programs for drawing the following: rectangle, circle, concentric rectangles, concentric circles, changing the colors and line types
- ix) LISP program for drawing the spur gear given the gear parameters (may be done as a simple project; not for exam. Reference may be made to the book: Mastering CAD/CAM by Ibrahim Zeid, Special Indian Ed. 2007., pp91)

Part-2 CAM Practical (45 Hours)

Introductions (9 Hours)

1. Study of CNC lathe, milling
2. Study of international standards G-Codes, M-Codes
3. Program writing – Turning simulator – Milling simulator, IS practice – commands – menus

Exercise practice (36 Hours)

CNC Lathe

1. Develop and simulate a part program for step turning and machine the component using
XLTURN Machine
2. Develop and simulate a part program for taper turning and machine the component using
XLTURN Machine
3. Develop a part program for circular interpolation and simulate
4. Develop a part program for multiple turning operation and simulate
5. Develop a part program for thread cutting, grooving and simulate
6. Develop a part program for internal drills, boring and simulate

CNC Milling

1. Develop and simulate a part program for grooving and machine the component using XLMILL Machine
2. Develop and simulate a part program for mirroring with subroutines and machine the component using XLMILL Machine
3. Develop a part program for drilling (canned cycle) and simulate
4. Develop a part program for rectangular and circular pocketing and simulate

CNC LATHE WITH BUILT IN CONTROLLER AND MONITOR

CNC MILL /MACHINING CENTRE WITH ATC IN BUILT CONTROLLER & MONITOR

Specification of CNC Lathe

Machine Specification

Turning Length in chuck:80-120mm

Turning Diameter : 32 mm

Distance between center: 200-250mm

X&Z Travel

X axis Travel: 70mm -90mm

Z axis Travel :150mm- 200mm

Positioning Accuracy: 0.010mm

Repeatability: 0.005mm

Input Resolution: 0.001mm

Distance between Centre- 210mm

Rapid Traverse: 1.2m/min

Spindle Speed: 150- 3000rpm

Spindle Power: 0.750- 1.2kw

Spindle nose taper: MT3

Chuck size: 100mm

6/8 Station Programmable Indexing Tool Post or Linear Tooling

Bed Type: Slant bed 45.

1. Control Specifications:

Built in Industrial type control with 8 inches colour monitor

Closed loop control with Servo Motors(100w)

Spindle Motor with encoder

Operator Panel with following on off.

Switch Spindle forward,reverse,switches MPG, Feed & Speed override potentiometers.

Built in PLC with Parameter for functions.

2. Program features:

Essential:

G&M codes as per Fanuc Oi Turning Milling Control

Parametric Programming

MEB651 AUTOMOBILE ENGINEERING PRACTICAL

4 Hrs/Week

146 Weeks /Sem.

Total Hrs : 64 hrs

IMPORTANCE OF THE SUBJECT

Automobiles are one of the necessities of modern life. Development & progress of the world majoritily is based upon the development of modern automobiles. Diploma engineer should know about principles of construction, working and various systems of automobile vehicles of different type and sizes. Now-a-days much advances in automobile technology have been made like automatic transmission, MPFI, microprocessor control of automobiles, PUC techniques, fuel cell, electrical automobile, safety systems etc. A diploma engineer should be conversant with these modern developments.

This lab manual helps a student to develop basic hands on skills on working of automotive systems and the sub-systems associated with them. The automotive systems are noting but various mechanism and relatively rotating or sliding parts. These parts are bound to develop some kind of failures after some time. The failures must be detected in time and essentially repaired by proper diagnosis, dissembly and assembly.

Topic related to air pollution is incorporated so as to have the consciences for eco-friendly environment. In automobile laboratory the student learns the procedure of dismantling and assembly of different sub-systems of automobiles such as engine, carburettor, gearbox, clutch, injection system, differential and suspension system.

This subject is related with the other subject such as theory of machines, IC engines, thermal engineering and mechatronics, etc.

By understanding this subject, following are the areas where diploma engineer can work -
· Dealerships, where cars and trucks are sold and serviced
· Service stations, where vehicles get fuel, oil and related products and services
· Tire and battery dealer
· Speciality shops, which handle wheel alignment, transmissions, body repair and tune-up work
· Part stores, where automotive parts are sold

CURRICULUM PHILOSOPHY

The curriculum document explicitly describes technical skills, social skills and attitudes to be developed in industries while designing this subject; the principles under theories of learning have been used. The link diagram and graphical structure is provided, which helps the students to learn systematically and also helps the teachers to use different strategies for teaching.

The major important points to note for users of curriculum (as described in curriculum document of MSBTE) are:

Job description and role of technician
Curriculum objectives drawn from job analysis
Personal development domain
Social development
Life Long Learner

Industry related professional role
Curriculum areas to develop / achieve curriculum objectives
Graphical structure of the subject area
Teaching learning process at curriculum level
Approach student evaluation

Know your laboratory

When the student enters the laboratory he is expected to know different systems of automobile. In automobile engineering laboratory, following systems and tools are generally observed.

- 1 Diesel / petrol engine
- 2 Carburetor
- 3 Fuel injection pump
- 4 Battery ignition system
- 5 Gear box
- 6 Clutch
- 7 Differential
- 8 Pollution control testing equipments etc.
- 9 Suspension systems such as leaf spring, shock absorber
- 10 Brakes
- 11 Steering systems
- 12 Different tools for assembly and dismantling of these systems such as
 - a. A set of fixed spanner
 - b. A set of ring spanner
 - c. A set of box spanner
 - d. A screw driver set
 - e. Hammers, nose pliers
 - f. Special tools like - circlip pliers, ring expanders, torque wrench, etc.

