

DRAFT CURRICULUM & SYLLABUS – 2008

K SCHEME

DIPLOMA IN MECHANICAL ENGINEERING

**DIRECTORATE OF TECHNICAL EDUCATION,
TAMILNADU**

**DIPLOMA COURSES IN MECHANICAL ENGINEERING
(FULL TIME)
SEMESTER SYSTEM
(Implemented from 2007- 2008)**

K - SCHEME

REGULATIONS

1. Description of the Course

The Course for the Diploma in Engineering shall extend over a period of three academic years, consisting of 6 semesters and the First Year is common to all Engineering Branches.

Each Semester will have 16 weeks duration of study

The Curriculum for all the 6 Semesters of Diploma Programmes (Engineering & Special Diploma Programmes) have been revised and revised curriculum is to be implemented for the candidates admitted from 2007 – 2008 onwards.

The salient features of this revised curriculum under 'K' Scheme are:

- ❖ Removal of obsolete portions
- ❖ Addition of topics covering of new technology, new industrial practices to cope up with the modern trends in Engineering and Services.
- ❖ Inclusion of Professional Ethics
- ❖ Creation of consciousness about Environment Management
- ❖ Preparing the students to tackle emergency situations due to various disasters
- ❖ Adoption of Industrial Safety Practices
- ❖ Offering electives to suit the local needs of industries
- ❖ Laying more stress on Communication English
- ❖ Training in Soft Skills
- ❖ Enhancement of Computer Skills
- ❖ Enhanced Practical Skills to supplement the theory learnt
- ❖ Introduction of Continuous Internal Assessment
- ❖ Conduct of Periodical Tests and Assignments and uniformity in assigning sessional marks
- ❖ Listing of Equipment, Instruments/ manuals along with the Practical Experiments
- ❖ Revised Question Paper pattern to test the in-depth knowledge of students.

2. Eligibility for the Award of Diploma

No candidate shall be eligible for the Diploma unless he/she has undergone the prescribed course of study for a period of not less than 3 academic years in an institution when joined in First Year and two years if joined under Lateral scheme in the second year, affiliated to the State Board of Technical Education and Training, Tamilnadu and has passed the prescribed examination.

3. Subject of study and curriculum outline

The subjects of study shall be in accordance with the syllabus prescribed from time to time, both in theory and practical. The curriculum outline for III, IV, V and VI Semester is given in

Annexure-I

4. Examinations

Board Examinations in all subjects of all the semesters under the scheme of examinations will be conducted at the end of each semester.

The sessional marks in all the subjects will be awarded on the basis of continuous internal assessment earned during the semester concerned. For each subject 25 marks are allotted for sessional marks and 75 marks are allotted for Board Examination.

5. Continuous Internal Evaluation

Theory

It has been decided to introduce Continuous Internal assessment marks for a total of 25 marks, which are to be distributed as follows:

Attendance

5 Marks

(Award of marks for attendance will be as per the range given below)

80%	-	83%	1 Mark
84%	-	87%	2 Marks
88%	-	91%	3 Marks
92%	-	95%	4 Marks
96%	-	100%	5 Marks

Test

10 Marks

3 Tests each of 2 hours duration for a total of 30 marks is to be conducted out of which the best two will be taken and the marks to be reduced to 10.

TEST	UNITS	WHEN TO CONDUCT	MARKS
Test – I	Unit – I	End of 4 th week	30
Test – II	Unit – II & III	End of 10 th week	30
Test – III	Unit – IV	End of 14 th week	30

Question Paper Pattern for Periodical Test:

5 Questions X 1 mark	... ..	05 marks
5 Questions X 2 marks	... ..	10 marks
3 Questions X 5 marks	... ..	15 marks
		<u>30 marks</u>

Model Examination covering all 5 units for 75 marks and 3 hrs. duration.

Assignment

10 Marks

For each subject three Assignments are to be given each for 20 marks and the average marks scored should be reduced for 10 marks

All Test Papers and assignment note books after getting the signature from the students must be kept in the safe custody in the Department for verification and audit. It should be preserved for a Semester for Academic Audit.

Practical

The internal assessment mark calculation for Practical subjects is given as follows:-

a)	Attendance	: 5 Marks - evaluation pattern same as Theory
b)	Procedure/ observation and tabulation/ other related Practical Work	: 10 Marks
c)	Result	: 5 Marks
d)	Record writing	: 5 Marks
	TOTAL	: 25 Marks

The Record for every completed exercise should be submitted in the subsequent Practical classes and marks should be awarded for 20 for each exercise as per the above allocation.

At the end of the Semester, the average marks of all the exercises should be calculated for 20 marks and the marks awarded for attendance is added to arrive at the internal mark for Practical.

All the mark entries for assignment, Test and attendance should be entered in the Personal Log Book of the staff handling the subject. This is applicable to both Theory and Practical subjects.

6. **Communication Skill Practicals**

The Communication Skill Practical with more emphasis is being introduced in IV Semester for Circuit Branches and in V Semester for other branches of Engineering.

Much Stress is given on:

- ❖ Reading Skill
- ❖ Listening Skill
- ❖ Writing Skill
- ❖ Pronunciation
- ❖ Interview Techniques
- ❖ Writing Resumes

Internal Assessment Mark 25 Marks

Board Examination Mark Allocation

Allocation of Marks

Communication Practicals 45 Marks

Written Test in Professional Ethics for 1 Hour

Professional Ethics 15 X 2 30 Marks

Selection of 15 Questions (15 X 2 marks) should be only from the Question Bank given by the External Examiner with out any choice.

7. **Project Work**

The students of all the Diploma Programmes (except Diploma in Modern Office Practice)

have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamilnadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. The selection of Project work should be taken up in V Sem.

of study. The First Project review should be done in 14th week of study in V Semester. The Second Project Review should be done in the 8th week of study in the VI Semester.

a) Internal Assessment mark for Project Work & Viva Voce:

Project Review I	(V Sem.)	...	05 marks
Project Review II	(VI Sem.)	...	05 marks
Project Review III	(VI Sem.)	...	10 marks
Attendance			05 marks
Total	....	....	<u>25 marks</u>

b) Project Work & Viva Voce Board Examination

The allocation of Mark:

Viva Voce	...	15 marks
Project Report	...	10 marks
Demonstration	...	15 marks
Applicability of the Project	...	05 marks
Total	...	<u>45 marks</u>

Written Test in 3 topics for 1 hour:

a) Entrepreneurship	5 questions X 2 marks	=	10 marks
b) Environment Management	5 questions X 2 marks	=	10 marks
c) Disaster Management	5 questions X 2 marks	=	10 marks
			<u>30 marks</u>

Selection of Questions from Question Bank by the External Examiner, no choice need be given to the candidates.

8. Scheme of Examinations

The Scheme of examinations for subjects in the III, IV, V and VI Semester are given in **Annexure-II**

9. Criteria for Pass

1. No candidate shall be eligible for the award of Diploma unless he/she has undergone the prescribed course of study successfully in an institution approved by AICTE and affiliated to the

State Board of Technical Education & Training, Tamil Nadu and pass all the subjects prescribed in the syllabus.

2. A candidate shall be declared to have passed the examination in a subject if he/she secures not less than 40% in theory, drawing subjects and 50% in practical subject out of the total prescribed maximum marks including both the sessional and the Board Examination marks put together, subject to the condition that he/she has to secure at least a minimum of 30 marks out of 75 marks in the Board's Theory/Drawing and a minimum of 35 marks out of 75 marks in the Practical Examinations.

10. Classification of successful candidates

Classification of candidates who pass out the final examination from April 2010 onwards (joined in first year in 2007-2008) will be done as specified below:

FIRST CLASS WITH HONOURS

A candidate will be declared to have passed in First Class with Honours if he/she secures not less than 75% of the aggregate marks in all semesters put together, except I and II Semester and passes all the above Semesters in the first appearance itself and completes all papers including that of I & II Semester within the stipulated period of study 3/ 3½/ 4 years (Full Time/Sandwich/Part Time) without any break in study.

FIRST CLASS

A candidate will be declared to have passed in First Class if he/she secures not less than 60% of the aggregate marks in all semesters put together except I & II Semesters and completes all papers including that of the I & II Semester within the stipulated period of study 3/ 3½ / 4 years (Full Time/Sandwich/Part Time) without any break in study.

SECOND CLASS

All other successful candidates will be declared to have passed in Second Class. The above mentioned classification is applicable for the Sandwich / Part-Time students who pass out Final Examination from October 2010 /April 2011 onwards (both joined in First Year in 2007-2008)

10. **DURATION OF A PERIOD IN THE CLASS TIME TABLE**

The duration of each period of teaching in a day is 1 hour and the total period of Instruction hours excluding interval and Lunch break in a day should be uniformly maintained as 7 hours corresponding to 7 periods of instruction (Theory & Practical)

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**Curriculum and Scheme of Examination
Diploma in Mechanical Engineering (Full Time)
(With effect from 2008-2009)**

K - Scheme

Total Curriculum Hours : 35 Hours / Week

Total Working Hours : 35 Hours / Week
16weeks/Semester

III Semester

Sl. No	Subject Code	Subject	Hrs per week	Scheme of Exam				
				Duration of Exam Hours				Min. Marks for Pass
					IA	BE	Total	
1	2031	Mechanics of Materials	6	3	25	75	100	40
2	2032	Manufacturing Process*	5	3	25	75	100	40
3	2033	Fluid Mechanics & Fluid Power	6	3	25	75	100	40
4	2034	Machine drawing & AutoCAD* \$	8	3	25	75	100	50
5	2035	Mechanics of Materials & Fluid Mechanics Lab.	4	3	25	75	100	50
6	2036	Work shop – I (Smithy, Foundry, Welding)*	6	3	25	75	100	50

IV Semester

Sl. No	Subject Code	Subject	Hrs per week	Scheme of Exam				
				Duration of Exam Hours				Min. Marks for Pass
					IA	BE	Total	
1	2041	Applied Thermodynamics*	6	3	25	75	100	40
2	2042	Machine shop Technology*	6	3	25	75	100	40
3	MEK-430	Electrical & Electronics Engineering	5	3	25	75	100	40
4	2054	Thermodynamics Lab	6	3	25	75	100	50
5	MEK-460	Electrical & Electronics Engineering Lab	6	3	25	75	100	50
6	2046	Workshop II (Turning, Drilling and Shaping)*	6	3	25	75	100	50

V Semester

Sl. No	Subject Code	Subject	Hrs per week	Scheme of Exam				
				Duration of Exam Hours	Total Marks			Min. Marks for Pass
			IA		BE	Total		
1	2051	Design of Machine Elements \$	6	3	25	75	100	40
2	2052	Thermal Engineering	6	3	25	75	100	40
3	2053	Elective Theory-I	5	3	25	75	100	40
4	2054	Communication skills Practical*	6	3	25	75	100	50
5	2055	Elective Practical – I	6	3	25	75	100	50
6	2056	Workshop – III(Slotting, Planning, Milling, Grinding & CNC turning)	6	3	25	75	100	50

<u>Elective Theory-I</u>	<u>Elective Practical-I</u>
1. Refrigeration and Air Conditioning 2. Metrology, Machine Tool Maintenance & Testing	1. Refrigeration and Air Conditioning Lab 2. Metrology, Machine Tool Maintenance & Testing Lab

VI Semester

Sl. No	Subject Code	Subject	Hrs per week	Scheme of Exam				
				Duration of Exam Hours	Total Marks			Min. Marks for Pass
			IA		BE	Total		
1	2061	Industrial Engineering & Management \$	6	3	25	75	100	40
2	2062	Computer Aided Design and Manufacturing * \$	6	3	25	75	100	40
3	2063	Elective Theory –II	5	3	25	75	100	40
4	2064	Computer Aided design and Manufacturing Practical *	6	3	25	75	100	50
5	2065	Elective Practical-II	6	3	25	75	100	50
6	2066	Project work, Entrepreneurship, Environment and Disaster management *	6	3	25	75	100	50

<u>Elective Theory-II</u>	<u>Elective Practical-II</u>
1. Automobile Technology 2. Mechatronics	1. Automobile Technology 2. Mechatronics

* Common with Diploma in Mechanical Engineering

2031 MECHANICS 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.
- Describe the power transmission by the belt, chain and gear drives.