When working in your laboratory, use the equipments with proper care and delicacy. Do not apply excessive pressure to levers/knobs etc. there are chances of breakages and injury. Do not touch the rotating and hot parts. This may cause burns and injuries. Use tools and clean them after the practical and keep them at designated places. Ask the queries to respective faculty and lab assistant. Clean the floor after the practical as generally oil and dust remains on floor cause slippage while walking. Read the charts, which are available in the lab.

DEVELOPMENT OF SKILLS

Intellectual Skill

- I1 Identify & locate various elements of automobile for dismantling and assembling of different elements.
- I2 Select proper tools and their range
- I3 Understand the construction, principle & working of automobile
- I4 Take the reading from the instrument

Motor Skill

- M1 Draw a neat sketch of an auto engine component
- M2 Use of various tools
- M3 Disassembling and assembling

M4 To operate the automobile

SYLLABUS

1. To dismantle and assemble a four stroke multi-cylinder engine
2. To dismantle and assemble a two stroke petrol engine
3. To dismantle and assemble variable venturi carburetor
4. To dismantle and assemble jerk-type fuel injection pump
5. To study cut section of lead acid automotive battery (12V)
6. To dismantle and assemble distributor of battery ignition system
7. To study a synchro-mesh gear box by dismantling and assembling
8. To dismantle and assemble a single plate clutch assembly
9. To dismantle and assemble a differential
10. To study independent and conventional suspension system
11. To study brake system
12. To check emission level of an automobile using exhaust gas analyzer
13. To study modern trends in automobiles

MEB652 MECHATRONICS LABORATORY

4 Hrs/Week

16 Weeks /Sem.

Total Hrs : 64

OBJECTIVES:

- Identify pneumatic operated single acting cylinder and double acting cylinder.
- Analyse operation of quick exhaust valve.
- Analyse the speed control of double acting cylinder.
- Analyse the operation of hydraulic operated cylinder and motor.
- Analyse the speed control of hydraulic operated double acting cylinder.
- Analyse the operation of hydraulic directional control valve.
- Analyse the operation of logic control circuit used in PLC.
- Analyse the operation of Timer, Latch, Counter used in PLC.

A) PNEUMATICS LAB

1. Study of pneumatic system - elements - pressure control valves - directional control valves (DCV)
2. Direct operation of a single acting cylinder
3. Direct operation of a double acting cylinder.
4. Operations of single acting cylinder controlled from two different positions using shuttle valve.
5. Operation of a double acting cylinder with quick exhaust valve.
6. Speed control of double acting cylinder using metering in and metering out circuit.

B) HYDRAULICS LAB

1. Study of hydraulic system and its elements.
2. Direct operation of double acting cylinder.
3. Direct operation of hydraulic motor.
4. Speed control of double acting cylinder - using metering-in and metering-out control.
5. Speed control of hydraulic motor - using metering-in and metering-out control.
6. Operation of a double acting cylinder using solenoid operated directional control valve.

C) PLC LAB

1. Study of PLC system and its elements.
2. Direct operation of a motor using latch circuit.
3. Operation of a motor using AND logic control.
4. Operation of a motor using OR logic control.
5. On-delay timer control of a motor.
6. Off-delay timer control of a motor.

RESOURCES

1. Pneumatic trainer kit with air compressor.
2. Hydraulic trainer kit with hydraulic power pack
3. Programmable logic controller with electro - pneumatic training kit.

SCHEME OF EXAMINATION:

Pneumatic circuit / Hydraulic circuit (by lot)	: 40 marks
Programmable Logic Controller(PLC)	: 30 marks
Viva - Voce	: 05 marks
Total	: 75 marks

MEB660 PROCESS AUTOMATION LABORATORY

4 Hrs/Week

16 Weeks /Sem.

Total Hrs : 64

OBJECTIVES:

Design and operate pneumatic circuits.

Design and operate fluid power circuits.

Use PLC system and its elements for process control

Write ladder logic for logic controls such as AND,OR

Familiarize the working of function blocks in PLC

Use ON-Delay timer to control a motor

Use OFF-Delay timer to control a motor

Use counter function block (Up counter and Down counter)

Control the automatic operation of pneumatic cylinder using PLC

Control sequential operation of pneumatic cylinders using PLC

Exercises

Part A

I. Pneumatics Systems:-

1. Study of pneumatic system and its elements.
2. Direct operation of single and double acting cylinder
3. Operation of a single acting cylinder controlled from two different positions using shuttle valve.
4. Operation of double acting cylinder with quick return using quick exhaust valve.
5. Speed control of double acting cylinder using metering-in and metering-out circuits.
6. Controlling the speed of a Double acting cylinder using metering –in and metering out controls.
7. Automatic operation of a double acting cylinder using limit switch and memory valve.

II. Hydraulics Systems:-

1. study of hydraulic system and its elements.
2. Direct operation of double acting cylinder.
3. Direct operation of hydraulic motor.
3. Controlling the speed of a double acting cylinder using metering in and metering out type control.
4. Sequencing of two cylinder using Sequence valve.
5. Regenerative circuit.
6. Counter – Balance circuit.

Part B

III. PLC

1. Study of PLC system and its elements

Control a Process Using PLC

1. Direct operation of a motor using latching circuit.
2. Operation of a motor using ‘AND’ logic control.
3. Operation of a motor using ‘OR’ control.
4. On-Delay control of a motor.
5. Off –Delay control of a motor.
6. Automatic operation of a Double acting cylinder-single cycle.
7. Automatic operation of a Double acting cylinder-single cycle - forward, time delay, return.

8. Automatic operation of Double acting cylinder-Multi cycle.
9. Automatic operation of Double acting cylinder-N cycles (using counter function block)
10. Sequential operation of a Double Acting Cylinder and a motor.
11. Sequential operation of two Double Acting Cylinders for the sequence A+, B+, B-, A-.

SCHEME OF EXAMINATION:

Part A: One question from Pneumatic And Hydraulic Lab (1½ Hrs)	- 35 marks
Part B: One question from PLC lab by lot (1½ Hrs)	- 35 marks.
Viva-voce	- 05 marks
Total	- 75 marks

PART A : ALLOCATION OF MARKS

(either Hydraulic systems or Pnumatic Systems)

Circuit diagram	20 marks
Connection	10 marks
Execution	5 marks
Total	35 marks

PART B : ALLOCATION OF MARKS

Logic Circuit Diagram	-15 marks
Entry and Edit of Logic circuit	-15 marks
Execution of circuit	- 5 marks
Total	-35 marks

LIST OF EQUIPMENTS

1. Pneumatic Trainer Kit
2. Hydraulics Trainer Kit
3. Programmable Logic Controller (PLC) Trainer Kit with 1
 - a) Solenoid operated DVCs
 - b) Pneumatic Double Acting cylinders with limit switches Stepper motor

BE 16 - ENGINEERING GRAPHICS - I

I Semester

Objectives

- At the end of the practice, the students will be able,
- To state the importance of drawing.
- To identify and use the drawing instruments.
- To practice the methods of dimensioning.
- To construct conics and special curves.
- To draw the projection of points, straight lines and solids.
- To draw orthographic views from isometric drawings.

SCHEME OF INSTRUCTION AND EXAMINATION

16 Weeks

Subject	Instruction		Examination			Duration
	Hours / Week	Hours / Semester	Marks			
			Internal	Examination	Total	
ENGINEERING GRAPHICS - I	6	96	25	75	100	3 Hrs.

TOPICS AND ALLOCATION

Sl.No.	Topics	Hours.
1	Drawing office practice - Dimensioning	12 Hrs.
2	Constructions of conic section curves	12 Hrs.
3	Projection of points, straight lines and solids	24 Hrs.
4	Orthographic projections	39 Hrs.
	Revision, Assignment and Tests	9 Hrs.
	TOTAL	96 Hrs.

DETAILED SYLLABUS

Unit-1

12

Hrs.

1. 1. Drawing office practice - Dimensioning

1.1.1 Importance of engineering drawing - drawing instruments: drawing board, mini drafter, compass, divider, protractor, drawing sheets etc., - layout of drawing sheets.

1.1.2 Importance of legible lettering and numbering - single stroke letters - upper case and lower case letters- general procedures for lettering and numbering - height of letters - guidelines.

1.1.3 Scales - Study of scales - full size scale, reduced scale and enlarged scale.

1.1.4 Dimensioning - Need for dimensioning - terms and notations as per BIS - Dimension line, Extension line and Leader line - Methods of dimensioning – Importance of dimensioning rules - Exercises.

Unit-2

12

Hrs.

2.1 Constructions of conic section curves

2.1.1 Conics: Different type of sections – Definition of locus, focus and directrix - Applications of ellipse, parabola and hyperbola.

2.1.2 Ellipse: Construction of ellipse by concentric circle method, rectangular method and Eccentricity method when focus and directrix are given – Practical applications.

2.1.3 Parabola: Construction of parabola by rectangular method, parallelogram method and eccentricity method when focus and directrix are given– Practical applications.

2.1.4 Hyperbola: Construction of hyperbola by rectangular method and eccentricity method when focus and directrix are given– Practical applications.

Unit-3

24

Hrs.

3.1 Projection of points.

3.1.1 Projection of points – points in different quadrants.

3.2 Projection of straight lines.

3.2.1 Projection of straight lines – parallel to one plane and perpendicular to other plane – inclined to one plane and parallel to the other plane – parallel to both the planes – inclined to both the planes.

64

3.3 Projection of solids

3.3.1 Introduction - important terms - classification of solids.

3.3.2 Projections of solids for the following object only - triangular and hexagonal prisms and pyramids - solids of revolution – cylinder and cone – Simple positions - parallel to one plane and perpendicular to other plane - axis inclined to one plane and parallel to other plane - axis parallel to both planes - exercises.

Unit-4

4.1. Orthographic projection

39 Hrs.

4.1.1 Introduction – projection terms - Orthographic projection – Perspective projection - Co-ordinate planes of projection - Angle of Projection - First angle projection - Third angle projection - Comparison of first and third angle projections.

4.1.2 Projection of views (Elevation, Plan and Side view) of simple objects using first angle projection only - exercises.