SCHEME OF INSTRUCTION AND EXAMINATION

Subjects	Instructions		Examinations		
	Hours/Week	Hours/Semesters	Internal	Board Exam	Total
2031- Mechanics of materials	6	96	25	75	100

TOPICS AND ALLOCATION

Unit	Topic	TIME (Hrs)
I.	1.1 Mechanical properties of materials	18
	1.2 Simple stresses and strains	
II.	2.1 Geometrical properties of sections	18
	2.2 Thin cylinders and then spherical shells	
III.	3.1 Shear force and Bending moment diagrams	18
	3.2 Theory of Simple bending	
IV.	4.1 Torsion	18
	4.2 Springs	
V.	5.1 Deflection of beams	18
	5.2 Friction	
	5.3 Gear drives and Belt drives	
	Revision and test	6
	TOTAL	96

UNIT I

1.1 Mechanical properties of materials:

Introduction - Definition of mechanical properties such as strength – elasticity, plasticity, ductility, malleability, stiffness, toughness, brittleness, hardness, wear resistance, machinability, cast ability and weld ability – Fatigue, Fatigue strength, creep – temperature creep – cyclic loading and repeated loading – endurance limit.

1.2 Simple stresses and strains:

Introduction – Definition – Load, stress and strain – Classification of force systems – tensile, compressive and shear force systems – Behavior of mild steel in tension upto rupture – Stress – Strain diagram – limit of proportionality – elastic limit – yield stress – breaking stress – Ultimate stress – 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 – volumetric strain of rectangular and circular bars – problems connecting linear, lateral and volumetric deformation – Elastic constants and their relationship (No derivation) – 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 (no Derivation) – 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

2.1 Geometrical properties of sections:

Introduction – Definition – Thin and thick cylindrical shell – Failure of thin cylindrical shell subjected to internal pressure – Derivation of Hoop and longitudinal stress causes in a thin cylindrical shell subjected to internal pressure – simple problems – change in dimensions of a thin cylindrical shell subjected to internal pressure – problems – Derivation of tensile stress induced in a thin spherical shell subjected to internal pressure – simple problems – change in diameter and volume of a thin spherical shell due to internal pressure – problems.

UNIT III

3.1 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.

3.2 Theory of simple bending

Introduction – theory of simple bending – Assumptions – Neutral axis – bending stress distribution – moment of resistance – Flexural formula – Definition – section modulus - rectangular and circular sections – strength of beam – simple problems involving flexural formula for cantilever and simple supported beam.

UNIT IV

4.1 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.

4.2 Springs

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

UNIT V

5.1 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 – simple problems.

5.2 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.

5.3 Gear drives and Belt Drives

Introduction – classification of gears – Nomenclature of a gear – Explanation and application of spur, helical and bevel gears, worm and worm wheel, rack and pinion – Velocity ratio of a gear drive – merits and demerits of gear drive – problems on simple gear train and Power transmitted by gear .

Belt drive – types-open belt drive – cross belt drive – flat belt drive – v belt drive - problems on power transmitted

Text Books:

1. Applied Mechanics by A. K. Upadhyay
2. Strength of Materials by R. S. Kurmi

Reference Book:

1. Applied Mechanics by SB Jun narkar, Dr. HJ Shara
Charater publishing house, Anand 388001. 16 th Edn 2001
2. Strength of Materials by S. Ramamrutham,
Dhanpat Rai Pub. Co. New Delhi. 15 th Edn 2004

2032 MANUFACTURING PROCESS

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 working of a lathe and its 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.

SCHEME OF INSTRUCTION AND EXAMINATION

Subject	Instruction		Examination		
	Hour/Week	Hours/Semester	Assessment Marks		
2032 Manufacturing Process	5	80	Internal	Board Exam	Total
			25	75	100

TOPICS AND ALLOCATION:

UNIT	TOPIC	TIME (Hours)
I.	Foundry	17
II.	Forging and Welding	14
III.	Powder Metallurgy and Heat Treatment	12
IV.	Lathe Work And Theory of Metal Cutting	13
V.	Metrology and Semi – Automatic and Automatic Lathe	12
	Revision Test	12
	Total	80

UNIT – I FOUNDRY

PATTERNS – definition – pattern materials – factors for selecting pattern materials – single piece solid, split patterns – pattern allowances – core prints – use of core boxes.

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 – casting using green sand and dry sand mould.

CASTING – definition – sand casting – gravity die casting – pressure die casting – hot and cold-chamber casting – centrifugal casting – continuous casting – chilled casting – malleable casting – melting of cast iron – cupola furnace – melting of non ferrous metals – crucible and arc furnaces – induction furnaces – instrument for measuring temperature – optical pyrometer – thermo electric pyrometers – cleaning of casting – tumbling, trimming sand and shot blasting – defects in casting – causes and remedies – safety practices in foundry.

UNIT – II FORGING AND WELDING

Hot working – advantages of hot working – hot working operations – rolling – forging, hammer or 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 – oxy – acetylene welding – 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 – three types of flames – gas welding equipment.

UNIT – III POWDER METALLURGY AND HEAT TREATMENT OF METALS

Methods of manufacturing metal powders – atomization of oxides and electrolytic deposition – pressing operation – sintering – hot pressing – sizing – infiltration – mechanical properties of parts made by powder metallurgy – design rules for the powder 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

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 – lathe attachments – tool post grinders – milling attachments.

Methods of taper turning in lathe – cutting tool materials – high carbon steel – high speed steel – satellite – carbide – ceramic single point tool – nomenclature – chip breakers – tool life – cutting speeds and feeds.

UNIT – V

METROLOGY AND SEMI – AUTOMATIC AND AUTOMATIC LATHE

Metrology – 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.

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.

Reference Book:

1. Elements of workshop Technology Volume I & II by Hajra Chowdry & Bhattacharaya.
2. Manufacturing process by Begeman.
3. Workshop Technology Volume I, II, & III by Chapman.
4. Workshop Technology by Raghuwanshi.
5. Production Technology by Jain & Gupta.
6. Production Technology by P. C. SHARMA
7. HMT manual.
8. A Text book of workshop Technology by R. S. Khurmi & J. K. Gupta
9. Manufacturing Engineering & Technology by Kalpakjian.

2033 FLUID MECHANICS & FLUID POWER

6 Hrs/Week

16 Weeks / Sem

Total Hrs : 96

OBJECTIVES:

- Define the properties of Fluids.
- Explain the working of pressure measuring devices
- 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.

SCHEME OF INSTRUCTION AND EXAMINATION

Subject	Instruction		Examination		
	Hours/week	Hours/Semester	Assessment Marks		
2033 – Fluid Mechanics & Fluid Power	6	96	Internal	Board Exam	Total
			25	75	100

TOPIC AND ALLOCATION

UNIT	TOPIC	TIME (Hrs)
I	Properties of Fluids and Pressure Measurements	16
II	Flow of Fluids and Flow through Pipes	18
III	Impact of Jets, Hydraulic Turbines, Centrifugal and Reciprocating Pumps	20
IV	Pneumatic Systems	15
V	Hydraulic Systems	15
	Revision Test	12
	Total	96

UNIT-I PROPERTIES OF FLUIDS AND PRESSURE MEASUREMENTS

- 1.1 Introduction-Definition of fluid-Classification of Fluids-ideal and real fluids-Properties of a fluid – definition and units.
- 1.2 Pressure-units of Pressure-Pressure head-atmospheric, gauge and absolute pressure-problems-Pascal's law-proof-applications of Pascal's law-Hydraulic press- Hydraulic jack
- 1.3 Pressure measurement-Piezometer tube- Simple U-tube manometer-Differential U-tube manometer-Inverted Differential manometer-Micromanometer-Inclined tube micromanometer
- 1.4 Mechanical Gauges-Bourdon's Tube Pressure Gauge-Diaphragm pressure gauge-Dead weight pressure gauge

UNIT-II FLOW OF FLUIDS AND FLOW THROUGH PIPES

- 2.1 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.
- 2.2 Bernoulli's theorem-statement, assumptions and proof-applications and limitations of Bernoulli's theorem-problems on Bernoulli's theorem- venturi meter-derivation for discharge-orifice meter-derivation for discharge-difference between venturi meter and orifice meter-problems on venturi meter and orifice meter - Pitot tube –theory only (no problems)
- 2.3 Orifice-types-applications-hydraulic coefficients-determining hydraulic coefficients –problems-discharge through a small orifice discharging freely only-problems –Experimental method of finding C_v , C_c and C_d .
- 2.4 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)-no problems-Power transmission through pipes- problems.

UNIT-III IMPACT OF JETS, HYDRAULIC TURBINES, CENTRIFUGAL AND RECIPROCATING PUMPS

- 3.1 Impact of jet-on a stationary flat plate held normal to the jet and inclined to the direction of jet-Impact of jet on a flat plate moving in the direction of jet- Impact of jet on a series of moving plates or vanes-force exerted and work done by the jet-problems.
- 3.2 Hydraulic turbines-classifications-Pelton wheel-components and working-speed regulation (theory only)-Francis and Kaplan turbines- components and working-draft tube-functions and types-surge tank-differences between impulse and reaction turbines.

3.3 Centrifugal Pumps-classifications-construction and working of single stage centrifugal pumps-components with types- theory only-multi stage pumps-advantages-priming – manometric, mechanical ,overall efficiencies-definitions only-no problems-cavitation.

3.4 Reciprocating Pumps- classifications-construction and 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 vessel(functions and working)

3.5 Special pumps-jet pump-Turbine pump-Submersible pump.

UNIT-IV 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 – flow control vales – throttle valves –shuttle valves – 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 - operation of double acting cylinder with 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 ad demerits of pneumatic system-applications.

UNIT-V HYDRAULIC SYSTEMS

5.1 Hydraulic system-elements-merits and demerits-service properties of hydraulic fluids.

5.2 Hydraulic accumulator-weighted or gravity type accumulator - spring loaded type accumulator-gas filled bladder accumulator-pressure intensifier.

5.3 Fluid power pumps-external and internal gear pump, vane pump, radial piston pump 5.4 ISO symbols for hydraulic components –hydraulic circuit using sequencing valve-hydraulic circuit using counter balance valve- hydraulic circuit for shaping machine, surface grinding machine, milling machine.

5.5 Comparisons of hydraulic and pneumatic systems.

Reference Books :

1. Hydraulic Machines - Jagadishlal
2. Fluid Mechanics and Hydraulic Machines - R.K.Bansal
3. A Text Book of Hydraulics, Fluid Mechanics and Hydraulic Machines - R.S.Khurmi

4. A Text Book of Hydraulics - R.K.Rajput
 5. Hydraulics and Pneumatics
 (A Technician's and Engineer's Guide) - Andrew Parr
 6. Fundamentals of Pneumatic control Engineering - FESTO manual

2034 MACHINE DRAWING AND CAD

8 Hrs/Week

16 Weeks /Sem

Total Hrs : 128

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 soft 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.

SCHEME OF INSTRUCTION AND EXAMINATIONS:

Subject	Instruction				Examination		
	Theory / Week	Theory / Semester	Practical / Week	Practical / Semester	Assessment Marks		
					Internal	Board Exam	Total
2034 Machine drawing and CAD	2	32	6	96	25	75	100

TOPIC AND ALLOCATION

Unit	Topic	Time (Hrs)
I.	Section views	4
II.	Limits, fits and tolerances	8
III.	Keys and surface finish	6
IV.	Screw threaded fasteners	6
V.	CAD Drawings	66
	Revision and Test	6
	Total	96 Hrs

CAD Drawing

1.	Sleeve and cotter joint	3Hrs
2.	Socket and spigot cotter joint	3Hrs
3.	Gib and cotter joint	6Hrs
4.	Knuckle joint	6Hrs
5.	Flange coupling – protected type	6Hrs
6.	Universal coupling	6Hrs
7.	Bushed bearing	6Hrs
8.	Plummer block	6Hrs
9.	Swivel bearing	6Hrs
10.	Simple eccentric	6Hrs
11.	Machine vice	6Hrs
12.	Screw Jack	6Hrs
	Total	66 Hrs

UNIT I SECTION VIEWS:

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:

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:

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

Introduction – Nomenclature of screw threads – Basic profiles or 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 – Rivedted head – Types.

Text Books

1. Machine Drawing – N. D. Bhaff
2. Machine Drawing – K. R. Goplakrishnan

Reference Book

A First year Engineering Drawing
By A. C. Park is san
First Rep 1982
A. H. Wheeler & Company (P) Ltd,
15, L. B. Shastri marg
Allaghabed – 211 001.

2035 MECHANICS OF MATERIALS & FLUID MECHANICS LAB

4 Hrs/Week

16 Weeks / Sem

Total Hrs : 64

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.

Scheme of Instructions and Examinations

Subject	Instruction		Examination		
	Hours/week	Hours/Semester	Assessment Marks		
2035 – Mechanics of materials & Fluid Mechanics lab	4	64	Internal	Board Exam	Total
			25	75	100

I MECHANICS 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)

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: Either 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: Either Pneumatic trainer kit with air compressor (or) Hydraulic trainer kit with hydraulic power pack)

2036 (WORKSHOP – I)
(SMITHY, FOUNDRY & WELDING)

6 Hrs/Weeks

16 Weeks / Sem

Total Hrs : 96

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.

SCHEME OF INSTRUCTION AND EXAMINATION

Subjects	Instructions		Examinations		
			Assessment Marks		
2036 (Workshop – I) (Smithy, Foundry & Welding)	Hours/Week	Hours/Semesters	Internal	Board Exam	Total
		6	96	25	75	100

DETAILED SYLLABUS

Foundry

Syllabus

1. Introduction to study of tools and equipments
2. Types of patterns
3. Types of sand
4. Preparation of sand moulds
5. Furnaces, crucible furnace, melting of non-ferrous metal
6. Making of castings by sand moulds
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-joint
2. Split pattern
 - a. Pipe bend
 - b. Tumbles
3. Cylindrical core making
4. Melting and casting– (Not for Examination, only for class exercises)
Melting non ferrous metal and making sand casting

Welding**OBJECTIVES:**

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

- Acquire knowledge about welding transformer, generator and select proper electrode and welding current.
- Adjust oxyacetylene flame.
- Prepare different types of edges
- Form uniform beeding
- Identify different welding defects.

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
5. Defects in welding joints.

Exercise:

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

Smithy**OBJECTIVES:**

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

- Identify the tools and equipments used in smithy
- Use proper tools and equipments
- Operate smith furnace
- Identify the various operation in smithy
- Make components in smithy

Syllabus:

1. Introduction to safety in smithy shop
2. Introduction of hand tools and equipments
3. Details of operation done 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.

EXAMINATION SCHEME:

Topic	Marks	Duration
Foundry	45	2 Hours
Any one by lot Welding / Smithy	25	1 Hours
Viva Voce	5	
Internal Assessment	25	
Total	100	3 Hours

Minimum Marks for pass: 50
LIST EXPERIMENTS / EXERCISES

Foundry:

1. Stepped Pulley pattern
2. Bearing top pattern
3. Gear Wheel pattern
4. T-joint pattern
5. Pipe bend pattern
6. Tumbles pattern
7. Cylindrical core
8. Oil fired furnace
9. Pit furnace

Welding

Arc Welding

10. Lap joint (Material: 25mm x 3mm Ms Flat)
11. Butt joint (Material: 25mm x 6mm Ms Flat)
12. T-joint (Material: 25mm x 3mm Ms Flat)
13. Corner joint (Material: 25mm x 3mm Ms Flat)

Gas Welding

14. Lap joint (Material: 25mm x 3mm Ms Flat)
15. Butt Joint (Material: 25mm x 6mm Ms Flat)
16. Gas cutting: Profile cutting

17. Soldering and brazing (Demonstration only)

Smithy

18. Round rod to hexagonal rod

19. Round rod to square rod

20. Round rod to square headed bolt

21. Round rod to any simple letters like 'S'

22. Round rod to flat with 25mm.

18...22 (6 hrs/week) (18 to 22 exercises for practical having 6 hrs / week)

14...16 (14 to 16 exercises for practical having 6 hrs / week)

List of Equipment, Instruments, material, manual etc required to impart / do above experiment / exercises with numbers for a batch of 30 students.

Foundry

1. Shovel

2. Rammer. (pin, round)

3. Trowel

4. Straight wood

5. Liften or cleaner

6. Vent wires

7. Runner

8. Riser

9. Moulding Bod (Flasks)

Solid pattern

10. Stepped Pulley pattern

11. Bearing top pattern

12. Gear Wheel pattern

13. T-joint pattern

14. Pipe bend pattern

15. Tumbles pattern

16. Coupola

17. Pit furnace

Welding

Instruments

1. Arc Welding

1. Welding generator with a welding transformer. -2 nos
2. Power supply (100-140 amps)
3. M. S flare 50X6 mm

Gas Welding

Instruments

1. Oxy – Acetylene cylinder
2. Oxygen Pressure Regular
3. Acetylene pressure regulator
4. Typical medium pressure welding blow pipe

Tools for both arc welding and gas welding

1. Electrode holder
2. Gloves leather 6 nos
3. Apron leather -6 nos
4. Chipping hammer
5. Tongs
6. Steel wire brush
7. Goggles
8. Hand shield
9. Chipping machine
10. M. S electrode (4-16 SWG)
11. Flat file -12" rough 12-nos
12. Welding Holder.

Smithy

Tools

1. Furnace or hearth
2. Anvil
3. Chisel (Flat chisel, cold chisel, hot chisel)
4. Centre Punch
5. Close Tongue

6. Hollow bit tongue
7. Hammers (Hand hammer, Sledge hammer, Power hammer)
8. Clod set
9. Swage block
10. Pick up tongs
11. Side bit tongs
12. Duck bill tongs
13. Fuller
14. Flatter set hammer
15. Gouges

2041 APPLIED THERMODYNAMICS

6 Hrs/Week

16 Weeks /Sem.

Total Hours : 96

Objectives:

- Explain the basics of systems and laws of thermodynamics, and thermodynamic processes.
- Explain different Air cycles.
- Apply steady flow energy equation for nozzles and condensers.
- Explain the types and functions of I.C. Engines.
- Explain the fuels and calorific value of fuels.
- Explain the performance tests on I.C. Engines.
- Compare the modes of heat transfer and evaluate the heat transfer by various modes.
- Familiarize parts, function and types of Air compressors and determine their efficiency.
- Describe the working of Gas turbines.

SCHEME OF INSTRUCTION AND EXAMINATION

Subjects	Instructions		Examinations		
	Hours/Week	Hours/Semesters	Internal	Board Exam	Total
2041- Applied Thermodynamics	6	96	25	75	100

TOPICS AND ALLOCATION

Unit	Topic	TIME (Hrs)
I.	Thermodynamic and Expansion of gases	18
II.	Steady flow energy equation and Air cycles	18
III.	Internal combustion engines	18
IV.	Fuels and Performance of IC Engine	18
V	Air compressors and gas turbines	18
	Revision and test	6
	TOTAL	96

Unit I: Thermodynamics and Expansion of gases

Introduction - definitions and units of mass, weight, volume, density, specific weight gravity - pressure - units - atmospheric, gauge, vacuum and absolute pressure - temperature - Celsius and absolute temperature - S.T.P and N.T.P conditions - heat - specific heat capacity at constant volume and at constant pressure - work - power - energy - types - thermodynamic system - types - properties and state of system - intensive and extensive properties - thermodynamic process - cycle - point and path function - law of conservation of energy - equilibrium - thermodynamic - zeroth, first and second law of thermodynamics- problems

Perfect gases - law of perfect gases - Boyle's, Charles', Joule's, Regnault's and Avagadro's law - characteristic gas equation - relation between specific heats and gas constant - universal gas constant - problems -enthalpy -change in enthalpy - entropy - change in entropy - general equation for change in entropy.

Expansion of gases - thermodynamic processes - constant volume, constant pressure, isothermal (hyperbolic), isentropic (reversible adiabatic), polytropic, free expansion and throttling processes - p-V and T-s diagrams, work done, change in internal energy, heat transfer, change in enthalpy, change in entropy for various processes - problems.

Unit II: Steady flow energy equation and Air cycles

Steady flow system - control volume - steady flow energy equation - applications- steam boiler - condenser -nozzles - steam and gas turbines -reciprocating and rotary compressors - non flow energy equation - problems.

Air cycles - air standard efficiency - reversible and irreversible processes - thermodynamic reversibility - conditions of reversibility assumptions in deriving air standard efficiency -Carnot cycle- Otto cycle - Joule cycle -Diesel cycle -comparison of Otto cycle and Diesel cycle- ideal and actual p-V diagram of Diesel cycles - comparison - problems - dual combustion cycle (description only).

Unit III : Internal combustion engines

Introduction - classifications -four stroke cycle petrol and diesel engines - merits and demerits - two stroke cycle petrol and diesel engines - comparison- constructional details of I.C.engine -components of engines - cylinder block ,crankcase, cylinder head , liners ,oil pan , piston , piston rings ,connecting rod, crank shaft, cam shaft, valve and valve train - material and manufacturing methods - valve timing diagram for four stroke petrol and diesel engines - port timing for four stroke petrol and diesel engines

Layout of fuel supply system in petrol engines - A.C. mechanical fuel pump- simple carburetor - Solex carburetor - layout of fuel supply system in diesel engine - single acting fuel feed pump - CAV fuel injection pump -fuel injectors -types of nozzles - fuel filters.