REVISION, ASSIGNMENT AND TESTS

9 Hrs.

Text Books

1. Gill P.S., “Engineering drawing”, S.K.Kataria & Sons.
2. Bhat N.D., “Engineering drawing”, Charotar Publishing House.

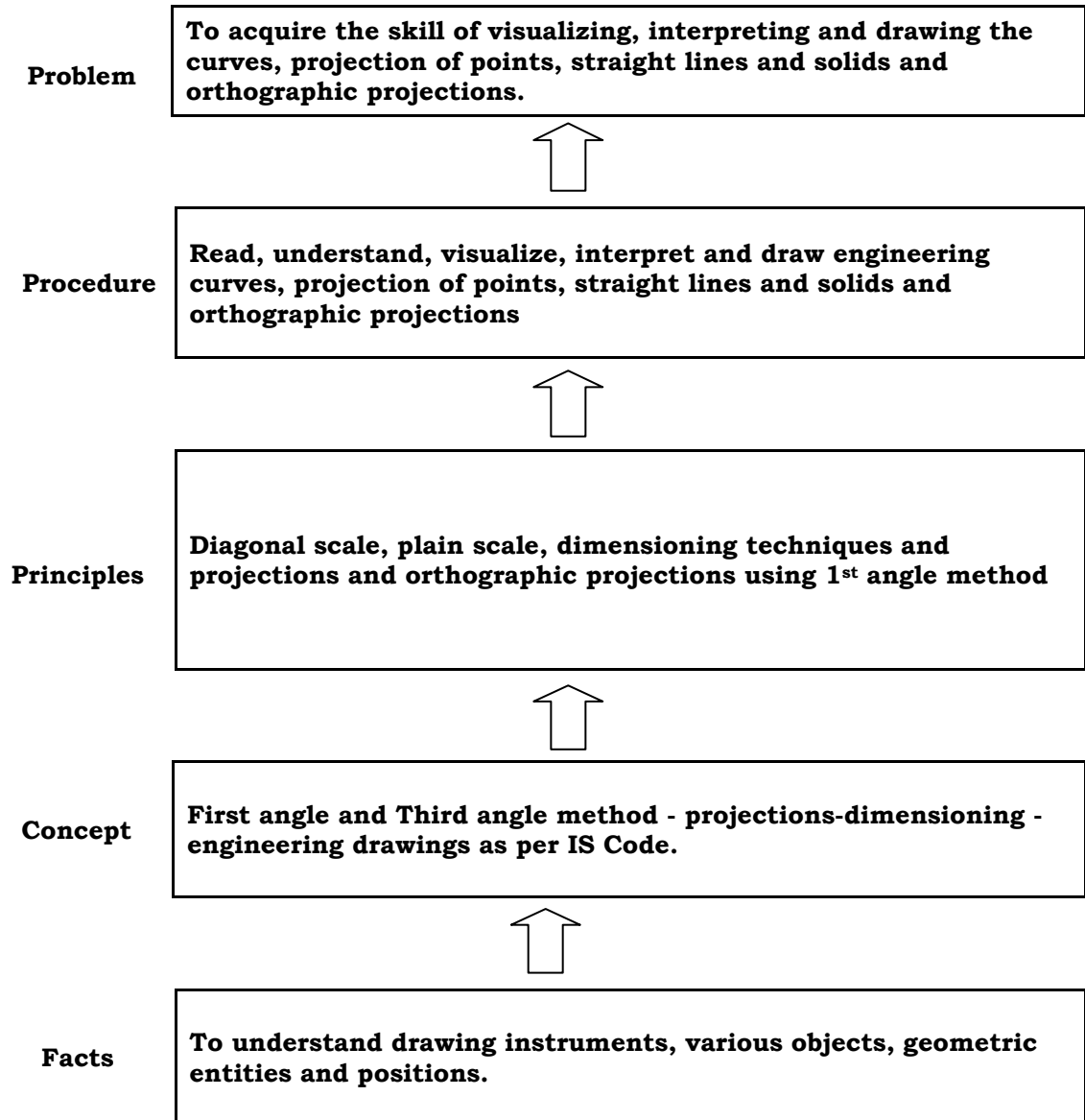
Reference Books

1. Gopalakrishnan.K.R., "Engineering Drawing", (Vol.I and Vol.II), Dhanalakshmi publishers.
2. Venugopal.K, Sreekanjana G, “Engineering Graphics” New Age International Publishers.
3. K V Nataraajan “A Text Book of Engineering Drawing”
4. Thomas E.French, Charles J.Vierck, Robert J.Foster, “Engineering drawing and graphic technology”, McGraw Hill International Editions.
5. Barkinson & Sinha, "First Year Engineering Drawing", Pitman Publishers.
6. Shah/Rana, “Engineering Drawing”, Pearson Longman.

ENGINEERING GRAPHICS – I

I Semester

Learning Structure:



Board Examination – Question pattern

Time: 3 Hrs.

Max.Marks: 75

[Note: Answer all the questions in the drawing sheet.]

Part A (Answer any four questions. Fifth question is compulsory. Each question carries ten marks.)

4X10 = **40**

1. One question from dimensioning.

2. Two questions from construction of conics (Ellipse, Parabola and Hyperbola)
3. One question from projection of straight lines.
4. One question from projection of solids (**Compulsory**).

Part B (Draw three views in the first angle projection.)

35

5. One question from orthographic projection.

Internal Marks

25

Class work - submission of drawing sheets - 10

Test (including model examination) - 10

Attendance - 5

Total - 25

MODEL QUESTION PAPER - 1

Time : 3Hours

Max. Marks :

75

[N.B. (1) First angle projection is to be followed. (2) All the questions are to be answered in drawing sheet supplied. (3) All dimensions are in mm. (4) Credit will be given for neatness.]

PART-A (Answer any four questions. Fifth Question is Compulsory. Each question carries ten marks.)