Ignition systems - compression and spark ignition - coil, magneto and electronic ignition systems - governing of I.C.engines - quantity and quality governing -cooling systems - air cooling - water cooling -merits and demerits .

Lubrication - purpose - properties of lubricant - types of lubrication system - oil pump and oil filters - scavenging - super charging- effects and applications - turbo charger.

Unit IV: Fuels & performance of I.C Engines

Fuels - classifications - merits and demerits - requirements of a good fuel - combustion of fuels - stoichiometric air required for complete combustion of fuels- excess air- products of combustion - problems - calorific value - Bomb and Junker's calorimeter - problems - Orsat apparatus for flue gas analysis - air pollution - effects and control of pollution

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

Unit V: Air Compressor and Gas Turbines

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 - merits and demerits - 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 - Roots, vane blowers - centrifugal and axial flow air compressors.

Gas turbines- classifications - advantages and disadvantages of gas turbines - constant pressure gas turbine - gas turbine with regenerator - inter cooler - reheater - effects - closed cycle gas turbines - merits and demerits of open and closed cycle gas turbine - turbojet engines- merits and demerits - turbo propeller engines- merits and demerits -ramjet- comparison of air - craft and industrial gas turbines.

Reference books:

1. Thermal engineering-P.L Ballaney
2. Thermal engineering-B.K Sarkar
3. Applied Thermodynamics-Domkundwar and C.P kothandaraman
4. Thermal Engineering-R.S.Khurmi and J.k..Gupta
5. Applied Thermodynamic-P.K.Nag

2042 MACHINE SHOP TECHNOLOGY

6 Hrs/Week

16 Weeks /Sem.

Total Hrs : 96

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.

SCHEME OF INSTRUCTION AND EXAMINATION

Subjects	Instructions		Examinations		
	Hours/Week	Hours/Semesters	Internal	Board Exam	Total
2042- Machine Shop Technology	6	96	25	75	100

TOPICS AND ALLOCATION

Unit	Topic	TIME (Hrs)
I.	Planer, Shaper and Slotter	18
II.	Drilling Machines and Milling Machines	18
III.	Grinding, Broaching, Boring and Jig Boring	18
IV.	Gear manufacturing Practice – Forming and Generating	18
V.	Jigs & Fixtures, Press working & Non-Conventional Machining process.	18
	Revision and test	6
	TOTAL	96

UNIT-I:
Planer:

Types of planers-description of double housing planer-specifications-principles of operation-drives-quick return mechanism-feed mechanism-types, 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-tools and fixtures.

Slotter:

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

UNIT -II:

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-reaming-counter sinking-counter boring-spot facing-tapping-deep hole drill-drill jigs.

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 collets-adaptors-milling cutters-plain milling cutter-slab milling cutter-slitting saw-side milling cutter-angle milling cutter-T-slot milling cutter-woodruff milling cutter-fly cutter-nomenclature of milling cutter-milling process-conventional milling-climb milling-milling operations-straddle milling-gang milling-vertical milling attachment-types of milling fixtures.

UNIT-III:

Grinding machines:

Types and classification-specifications-rough grinders-floor mounted hand grinders-portable grinders-belt grinders-precision grinders-cylindrical,surface,centreless grinders-internal grinders-planetary grinders-principles of operations-grinding wheels-abrasives-natural and artificial-dressing and truing of wheels-balancing of grinding wheels-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.

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 processes:

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

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, fibre-no problems.

UNIT-V:

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-curling-seaming-shearing operations-blanking, punching, curling off-trimming-notching-slitting-lancing-shaving.

Non-Conventional Machining process:

Ultrasonic machining-chemical machining-electro chemical grinding-electrical discharge machining-plasma arc machining-laser machining.

REFERENCE BOOKS:

1. Production Technology-HMT
2. Elements of Workshop Technology-VII & II-Hajra Choudry & Battacharya
3. Manufacturing process-Myro N Begman
4. Production Tech- Jain & Gupta
5. Workshop Tech Vol I, II, III-Chapman
6. Production processes TTTI, Chennai

MEK 430 ELECTRICAL & ELECTRONICS ENGINEERING

Total No. of Hours / Week : 5
Total No. of Weeks / Semester : 16
Total No. of Hours / Semester : 80

Scheme of Instruction and Examination

Subject	Instruction		Examination		
	Hours / Week	Hours / Semester	Assessment Marks		
MEK 430 ELECTRICAL & ELECTRONICS ENGINEERING	5	80	Internal	Board Exam	Total
			25	75	100

TOPICS AND ALLOCATION

UNIT	TOPIC	TIME (Hrs)
UNIT I	DC Circuits, Electromagnetism, AC Fundamentals and Batteries	14
UNIT II	DC Generator, DC Motor, Transformer and Alternator	14
UNIT III	AC Motors and Electrical Safety	14
UNIT IV	Basic Electronics and logic gates	13
UNIT V	PLC and stepper motor	13
	Revision and Test	12
	TOTAL	80

OBJECTIVES :

- To know the principles of DC and AC
- To understand the working and maintenance of batteries.
- To understand the concepts of magnetism.
- To know the working of DC Generators
- To know the applications of DC Generators.
- To understand the working of DC motors.
- To know the application of DC motors.
- To understand the working of Transforms and auto transformer.
- To know the working of Alternator.
- To know the working of single phase induction motor and 3 phase.
- To understand the causes and prevention of electric shock.
- To know about stepper motors and their working and applications.

- To know the working of PN junction diodes.
- To understand the working of SCR and their characteristics.
- To comprehend the logic gates.
- To understand the PLC.
- To apply PLC for specific function.

UNIT I – DC AND AC CIRCUITS AND BATTERIES

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

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

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.

UNIT IV – BASIC ELECTRONICS AND LOGIC GATES

Semiconductor materials – N type and P type – PN Junction – forward and reverse bias, characteristics of PN junctions 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.

UNIT V – PLC

PLC definition – features and benefits of PLC – 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 – types of contacts normally open (NO) contact, normally closed (NC) contract – ladder logic symbol – AND logic OR logic , truth table – steps involved in application circuits using a PLC – 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.

TEXT BOOKS

Sl.No.	Name of the Book	Author	Publisher
1.	Fundamentals of Electrical and Electronics Engineering	B.L. Theraja	S.Chand & Co.,
2.	Fundamentals of Electrical and Electronics Engineering	T. Thiyagarajan	Scitech Publicatiuons (India) Pvt.ltd.,
3.	Automation, Production System and Computer Integrated Manufacturing	Mikell P. Groover	PHI Pvt.Ltd.,
4.	Electrical Design Estimating and Costing	KB Raina & S.K. Battachariya	Willey Eastern Ltd., New Delhi
5.	Introduction to Programmable logic controls	Gary Dummy	Thomson Debnar learning second edition second reprint 2003

2044 THERMODYNAMICS LABORATORY

6 Hrs/Week

16 Weeks /Sem.

Total Hrs : 96

Objectives:

- Determine the flash point, power 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 of petrol Engine.
- Draw the port timing diagram of two stroke petrol engine.
- Conduct performance test on petrol engines.
- Conduct performance test on diesel engines.
- Identify the parts of a high pressure boiler and their applications.
- Prepare heat balance sheet for an I.C. Engine.

SCHEME OF INSTRUCTION AND EXAMINATION

Subjects	Instructions		Examinations		
	Hours/Week	Hours/Semesters	Internal	Board Exam	Total
2044- Thermodynamics Laboratory	6	96	25	75	100

Study Exercise: (Not for Examination)

1. Study of petrol engine & diesel engine and its components.
2. Study of high pressure boiler(with model).
3. Study of boiler mountings.
4. Study of boiler accessories.

List of experiments

1. Determining flash and fire points of the given oil using open cup apparatus.
2. Determining flash and fire points of the given oil using close cup apparatus.
3. Determining the absolute viscosity of the given lubricating oil using Redwood viscometer.
4. Determining the absolute viscosity of the given lubricating oil using Saybolt viscometer.
5. Valve timing diagram of four stroke cycle petrol engine.
6. Valve timing diagram of four stroke cycle diesel engine.
7. Port timing diagram of two-stroke cycle petrol engine.
8. Load test (Performance Test) on petrol engine.
9. Load test (Performance Test) on diesel engine.
10. Morse test on multicylinder petrol engine.
11. Heat balance sheet on I.C engine.
12. Emission test for petrol / diesel engine.
13. Volumetric efficiency of air compressor.

MEK 460 ELECTRICAL & ELECTRONICS ENGINEERING PRACTICAL

6 Hours / Week

16 Weeks/Sem.

Total Hours : 96 Hrs.

SCHEME OF INSTRUCTION AND EXAMINATION

Subjects	Instructions		Examinations		
	Hours/Week	Hours/Semesters	Internal	Board Exam	Total
MEK 460- Electrical & Electronics Engineering Practical	6	96	25	75	100

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 with / without filter and measure AC input and DC output voltage.
12. Construct a Full wave rectifier with / without filter and measure AC input and DC output voltage.
13. Construct a bridge Rectifier with / without filter and measure AC input and DC output voltage.
14. Verification of truth table for AND, OR, NOT, NOR, NAND, EXOR and EXNOR gates.

2046 WORK SHOP-II (Turning, Drilling, Shaping)

6 Hrs/Week

16 Weeks /Sem.

Total Hrs : 96

Objectives:

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

SCHEME OF INSTRUCTION AND EXAMINATION

Subjects	Instructions		Examinations		
	Hours/Week	Hours/Semesters	Internal	Board Exam	Total
2046- Workshop –II (Turning, Drilling & Shaping)	6	96	25	75	100

LATHE, DRILLING & SHAPING MACHINE

Syllabus:

1. Introduction of safety in operating machines.
2. Introduction to lathe, drilling machine & shaping machine and its parts.
3. Introduction to work holding devices and tool holding devices.
4. Types of tools used in lathe work, drilling & shaping.
5. Types of measuring instruments and their uses.
6. Setting of work and tools.
7. Operation of lathe, drilling & shaping.
8. Various operations performed on a lathe

Note: The dimensions may be modified according to the materials specified.

EXAMINATION SCHEME:

		Marks	Duration
I.	Lathe work } Shaping } Drilling }	70	3 Hrs
II.	Viva-Voce	5	
III.	Internal Assessment	25	
	Total	100	3 Hrs

Enclosures : Sketches of Lathe, drilling & shaping Exercises.

2051 DESIGN OF MACHINE ELEMENTS

6 Hrs/Week

16 Weeks / Sem.

Total Hrs : 96

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

SCHEME OF INSTRUCTION AND EXAMINATION

Subject	Instruction		Examination		
	Hours/week	Hours/Semester	Assessment Marks		
2051 - Design of Machine Elements	6	96	Internal	Board Exam	Total
			25	75	100

TOPICS AND ALLOCATION

UNIT	TOPIC	TIME (Hours)
VI.	Selection of Materials, Procedure for design, Design of Shaft	18
VII.	Design of bolt, Pins, Keys Design of cotter joint and couplings	16
VIII.	Design of Belts	16
IX.	Design of Bearings	16
X.	Design of Levers Design of Gears	18
	Revision Test	12
	Total	96

UNIT – I

1.1 Properties OF MATERIALS related TO MECHANICAL DESIGN

Factors affecting selection of materials – Ferrous metals – Cast Iron, wrought Iron, Steel, alloy steel
Non – ferrous metals – copper, alloys of copper, Aluminium – alloys of aluminium, Tin, Zinc
Procedure for designing machine elements – Types of failures.

1.2 Design of Shafts

Forces on the shaft due to belt drives – Maximum bending moment – Maximum Torque –
Determination of shaft size based on combined bending and twisting moments – Problems.

UNIT – II

2.1 Design of bolts, Pins and keys

Bolt – Stud – Nut – Design of bolted joints – Design of cylinder cover studs – Taper pins – Type of
keys – Effect of key ways in sunk keys – Feather keys and splined shafts – Design of sunk key –
Problems.

2.2 Design of Cutter Joint and Couplings

Design of – Sleeve and cutter joint – socket and spigot joint – rigid flange couplings – Problems.

UNIT – III

3.1 Design of Flat belts

Type of belts – materials for belts – Designation of belts – Belt drives – Slip – Design procedure for
flat belts – Design of flat belt based on Manufacturer's data – problem.

3.2 Design of V-belts

V-belt drives – Design of V-belt drives – Selection of V-belt by using Manufacturer's data – Problems.

UNIT – IV

4.1 Design of Bearing

Types of bearing – Ball bearing – Radial and thrust ball bearing – Single row – Double row – Self
aligning bearings – Roller bearings – Cylindrical, Spherical, Needle and taper – Standard dimensions
and designation of bearings – Materials used for balls and rollers – Lubrication of bearings – Journal

bearing – Heat generated – Heat dissipated – Design procedure for journal bearings – Problems
(Design questions based on approved data book only)

UNIT – V

5.1 Design of Levers

Type of levers – Application – Design of hand lever – Foot lever – Cranked lever – Problems.

5.2 Design of Gears

Type of Gears – Gear materials – Spur gear terminology – Lewis equation – Buckingham Equation – Design procedure for spur gear based on Buckingham – Lewis equation only – Problems (Based on approved data book only)

Text Book

- | | | |
|---------------------|---|--|
| 1. Machine Design | - | by Pandya & Shah |
| 2. Machine Design | - | by T. V. Sundararaja Moorthy & N. Shanmugam |
| 3. Design Data Book | - | PSG Tech |
| 4. Design Data Book | - | Bala Chitra Publishers |

Reference

1. A text book of machine design – by **R. S. Khurmi & J. K. Gupta**

2052 THERMAL ENGINEERING

6 Hrs/Week

16 Weeks /Sem.

Total Hrs : 96

Objectives:

- 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.

SCHEME OF INSTRUCTION AND EXAMINATION

Subjects	Instructions		Examinations		
	Hours/Week	Hours/Semesters	Internal	Board Exam	Total
2052- Thermal Engineering	6	96	25	75	100

TOPICS AND ALLOCATION

Unit	Topic	TIME (Hrs)
I.	Steam and Expansions of Steam	18
II.	Steam Boilers and performance of boilers	18
III.	Thermal power plant	18
IV.	Energy Engineering and management	18
V.	Refrigeration and Air Conditioning	18
	Revision and test	6
	TOTAL	96

UNIT - I: STEAM AND EXPANSION OF STEAM:

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:

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:

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:

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:

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-psychometric 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-psychometric chart-psychometric processes-sensible heating and cooling-humidification-dehumidification-simple problems using psychometric 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.

REFERENCE BOOKS:

- | | |
|------------------------------------|---|
| 1. Thermal Engineering | P.L.Ballaney |
| 2. Thermal Engineering | R.S.Khurmi and J.K.Gupta |
| 3. Thermal Engineering | R.K.Rajput |
| 4. Thermal Engineering | B.K.Sarkar |
| 5. Power plant Engineering | S.Domkundwar, A.V.Domkundwar
S.C.Arora |
| 6. Power plant Engineering | Nagpal |
| 7. Power plant Engineering | P.C.Sharma |
| 8. Non Conventional Energy sources | G.D.Rai |
| 9. Refrigeration and Air condition | P.L.Ballaney |
| 10.Refrigeration and Air condition | Manohar Prasad |

2053A REFRIGERATION AND AIR CONDITIONING

5 Hrs/Week

16 Weeks /Sem.

Total Hrs : 80

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 Psychrometry chart
- Describe the equipment used for air conditioning.
- Estimate the cooling load for the given requirement.
- Explain the industrial application of refrigeration.

SCHEME OF INSTRUCTION AND EXAMINATION

Subjects	Instructions		Examinations		
	Hours/Week	Hours/Semesters	Internal	Board Exam	Total
2053A- Refrigeration and Air conditioning	5	80	25	75	100

TOPICS AND ALLOCATION

UNIT	TOPIC	TIME (Hrs)
I.	1.1 Refrigeration system 1.2 Refrigeration equipments	15
II.	2.1 Vapour compression refrigeration system 2.2 Vapour absorption refrigeration system	15
III.	3.1 Refrigeration flow controls, refrigerants and lubricants 3.2 Applications of refrigeration	15
IV.	Psychrometry and comfort air conditioning	15
V.	5.1 Air conditioning systems 5.2 Cooling load calculations	15
VI.	Revision Test	5
	TOTAL	80

UNIT I

1.1 Refrigeration System

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.

1.2 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

2.1 Vapour Compression Refrigeration System

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 - problems – effect of - evaporative pressure - condenser pressure - liquid –vapour refrigeration heat exchangers - advantages and disadvantages of superheating and under cooling – use of flash chamber and accumulator.

2.2 Vapour Absorption Refrigeration System

Simple absorption system – Electrolux system -NH₃ and lithium Bromide system – solar absorption refrigeration system- absorption system comparison with mechanical refrigeration system.

UNIT III

3.1 Refrigerant flow controls, refrigerants and lubricants

Capillary tube-automatic expansion valve-thermostatic expansion valve-solenoid valve-evaporator pressure regulator –suction pressure regulator-selection of a refrigerant-properties and applications of following refrigerants SO₂ , CH₄ , F₁₁, F₁₂ ,F₂₂, and NH₃ –CFCs refrigerants- equivalent of CFCs refrigerants (R-123a,R-143a,R-69S)- lubricants used in refrigeration and their applications.

3.2 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

4.1 Psychrometry and Comfort Air Conditioning

Definitions of dry air, moist air, water vapour, Avagadro's law, Dalton's law of partial pressure - dry and wet bulb temperature - dew point - humidity - specific and absolute - relative humidity - degree of saturation - enthalpy of moist air- 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 with simple problems – governing optimum effective temperature – comfort chart-design consideration.

UNIT V

5.1 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 type air conditioner – central plant system – properties of ideal insulator, types of insulating materials –air distribution and duct systems – tools and installation, servicing and maintenance of R & AC systems.

5.2 Cooling load calculations

Different heat sources – conduction heat load – radiation load of sun – occupants load – equipment load - infiltration air load – miscellaneous heat sources –fresh air load - simple problems.

Reference books :

1. Refrigeration and air conditioning – P.L . Ballaney.
2. A course in refrigeration and air conditioning – Domkundwar.
3. Principles of refrigeration – Dossat.
4. Home refrigeration and air conditioning – Audels.
5. Refrigeration and air conditioning - C.P Arora
6. Refrigeration and air conditioning – V.K. Jain

2053B : METROLOGY, MACHINE TOOL MAINTENANCE AND TESTING

5 Hrs/Week

16 Weeks/Sem

Total Hrs : 80

Objectives:

- State the objectives of metrology and define various terms
- Explain the working principles of mechanical, electrical and optical measuring instruments.
- Describe the construction and operating procedures and applications of linear, angular and taper measuring instruments.
- Compare various methods of measuring external thread
- Explain the different methods of measuring internal thread nomenclature.
- Explain the various methods of measuring gear tooth thickness and tooth profile.
- Represent the surface finish as per BIS code.
- Compare the various methods of measuring surface inspection.
- State the importance, types and uses of comparators.
- Describe the construction, procedure of usage of major mechanical comparators.
- Describe the construction procedure of usage of major electrical/electronic comparators.
- Describe the construction procedure of usage of major pneumatic and optical comparators
- Explain the working and applications of CMM
- Explain the various machine tool tests generally carried out.
- Explain the maintenance procedure of standard machine elements.

SCHEME OF INSTRUCTION AND EXAMINATION

Subjects	Instructions		Examinations		
	Hours/Week	Hours/Semesters	Internal	Board Exam	Total
2053B- Metrology, Machine Tool Maintenance and testing	5	80	25	75	100

TOPICS AND ALLOCATION

UNIT	TOPIC	TIME (Hrs)
I	Standards of Measurements & Principles of Measuring Instruments	16
II	Linear, Angular & Taper Measurements	18
III	Measurement of Threads and Gears	16
IV	Measurement of Surface Finish & Comparators	18
V	Machine tool testing and maintenance	16
	Revision, Test	12
	Total	96

UNIT-I STANDARDS OF MEASUREMENTS & PRINCIPLES OF MEASURING INSTRUMENTS

1.1 Introduction to metrology – Objectives of Metrology – Precision and Accuracy – Standards of Measurements: Line standard, End Standard, Wavelength Standard – Classification of Standards – Characteristics of line and end standards.

1.2 Sources of errors – Classification of measuring instruments – Selection of instruments – Principles of measuring instruments: Mechanical, Optical, Electrical and Pneumatic measuring principles.

UNIT-II LINEAR, ANGULAR AND TAPER MEASUREMENTS

2.1 Linear Measurements: Vernier calipers – Vernier height gauges – Vernier depth gauges - Micrometers – Bore gauges – Slip gauges.

2.2 Angular Measurements: Bevel Protractors and its types – Sine bar, Sine table and Sine centre – Angle gauges – Microptic Autocollimator and Angle Dekkor - Clinometer.

2.3 Taper Measurements: Gauges for tapers – Measurement of taper shafts – measurement of taper holes.

UNIT-III MEASUREMENT OF THREADS AND GEARS

3.1 Threads: External screw thread measurements: Measurement of Major dia, Minor dia, Effective dia and Pitch – Internal screw thread measurements: Measurement of Major dia, Minor dia, Effective dia and Pitch – Screw thread gauges.

3.2 Gears: Gear tooth terminology – Sources of errors in manufacturing of gears – Measurement of tooth thickness: Gear tooth vernier, Constant chord method, Addendum comparator method and Base tangent method – Measurement of tooth profile: Tool maker's microscope or projector, Involute tester – Measurement of pitch – Measurement of run out – Lead and Backlash checking .- Measurement of concentricity – Alignment of gears – Composite errors: Master gear, Parkinson's gear tester.

UNIT-IV : MEASUREMENT OF SURFACE FINISH & COMPARATORS

4.1 Measurement of Surface Finish : Representation of surface finish as per BIS – Methods of measuring surface finish: Comparison method and Direct instrument measurements – Surface inspection by comparison methods: Touch inspection, Visual inspection, Scratch inspection, Microscopic inspection, Comparison with standard specimen, Surface photographs – Direct instrument measurement: Intersectional method, Interference method and Stylus method .

4.2 Features of comparators – Uses of comparators – Types of comparators – Mechanical comparators: Dial indicator, Reed type and Sigma comparators – Optical comparators: Optical lever, Simple optical comparator, Cooke and Zeiss optimeter – Electrical/Electronic comparators: Electrical comparator, Electro-mechanical comparator, Electro-limit gauges, Electronic comparator and Electronic measuring equipment – Pneumatic comparators: Solex pneumatic comparator, Air gauging important characteristics.