4 X 10 = **40**

1. Read the dimensioned drawing shown in fig.1. Redraw the figure to full size and dimension it as per Indian Standards.

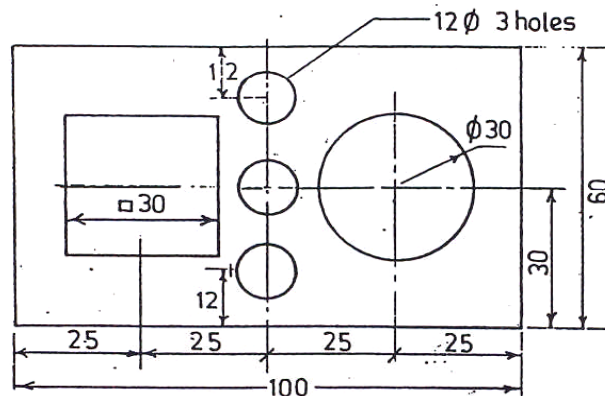


Fig. 1

2. A cricket ball thrown from the ground level reaches the wicket keeper's gloves. Maximum height reached by the ball is 5m. The ball travels a horizontal distance of 11m from the point of projection. Trace the path of the ball.
3. The head lamp reflector of a motor car has a maximum rim diameter of 130mm and maximum depth of 100 mm. Draw the profile of the reflector and name it.

4. A line AB 60 mm long has its end A in both the H.P. and V.P. it is inclined at 45° to H.P. and 30° to V.P. Draw the projections of the line AB.
5. A cone of base diameter 60 mm and altitude 80 mm rests on the HP with its axis inclined to the HP and parallel to the VP. Draw its front and top views.

Part B

35

6. The Pictorial view of an object is shown in fig.3. Draw the following views to full size scale.
- a) Elevation in the direction of arrow - 15 Marks
- b) Left end elevation - 10 Marks
- c) Plan - 10 Marks

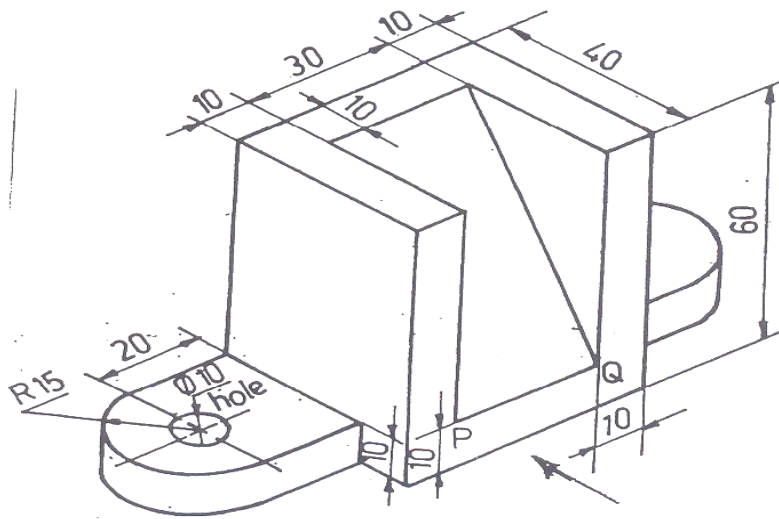


Fig. 3

MODEL QUESTION PAPER - 2

Time : 3Hours

Max. Marks :

75

[N.B. (1) First angle projection is to be followed. (2) All the questions are to be answered in drawing sheet supplied. (3) All dimensions are in mm. (4) Credit will be given for neatness.]

PART-A (Answer any four questions. Fifth Question is compulsory. Each question carries ten marks.)

4 X 10

= 40

1. Read the dimensioned drawing shown in fig.1. Redraw the figure to full size and dimension it as per Indian Standards.

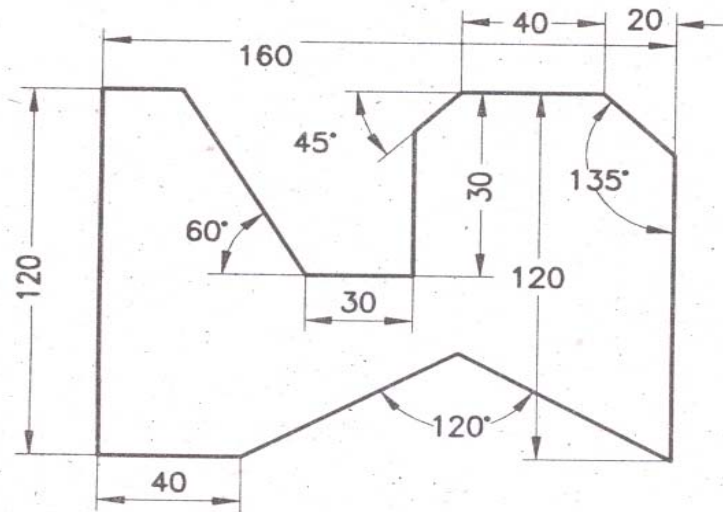


Fig. 1

2. A flowerbed in a botanical garden is in elliptical shape with major and minor axis dimensions are 10m and 6m respectively. Draw profile of the flowerbed by concentric circles method.
3. Construct a hyperbola when the distance between the focus and directrix is 40mm. The eccentricity is $4/3$.
4. A line AB 50 mm long is inclined at an angle of 30° with the H.P. and parallel to the V.P. Draw the projections when the end A is 15 mm in front of the V.P. and 10 mm H.P.
5. A triangular pyramid of base edge 40 mm and altitude 60 mm is resting on the HP on one of its base edges with its axis parallel to both the HP and VP. Draw its front and top view.