UNIT-V : MACHINE TOOL TESTING AND MAINTENANCE

5.1 Machine Tool Testing: Introduction – Machine Tool tests – Instruments required for alignment tests – Alignment test on lathe – Alignment tests on drilling machine – Alignment tests on milling machine – Acceptance test for surface grinders.

5.2 Bearing inner race loose on shaft – Housing bore loose on shaft – Bearing running dry – Misalignment – Damaged one or more balls/rollers – Radial play – Assembly of bearing unit.

5.3 Key – Shaft/housing key-way – Disassembly of keyed joints – Assembly of keyed joints.

5.4 Lead Screw Repair: Thread wears up to 0.3 mm – Thread wear exceeding 0.3mm – Repairs of lead nut – Elimination of play.

5.5 Spindle Shank & Journal Seats: Repair standards, Repair methods for bush bearing seats, Repair methods for ball/roller bearing seats.

Taper Bore: Repair standard, Repair methods – Threads: Repair standards, Repair methods – Keyways: Repair methods.

Text Books:

S.No.	Author(s)	Title	Edition / Year	Publisher
1	M.Mahajan	Engineering Metrology	2005	Dhanpatrai & Co.,New Delhi.
2	Garg.H.P	Industrial Maintenance	Reprint 2002	S.Chand & Co. Ltd., New Delhi.

Reference Books:

S.No.	Author(s)	Title	Edition / Year	Publisher
1	R.K.Jain	Engineering Metrology	2002	Khanna Publisher, New Delhi.
2	ASTME	Hand Book of Industrial Metrology	1990	Prentice Hall of India, New Delhi.
3	R.K.Rajput	Engineering Metrology & Instrumentation	4 th Edition 2004	S.K.Kataria & Sons, New Delhi.

2054 ENGLISH COMMUNICATION PRACTICAL

(Common to all Branches)

Curriculum Outline

The course on English Communication Practical will enable the learners develop their Communication skills in English, especially at a time when the Info-Tech Explosion on one side and the search for Communicational Exploration on the other have been taking the contemporary world by leaps and bounds.

Keeping in view the career requirements of the students at Diploma level, the course on English Communication Practical has been designed in such a way that it will enable the learners acquire the much needed proficiency in the art of Communication and this will go a long way in shaping and fine tuning the future career of the students.

Objectives:

1. To equip the learners with effective speaking and listening skills in English
2. To make them realize the communication potential of English language
3. To infuse in their minds the much-needed and all the more important 'CONFIDENCE'
4. To facilitate them to acquire a fairly acceptable skill in pronunciation
5. To train them to use language effectively to face interviews, group discussions and public speaking
6. To enable them to prepare their resume, curriculum vitae etc.,
7. To promote ethical values and inculcate organizational behaviour...

For achieving the objectives identified above, the following skills are to be developed to enhance the communicative potential of the students.

The Skills are:

- I. Listening
- II. Reading and Pronunciation
- III. Speaking and Presentation
- IV. Writing

SCHEME OF INSTRUCTION AND EXAMINATION

SUBJECT	INSTRUCTION		EXAMINATION			
	Hours/ Week	Hours/ Semester	Marks			Duration
ENGLISH COMMUNICATION PRACTICAL	4	64	Internal Assessment	Board Examination	Total		3 Hrs.
			25	75	100	

TOPICS AND ALLOCATION

UNIT	INSTRUCTION	TIME (Hrs)
I	Listening	12
II	Reading	12
III	Speaking	14
IV	Writing	8
V	Professional Ethics & Organizational Behaviour	8
VI	Project Report Writing (Outline)	2
	Revision and Tests	8
	TOTAL	64

DETAILED SYLLABUS

UNIT I LISTENING

Listening to pre-recorded short episodes, conversations, passages, stories, (hard copy of the material and cassettes) news bulletin, speeches by famous personalities – Listening for general and specific information etc.,

NOTE: The exercises given to the students must be recorded in the Record Notebook.

UNIT II READING

Reading aloud – by students individually - reading rhymes – proverbs – passages on various topics of interest – Newspaper reading – Reading humorous passages – Anecdotes – Stories

– tricky sounds (conditioners) – Reading manuals – Reading individual sentences with articulation, pronunciation, Tones, Punctuation, pauses etc...- Reading the titles of popular books, movies and poems.

NOTE: All the exercises given in Reading skills should be written in the Record Notebook.

UNIT III SPEAKING

- i. Self-introduction – introducing one self, one’s family – one’s friends and relatives, one’s language – one’s country etc...
- ii. Welcome Address, Vote of thanks
- iii. Extempore speeches.
- iv. Short speech on simple topics on simpler themes for about one minute.

- v. Role play – Group Discussion – Debate – Seminars – Machine Descriptions (depending upon branches) – Compering – Interviewing others by Asking Questions – Interview Techniques – Conversational Practice – Telephonic Conversation – Telephonic Interviews – How to establish conversation / dialogues – Entry Attempts/Admissions.

NOTE: Items taught in the Speaking skill should be written in the Record Notebook.

UNIT IV WRITING

- i. Writing Resume, preparing Curriculum Vitae.
- ii. Converting newspaper headlines into sentences.
- iii. Formation of Sentences – Using the table of Sentence-making and producing multiple sentences.
- iv. Framing Questions for the responses given
- v. Tips for better performance in interviews.
- vi. Describing Objects
- vii. Describing Situations.

NOTE: All the above topics must be taught to the students providing sufficient models and exercises and everything must be recorded in the Record Notebook.

UNIT V PROFESSIONAL ETHICS & ORGANIZATIONAL BEHAVIOUR:

Different kinds of Ethics – Ethics in different fields – Engineering Ethics – Senses of Engineering Ethics – Moral Values – Integrity & Loyalty – Work Ethics – Respect for others and authority – Empathy – Caring and Sharing – Honesty – Courage and Commitment – Valuing Time – Co-operation & Teamwork – Safety and Risk – Right Action – Professional ideals and virtues – Individual's Ambition – Conflict Resolution – Self-Confidence – Customs and Manners – General Behaviour – Etiquettes to be followed – Professional Responsibility – Accountability – Leadership Qualities – Effective Communication skills.

UNIT VI PROJECT REPORT WRITING (Outline):

Significant features of Project Report Writing – Organization – Presentation – Use of Impersonal Passives – Acknowledgements.

REFERENCES

UNIT I LISTENING:

Cassette with books:

- 1) Spoken English for you – Level I & Level II by Radha Krishna Pillai – Emerald Publishers.
- 2) Activity Sheets to be prepared.
- 3) BBC – Lingophone with Hard copy.
- 4) World Great Speeches – Book – Balaji's – Famous Speeches.

UNIT II READING:

- 1) Short story Books (Indian Writing – Panchathantra)
- 2) Reading Illustrated Books (Gokulam – Wisdom – Chandamama – Amarchitrakatha) must be subscribed.

UNIT III SPEAKING:

Books / materials related to speaking skill.

UNIT IV WRITING:

- 1) Internet Browsing and collecting information for C.V.
- 2) Book materials / Cassettes for writing skill.
- 3) Guided composition in English Language Teaching – Alexander L.G. Longman, 1971.
- 4) The Language Laboratory and Language Learning – Dahim Longman, London, 1967.

PROFESSIONAL ETHICS

REFERENCE BOOKS

1. Mike Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw Hill, New York 1996.
2. Charles D. Fleddermann, “Engineering Ethics”, Pearson Education / Prentice Hall, New Jersey, 2004.
3. Charles E. Harris, Michael S. Protchard and Michael J Rabins, “Engineering Ethics” – Concepts and Cases”, Wordsworth Thompson Learning, United States, 2000.
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for scientists and Engineers”, Oxford University Press, Oxford, 2001.
5. G.E. Moore, “Elements of Ethics”, Temple University Press, Philadelphia, 1991.
6. J.D. Mabbott, Hutchinson, “An Introduction to Ethics” Hutchinson University Library, London, 1969.
7. May Mothersill, “Ethics”, The MacMillan, New York, 1965.
8. Raymond Bradley and Stephen Duguid, “Environmental Ethics”, Vol I & II, Simon Fraser University, Canada 1989.
9. Kevin W. Bowyer, “Ethics and Computing – Living Responsibility in a computerized World”, IEEE Computer Society Press, California, 1996.

10. Jayashree Suresh and B.S. Raghavan, "Professional Ethics", S.Chand & Company Ltd., New Delhi, 2005
11. James V. McGlynn, Jules J. Toner, "Modern Ethical Theories", The Bruce Publishing Company, Milwaukee, 1962.

ENGLISH COMMUNICATION PRACTICAL

(Common to all branches)

LABORATORY REQUIREMENT

1. An echo-free room.
2. Public Address System
3. A pair of collar microphones with amplifiers and speakers
4. Headphone units – 30 Nos. with one control unit with a facility to play and record in cassettes.
5. Colour Television (minimum size – 61")
6. DVD/VCD Player with Home Theatre speakers
7. Clip Chart, white board.
8. Necessary furniture and comfortable chairs

ENGLISH COMMUNICATION PRACTICAL

(Common to all branches)

GUIDELINES

UNIT I LISTENING

- a. The students must have been trained on a minimum of 10 Passages / stories / speeches / episodes / news bulletin (about 200-250 words each) and **all other topics given in the syllabus** during their course of study.

In the examination a passage shall be played back for about 5 minutes from a pre-recorded cassette followed by 5 questions. Students may be allowed to take notes while listening and they shall answer the questions in writing and assessment shall be made depending upon their performance.

- b. The students must have been trained on a minimum of 10 dialogues during their course of study.

In the examination a dialogue (face-to-face conversation) running for about 5 minutes shall be played back from a pre-recorded cassette (either Video or Audio) followed by 5 questions. The students may be allowed to take notes while listening and they shall answer the questions in writing. Assessment shall be made depending upon the performance of the students.

UNIT II READING

The Students should have been trained to read out / articulate at least 200 different types of sentences. They should also be trained to pronounce 200 words (monosyllabic, by-syllabic, tri-syllabic and polysyllabic words) and all other topics given in the syllabus. The words and sentences are to be chosen in such a way that the tongue is articulating the sounds in the manner peculiar to the English Language. The students should also be trained to read aloud newspaper headings, proverbs, rhymes, poems, (use of) minimal pairs and other items identified in the syllabus.

The students should also be exposed to 44 sounds in English language and their symbols with examples. However questions need not be asked in this in the end examinations.

UNIT III SPEAKING

The students should have been trained on a minimum of 10 topics / role play / group discussion / debate / seminar and **other topics given in the syllabus**. The students must also be trained to introduce themselves and others. Each student must speak at least 10 sentences. The students must be given guidelines for making their presentation / speech effective.

UNIT IV WRITING

The students should be thoroughly trained in **all the items identified in the syllabus** under writing.

UNIT V PROFESSIONAL ETHICS & ORGANIZATIONAL BEHAVIOUR

Around 50 questions dealing with PROFESSIONAL ETHICS & ORGANIZATIONAL BEHAVIOUR are given in the syllabus. In the examination the students will be given 15 questions (selected out of 50 questions) and they have to write short answers to any 10 questions. This carries 20 marks.

Teachers are requested to refer the reference books given in the syllabus and help the students to find out the answers for all the 50 questions.

UNIT VI PROJECT REPORT WRITING (Outline)

Elaborate guidelines must be given to the students as to how to write a Project Report. They must be exposed to the salient features in writing the Project Report. The students will be expected to submit **outline of a Project Report** relevant to their branches of study in a separate folder and this will be assessed at the time of End Examination and marks will be awarded accordingly.

ENGLISH COMMUNICATION PRACTICAL

(Common to all branches)

SCHEME OF EXAMINATION

END EXAMINATION (75 Marks)

- 1) End examination will be conducted for duration of 3 Hrs. covering all the six units identified in the syllabus.
- 2) The examination should be conducted in such a manner that there must be enough evidence regarding the performance of the students and the distribution of marks for the academic audit.

INTERNAL ASSESSMENT (25 Marks)

- 1) Students will maintain a 150-page Record Notebook for all the activities done in the English Communication Lab., for which 20 marks will be allotted.
- 2) 5 marks will be awarded for attendance.

Annexure: A statement of allocation of marks.

Time and Marks Allocation for each unit:

GROUP	UNIT	TIME	MARKS ALLOTTED
GROUP A (Written Test)	PROFESSIONAL ETHICS & ORGANIZATIONAL BEHAVIOUR (UNIT V)	30 Minutes	10
	WRITING (UNIT IV)	45 minutes	10
	LISTENING (UNIT I)	45 minutes	15
GROUP B (Oral Test)	READING (UNIT II)	30 minutes	10
	SPEAKING (UNIT III)	30 minutes	20
GROUP C (Report Submission)	PROJECT REPORT WRITING (UNIT VI)		10

GROUP A

1. PROFESSIONAL ETHICS & ORGANIZATIONAL BEHAVIOUR (20 Marks)

The students will be asked to write brief answers, for any 10 questions out of 15 questions.

The examiners will select the questions from the question bank given in the syllabus. Each question carries 2 marks. It will be a written practical.

Annexure: A question bank of 50 questions.

2. WRITING (5 + 5 = 10 Marks)

Out of 7 items identified in the syllabus under **Writing skills**, the students are required to answer for any two items out of four (i.e. 2 out of 4 questions). Each item carries 5 marks.

There must be different questions for different batches.

3. LISTENING (5 + 5 = 10 Marks)

The students will be assessed on --

a) Auditory Comprehension (5 marks)

A pre-recorded cassette on short episodes / passages / stories / news bulletin / speeches by famous personalities (not exceeding 5 min.) will be played back only once. The Students are required to listen to this play-back with utmost attention.

After that, a sheet of paper containing 5 questions on the topic (that was played back to the students) with adequate space under each question (for the students to write the answers) will be supplied. The students are expected to write the answers in the space provided for each question.

Time for this exercise for the response of the students will be approximately 10 minutes.

b) Audio Visual Comprehension (5 marks)

A face - to - face conversation (not exceeding 5 minutes) will be played through a video or audio system (only once). The students are required to listen to this conversation with full attention.

After that, a sheet of paper containing 5 questions on this exercise shall be given with adequate space under each question for the students to write the answer. Fill in the blanks type of questions may also be given to assess the **Listening skills** of the students. Time to be taken by the students for this exercise will be approximately 10 minutes.

The selection of topics such as short episodes/passages/stories/news bulletins /speeches / dialogues etc... is left to the discretion of the internal and external examiners.

GROUP B

1. READING (5 + 5 = 10 Marks)

- a) Each student will have to read aloud a passage of about 200 words. (5 Marks)
- b) The Students will also be required to read individual sentences, rhymes, poems, newspaper headings, proverbs (use of) minimal pairs etc... (5 Marks)

NOTE: While reading, the students will be assessed based on their performance in pronunciation, articulation, intonation, punctuation, pauses etc...

The examiner needs to have as many passages / exercises as required, proportionate to the number of batches. The passage / exercises will be the same one to all the students of a particular batch. But it should not be repeated for other batches, there should be different passages / exercises for different batches.

2. SPEAKING (15 Marks)

- a) Introducing one self / Introducing others and **all the other topics given in the syllabus** 5 Marks.
- b) Short speech on simple topics on simpler themes for about 2 minutes – 5 Marks.
- c) Assessing the performance of the students on any of the topics given in the syllabus in sub division V under **Speaking skills**. – 5 Marks.

NOTE: The topics identified in the syllabus for Presentation (Speaking skills) need to be written individually one by one by the examiners in separate papers or in separate cards.

The students will be allowed to choose a topic through lot system. They are expected to speak on the topic chosen by them for at least 2 minutes.

The selection of the topics is left to the discretion of the examiner.

NOTE: Reading and Speaking:

For assessing the performance of the students in Reading and Speaking skills in the End Examination, each batch of students may be divided into two groups (if there are 30 students in a batch, they may be divided into 15 + 15) and both groups may be assessed simultaneously, one group by the external examiner (for **Reading skills**) and another by the internal examiner (for **Speaking skills**) and then vice versa.

This process will enable the examiners to complete the practical on time i.e., in 3 Hrs. duration.

GROUP C

PROJECT REPORT WRITING (10 Marks)

The students will be expected to submit an **outline of a Project Report** relevant to their branches of study in a separate folder and this will be assessed at the time of End Examination and marks will be awarded accordingly.

PROFESSIONAL ETHICS & ORGANIZATIONAL BEHAVIOUR

QUESTION BANK

- 1) What do we understand by ethics?
- 2) What are the universally accepted ethical principles?
- 3) What is meant by engineering ethics?
- 4) What is the need for engineering ethics?
- 5) Define work ethics.
- 6) What is integrity?
- 7) 'Commitment' – what does it mean?
- 8) What do you mean by empathy?
- 9) What is professional ethics?
- 10) What is the similarity between ethics and morals?
- 11) What are the responsibilities of engineers?
- 12) What are the rights of the engineers?
- 13) What are codes of conduct?
- 14) Explain briefly the importance of ethics in engineering profession.
- 15) How can an engineer orient himself towards his ethical responsibilities?
- 16) What are the priorities of an engineer in a situation wherein which conflicting values are involved?
- 17) How can an engineer implement ethics of his profession in a multi-cultural/multi-national environment?
- 18) What are the professional obligations of an engineer?
- 19) What should be the ethics that an engineer should adhere to in both pre and post employment scenarios?
- 20) What is the ethical way of handling retrenchment?
- 21) What are the various aspects of empathy?
- 22) What are the salient features of commitment?
- 23) What is team-work?
- 24) What do you mean by profession and professionalism?

- 25) What is meant by accountability?
- 26) What is environmental ethics?
- 27) What is computer ethics?
- 28) Define the term 'morals'.
- 29) What do you mean by 'values'?
- 30) What are the main qualities of work ethics?
- 31) What is altruism?
- 32) What is sharing?
- 33) What is caring?
- 34) What is honesty?
- 35) What is courage?
- 36) What is meant by valuing time?
- 37) What is co-operation?
- 38) What are the objectives of co-operation?
- 39) What is meant by commitment?
- 40) In what way the effective communication skills shape the careers of an engineer?
- 41) What is self-confidence?
- 42) What is morality and etiquette?
- 43) What are the different models of engineering ethics?
- 44) What are the most fundamental moral principles?
- 45) What are the moral responsibilities of an employee towards his employer?
- 46) What are the moral responsibilities of an employer towards his employees?
- 47) What are the moral responsibilities of an organization towards community?
- 48) What are the advantages of team-work?
- 49) What is loyalty?
- 50) What do you mean by professional rights?

Example Questions for Writing Skill

Staff Member may prepare similar type of questions for Class works & Examinations

WRITING

1. Your friend has asked for your advice for buying a birthday present. Write a letter to him/her suggesting which points he/she one should keep in mind like interest, age, need etc.while buying a birthday present. You are Shanty /Shanta of 1048 D, Gulabi Bagh, Delhi.
2. Children like to spend their pocket money on their favourite food items like chips, kurkures, hot dog, pizza and cold drinks. But they don't know that these things cause harm to their health. Write a paragraph describing the harmful effects of fast and junk food. Mention the health and other related problems caused by it in about 50 words.
3. You have to take part in a debate on the theme 'Examinations affect Teaching and Learning in schools' Write down your arguments in favour or against the motion in about 125 to 150 words
4. Recently you attended a fair of Eco clubs at Bal Bhawan where the students from different schools displayed eco friendly materials and ways to protect our earth through different models and charts. Write a report in about the fair in about 50-60 words.
5. Your cousin is a brilliant student but he is not keeping good health because he avoids homemade food and is very fond of eating outside. Write a letter telling him/her about the harmful effects of junk food and advising him/her how to maintain good health in not more than 100 words. You are Arpil/Arpita of C-8 Lawrence Road, Delhi.
6. Write a letter to the Principal of your school requesting him/her to introduce inter house activities like quiz programmes, debates, recitation, essay-writing, painting and sports explaining how it may be beneficial for all-round development of their personality. You are Vineet/Vineeta, the head boy/girl of New Modern School, Amritsar.
- 7.. You don't approve of the ways of people as they waste a lot of water in different activities. Even the taps in schools are not closed properly, thereby, wasting the valuable water due to negligence and carelessness. You wish to spread awareness among students about it. Write down your views appealing students of your school to conserve water and to save it for future in an article for school magazine in about 50-60 words.
8. You recently visited the 'World Book Fair' organized Near your Locality and found it quite an enriching experience. Write a report in about 50-60 words so as to encourage other students to visit it.

ENGLISH COMMUNICATION PRACTICAL
(Common to all branches)
MODEL QUESTION PAPER

TIME : 3 Hrs

Max.Marks : 100

GROUP A

Answer any ten of the following:-

(10 x 2 = 20)

- I
- 1) What is team work?
 - 2) 'Commitment' – What does it mean?
 - 3) What is code of conduct?
 - 4) How can an engineer orient himself towards his ethical responsibilities?
 - 5) What are the professional obligations of an engineer?
 - 6) What is the ethical way of handling retrenchment?
 - 7) What are the rights of the engineers?
 - 8) What is environmental ethics?
 - 9) What is sharing?
 - 10) What are the objectives of co-operation?
 - 11) What is morality and etiquette?
 - 12) What is loyalty?
 - 13) What are the moral responsibilities of an employee towards his employer?
 - 14) What do you mean by professional rights?
 - 15) What is altruism?

II **(2 x 5 = 10)**

- 1) Imagine you are applying for a job. Write a resume for the same.
- 2) Religious extremism, matter of concern : PM

III **(2 x 5 = 10)**

- 1) A short story to be played back (audio cassette).
- 2) A face to face communication to be played back (visual/audio)

GROUP B

I **(2 x 5 = 10)**

- 1) Read the following passage aloud -
A passage with tricky sounds to be given.
- 2) Read the following aloud -
A conversational passage to be given.

II **(3 x 5 = 15)**

- 1) Introduce yourself
- 2) Short speech - A religious fair
- 3) Any one of the topics given in the syllabus in sub-division v under **speaking skills**

GROUP C

10

Project Report – writing

The students will be expected to submit an **outline of a Project Report** relevant to their branches of study in a separate folder and this will be assessed at the time of End Examination.

ENGLISH COMMUNICATION PRACTICAL

Allocation & Statement of Marks

Duration : 3 Hrs.