Part B

35

6. The Pictorial view of an object is shown in fig.3. Draw the following views to full size scale.
 - a) Elevation in the direction of arrow - 15 Marks
 - b) Left end elevation - 10 Marks
 - c) Plan - 10 Marks

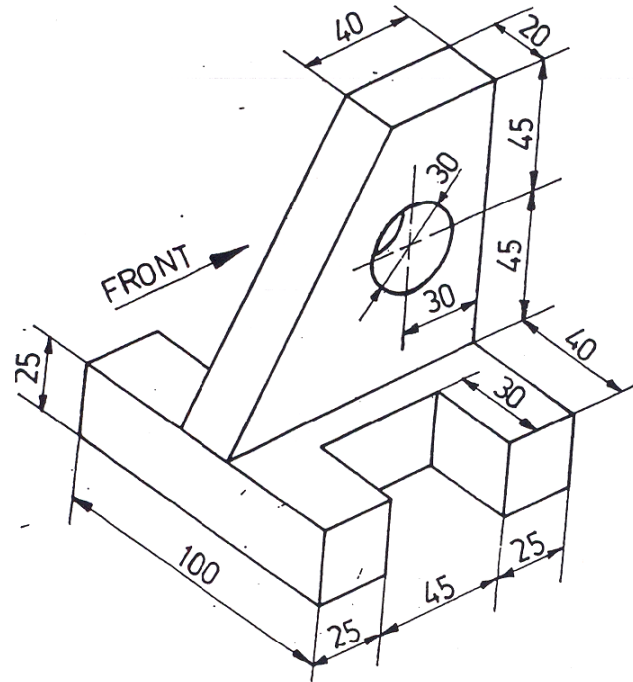


Fig. 3

BE 26 - ENGINEERING GRAPHICS – II

II Semester

Objective

- At the end of the practice the students will be able,
- To state the importance of drawing.
- To draw special curves.
- To draw the development of surfaces.
- To draw sectional views of solids and true shape.
- To convert orthographic views into isometric drawing.

SCHEME OF INSTRUCTION AND EXAMINATION

16 Weeks

Subject	Instruction		Examination			Duration
	Hours / Week	Hours / Semester	Marks			
ENGINEERING GRAPHICS - II	6	96	Internal	Examination	Total	3 Hrs.
			25	75	100	

TOPICS AND ALLOCATION

Sl. No.	Topics	Hours.
1	Construction of special curves	15 Hrs.
2	Development of surfaces	18 Hrs.
3	Section of Solids	21 Hrs.
4	Isometric projections	33 Hrs.
	Revision, Assignment and Tests	9 Hrs.
	TOTAL	96 Hrs

DETAILED SYLLABUS

Unit-1

15

Hrs.

1.1 Constructions of special curves.

1.1.1 Geometric curves: Definition, application and construction of cycloid - epicycloid – hypocycloid – exercises.

1.1.2 Involute of a circle - Archimedean spiral – helix – exercises.

Unit-2

18

Hrs.

2.1 Development of surfaces

2.1.1 Need for preparing development drawing with reference to sheet metal work - Development of cube, cylinder, prism and pyramids, frustum of pyramids and cones – Exercises in triangular, square, pentagon and hexagon prisms and pyramids, cylinder and cone.

2.1.2 Development of T-pipe, elbow, ducts, tray, lamp shade and funnel.

Unit - 3

21

Hrs.

3.1 Section of Solids

3.1.1 Introduction - section planes - apparent section - true section - sectional view - need for sectional view.

3.1.2 Section plane perpendicular to one plane and parallel to other plane - section plane perpendicular to one plane and inclined to other plane – Position of solids - triangular and hexagonal prisms and pyramids - cylinder and cone – axis parallel to one plane and perpendicular to other plane - axis parallel to both planes - true shape of section – exercises.

Unit - 4

33

Hrs.

4.1 Isometric projections

4.1.1 Introduction – isometric projection – construction of isometric view of circles and arcs - isometric scale - methods of drawing an isometric view- box method.

4.1.2 Angles in isometric view - Draw the isometric view of the object from the given orthographic view - exercises.

REVISION, ASSIGNMENT AND TESTS

9

Hrs.

Text Books

3. Gill P.S., “Engineering drawing”, S.K.Kataria & Sons.

4. Bhat N.D., “Engineering drawing”, Charotar Publishing House.

Reference Books

7. Gopalakrishnan.K.R., "Engineering Drawing", (Vol.I and Vol.II), Dhanalakshmi publishers, Edition 2, 1970

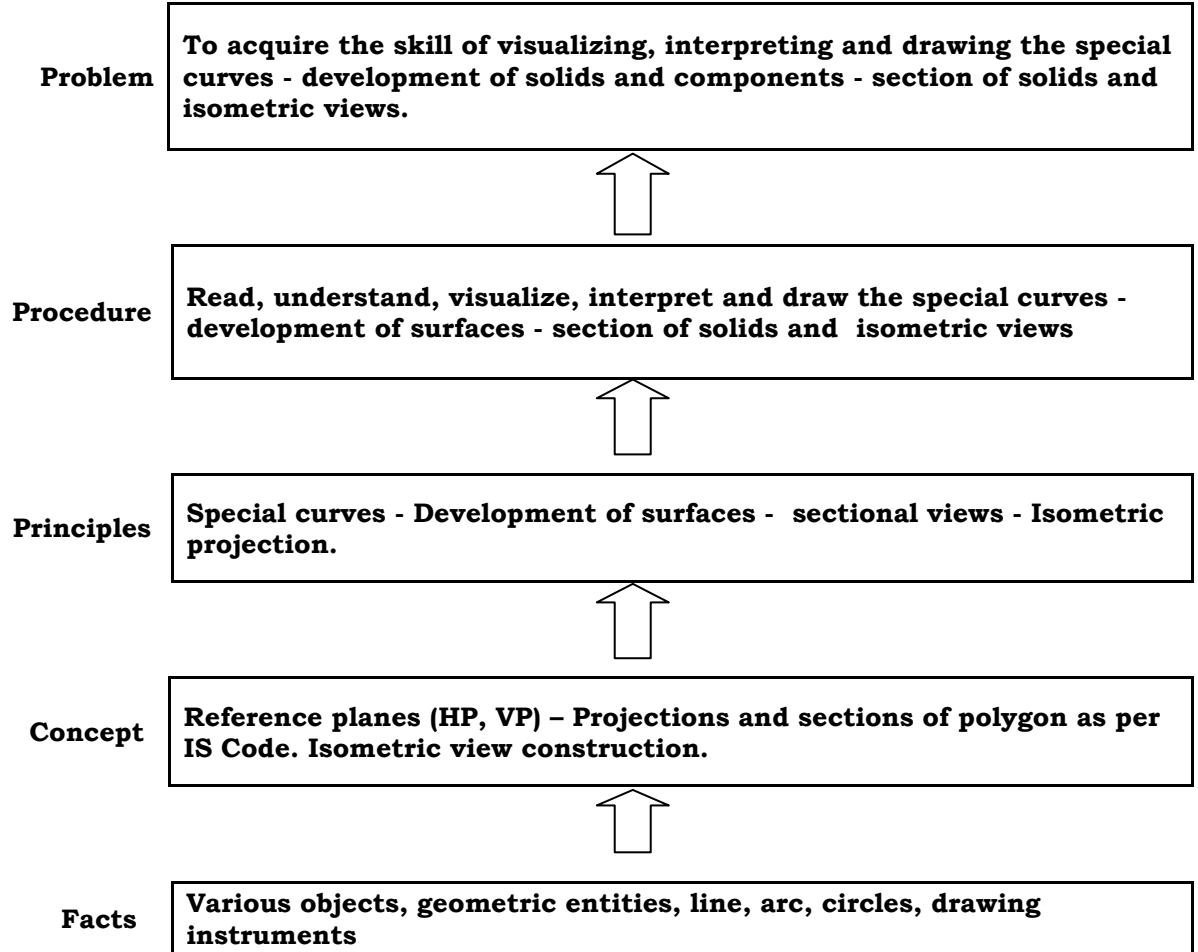
8. Venugopal.K, Sreekanjana G, “Engineering Graphics” New Age International Publishers.

9. K V Nataraajan “A Text Book of Engineering Drawing”

10. Thomas E.French, Charles J.Vierck, Robert J.Foster, "Engineering drawing and graphic technology", McGraw Hill International Editions.
11. Barkinson & Sinha, "First Year Engineering Drawing", Pitman Publishers.
12. Shah/Rana, "Engineering Drawing", Pearson Longman.

II Semester

Learning Structure:



Board Examination – Question pattern

Time: 3 Hrs.

Max.Marks: 75

Part A (Answer any three questions. Fourth question is compulsory. Each question carries fifteen marks.)

3 X 15 = **45**

1. Two questions from Special curves.
2. One question from development of surfaces.

3. One question from section of solids **(Compulsory)**.

Part B

30

4. Draw isometric view of the component (The object must have inclined and curved parts).

Internal Marks

25

Class work - submission of drawing file - 10

Test (including model examination) - 10

Attendance - 5

Total - 25

MODEL QUESTION PAPER - 1

Time : 3Hours

Max. Marks :

75

[N.B. (1) First angle projection is to be followed. (2) All the questions are to be answered in drawing sheet supplied. (3) All dimensions are in mm. (4) Credit will be given for neatness.]

PART-A (Answer any three questions. Fourth question is compulsory. Each question carries fifteen marks.)

3 X 15 = 45

1. Draw the cycloid formed by rolling circle of 50 mm in diameter.
2. Draw a helix when the cylinder diameter is 50 mm and pitch 120 mm.
3. Draw the development of Duct shown in Fig. 1.

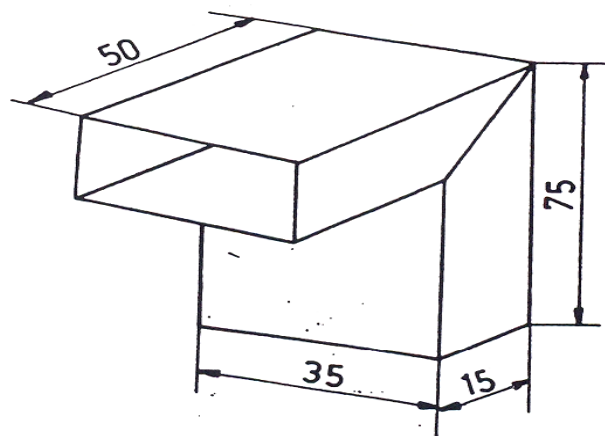


Fig. 1

4. A hexagonal prism of base side 40 mm and axis length 80 mm is lying on the HP on one of its

rectangular faces with its axis inclined at 60° to the VP. It is cut by a plane of which makes 45°

with the XY. The cutting plane nearest to the HP is 14 mm above it. Draw the front view, sectional

top view and the true shape of the section.

PART-B

30

5. Draw the isometric view of the object shown in Fig. 2.

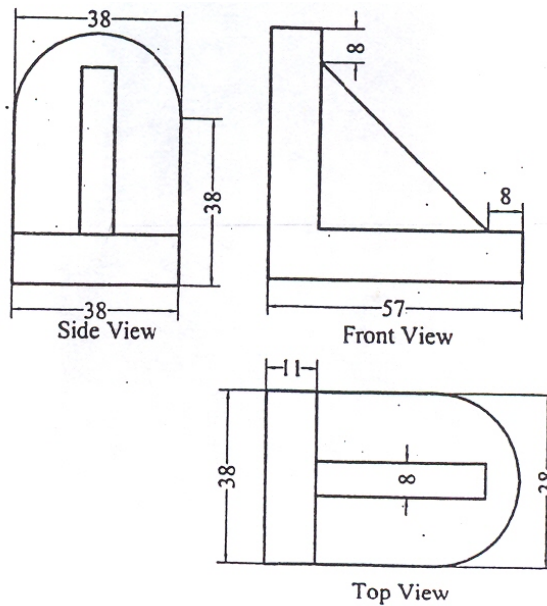


Fig. 2

MODEL QUESTION PAPER - 2

Time : 3Hours

Max. Marks :

75

[N.B. (1) First angle projection is to be followed. (2) All the questions are to be answered in drawing sheet supplied. (3) All dimensions are in mm. (4) Credit will be given for neatness.]

PART-A (Answer any three questions. Fourth question is compulsory. Each question carries fifteen marks.)

3 X 15 = 45

1. A coin of diameter 30 mm rolls along a straight line without slip. Draw the locus of the coin.
2. Draw one and half turn of an involute of a circle of 50 mm diameter.
3. A triangular pyramid of side of base 30 mm and height 60 mm is resting on its base on HP such

that a triangular face is parallel to VP. It is cut by a plane perpendicular to VP, inclined at 30° to

HP and passing through a point on the axis 25 mm from the base. Develop the lateral surface of

the truncated triangular pyramid.

4. A cylinder of diameter 40 mm and height 60 mm rests on its base on the HP. It is cut by a plane

perpendicular to the VP and inclined at 30° to the HP. The plane bisects the axis. Draw the front

view, sectional top view and true shape of the section.

PART-B

30

5. Draw the isometric view of the object shown in Fig. 1.

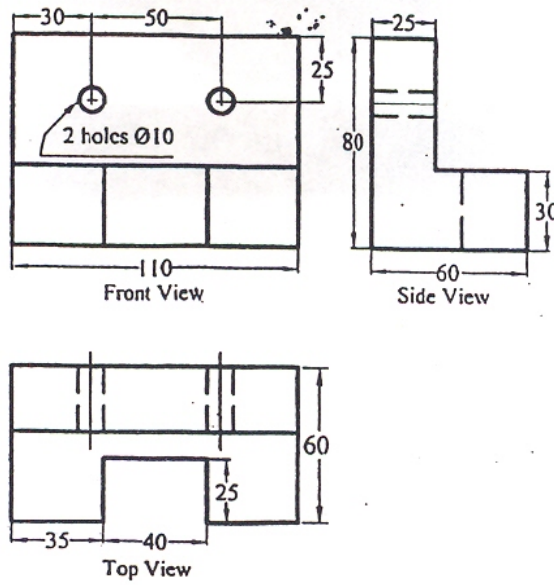


Fig. 1

SANDWICH DIPLOMA COURSE - INDUSTRIAL TRAINING

MEB480 INDUSTRIAL TRAINING - I MEB680 INDUSTRIAL TRAINING - II

1. Introduction

The main objective of the sandwich Diploma Course is to mould a well rounded technician acclimated with industrial environment while being a student in the institution.

The Sandwich Diploma Course study is pursued by students, in 7 semesters of 3½ years duration, the subjects of 3 years - Full Time Diploma Course being regrouped for academic convenience.

While in the 4th semester students under Industrial Training for 6 months (December through May). They also do course work in the institution for one day in a week, While in the 7th semester they undergo another spell of 6 months (June through November) industrial training.

The Apprenticeship (Amendment) Act 1973 is followed in regulating the Industrial training procedure for Sandwich Course.

I SEM	II SEM	III SEM	IV SEM	V SEM	VI SEM	VII SEM
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I Semester – Institutional Study

II Semester - Institutional Study

III Semester - Institutional Study

IV Semester - Industrial training First Spell(December - May)

V Semester - Institutional Study

VI Semester - Institutional Study

VI Semester - Industrial training Second Spell (June - November)

2. Attendance Certification

Every month students have to get their attendance certified by industrial supervisor in the prescribed form supplied to them. Students have also to put their signature on the form and submit it to the institution supervisor. Regularity in attendance and submission of report will be duly considered while awarding the sessional mark.

3. Training Reports

The students have to prepare two types of reports:

Weekly report in the form of diary to be submitted to the concerned staff incharge of the institution. This will be reviewed while awarding sessional marks.

Comprehensive report at the end of each spell which will be used for Board Examination.

3.1 Industrial Training Diary

Students are required to maintain the record of day - to- day work done. Such record is called Industrial training Diary. Students have to write this reports regularly. All days for the week should be accounted for clearly giving

attendance particulars (Presence, Absence, Leave, Holidays etc). The concern Industrial supervisor is to check periodically these progress reports.

3.2 Comprehensive Training Report

In addition to the diary, students are required to submit a comprehensive report on training with details of the organisation where the training was undergone after attestation by the supervisors. The comprehensive report should be incorporating study of plant/ product /process/ construction along with intensive in-depth study on any

one of the topics such as processes, methods, tooling, construction and equipment, highlighting aspects of quality, productivity and system. The comprehensive report should be completed in the last week of Industrial training. Any data, drawings etc should be incorporated with the consent of the Organisation.

4. Scheme of Evaluation

4.1 Sessional Marks

First review (during 3rd month)	: 10 marks
Second review (during 5th month)	: 10 marks
Attendance	: 05 marks (Awarded same as in Theory)
Total	: 25 marks

4.2 Board Examination

Presentation about Industrial Training	: 20 marks
Comprehensive Training Report	: 30 marks
Viva-voce	: 25 marks
Total	: 75 marks