Max. Marks : 100

Sl. No.	Reg.No	Name of the Candidate	Communication Lab.						Internal Assessment		Total
			GROUP A			GROUP B		GROUP C	Record	Attendance	
			PE & OB (20)	Writing (10)	Listening (10)	Reading (10)	Speaking (15)	Project Report Writing (10)			

2055 A REFRIGERATION AND AIR CONDITIONING PRACTICAL

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.

SCHEME OF INSTRUCTION AND EXAMINATION

Subjects	Instructions		Examinations		
	Hours/Week	Hours/Semesters	Internal	Board Exam	Total
2055A- Refrigeration and Air conditioning Practical	6	96	25	75	100

1. BASIC REFRIGERATION WORKSHOP 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.

- (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 a open type system with
 - i) Thermostatic expansion valve
 - ii) Capillary tube
 - iii) 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.

(a) 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.

2056 WORK SHOP – III (Slotting, Planing, Milling, Grinding & CNC Turning)

6 Hrs/Week

16 Weeks /Sem.

Total Hrs : 96

Objectives:

- ◆ 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.
- ◆ Handle the different types of work holding devices
- ◆ Set the tools in shaping, planing and slotting.
- ◆ Machine a component using different machine tools.
- ◆ Calculate the indexing for a work
- ◆ Operate turret and capstan lathe for machining.
- ◆ Write CNC part program
- ◆ Operate CNC Lathe and CNC milling machine.

SCHEME OF INSTRUCTION AND EXAMINATION

Subjects	Instructions		Examinations		
	Hours/Week	Hours/Semesters	Internal	Board Exam	Total
2056- WORKSHOP – III(Slotting, Planing, Milling, Grinding & CNC Turning)	6	96	25	75	100

Syllabus:

1. Introduction to planing machine and its parts.
2. Introduction to slotting machine and its parts.
3. Introduction to milling machine and its parts.
4. Introduction to grinding machine and its parts.
5. Introduction to turret and capstan lathe.
6. Introduction to work holding devices.
7. Types of tools used in planing and slotting machines.

8. Types of cutter used in milling machine.
9. Types of grinding wheels used in grinding machines.
10. Types of tools used in turret and capstan lathes.
11. Setting of work, tools and cutters in planing, slotting and grinding machines.
12. Operation performed in planing, slotting, milling and grinding machines.
13. Operation of planing, slotting, milling and grinding machines.
14. List of Experiments that can be done XLTURN Machine
 1. Programs using CAM software.
 2. Step turning operation using G00, G01, & G90 CYCLE.
 3. Taper turning operation using G00, G01, & G94 CYCLE.
15. List of Experiments that can be done XLMILL Machine
 1. Programs using CAM software.
 2. Sub Programming Concepts.
 3. Contour/Profile Milling Machine using G00,G01,G02 & G03 CODES.

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 Ø32 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

Examination Scheme :

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

Minimum Marks for Pass = 50%.

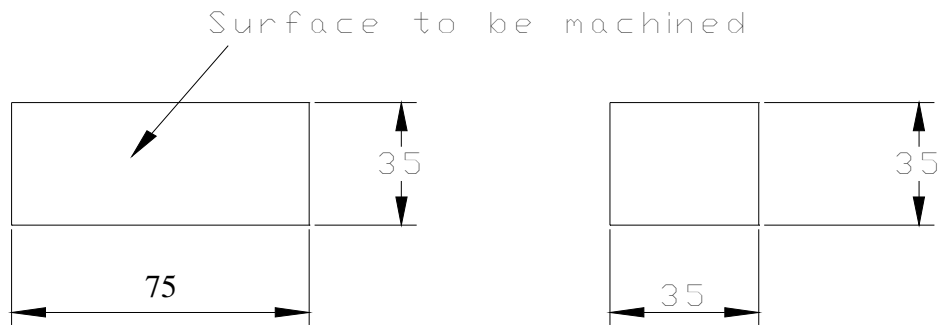
Note:

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

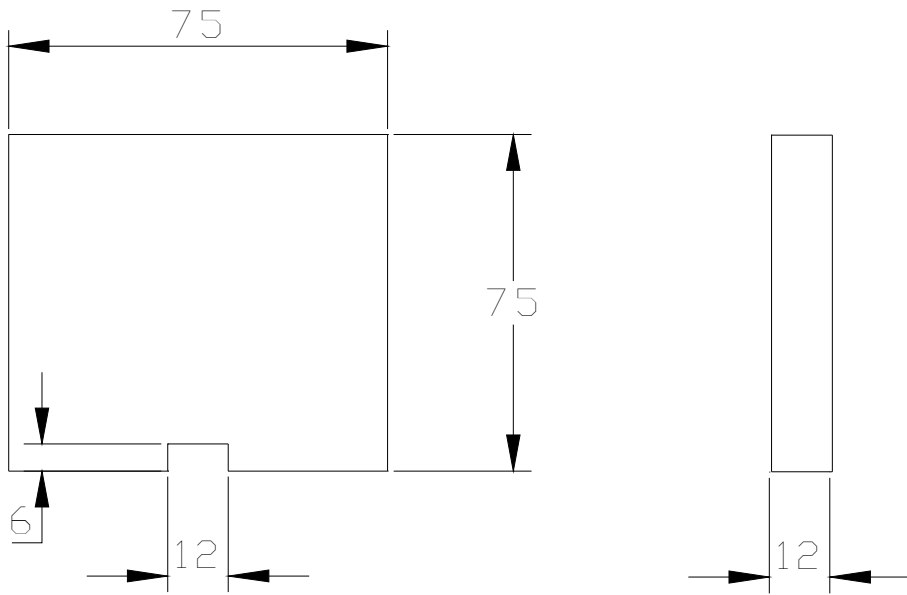
Enclosure : Sketches for Exercises in Special machines

2056 Workshop III Sketches

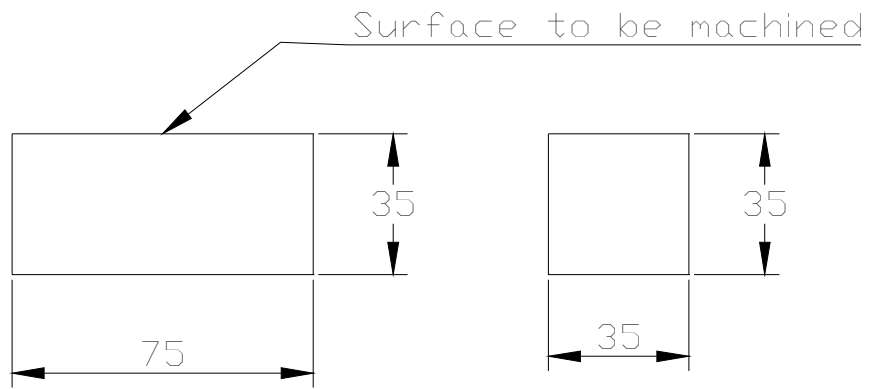
1. Study of Planing machine and machine a flat surface



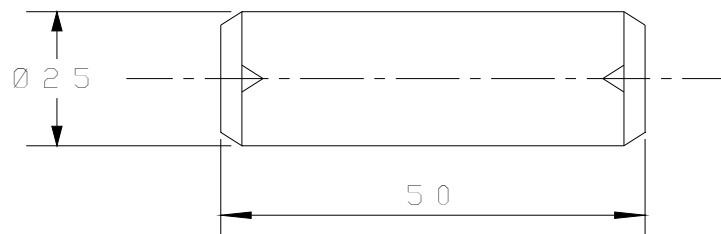
2. Study of slotting machine and machine a simple slot.



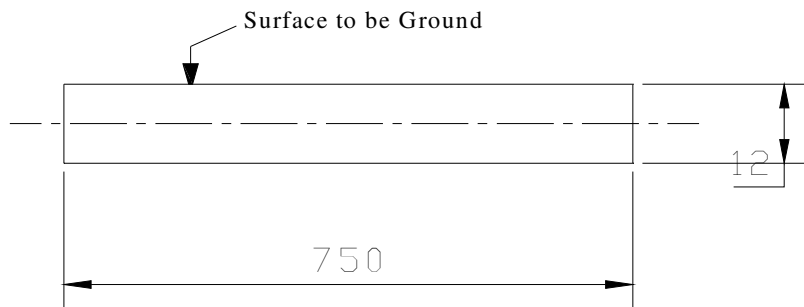
3. Study of Milling machine and machine a plane surface using plain milling cutter.



4. Study of Cylindrical grinder and grind a cylinder

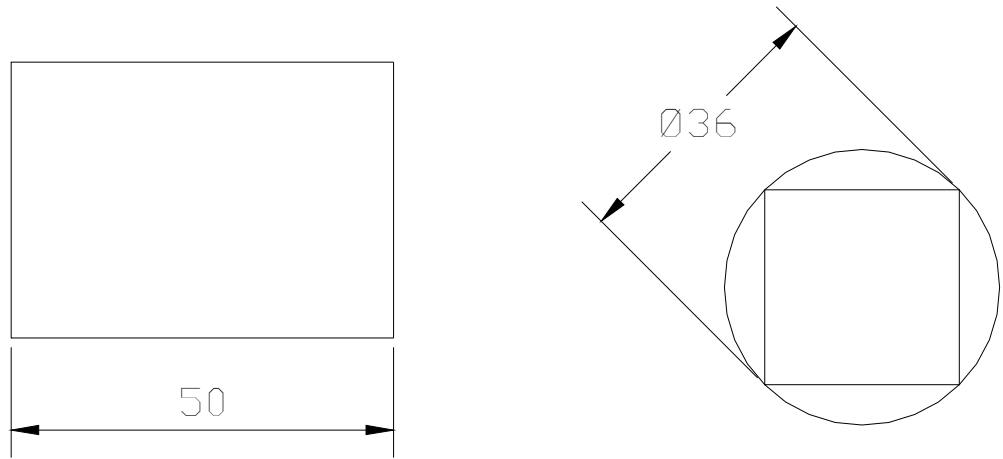


5. Study of surface grinder and grind a plane surface



7. Make a simple components(Three nos.) using turret and capstan lathe .

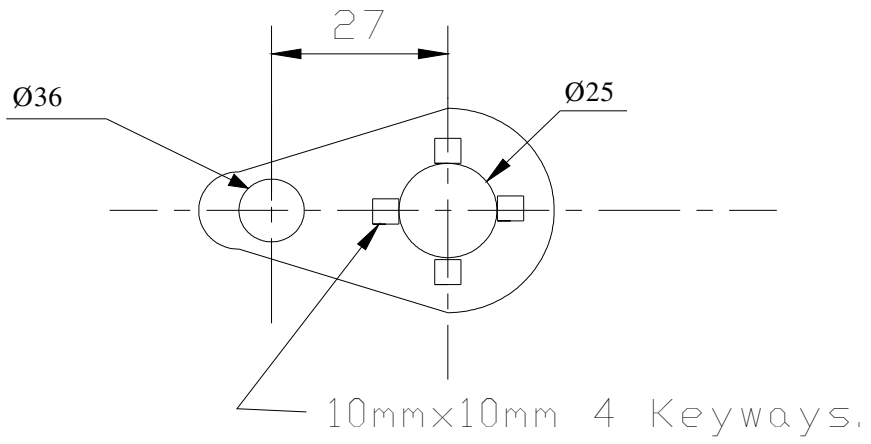
8. Planing a square – cast iron 50mmx50mm



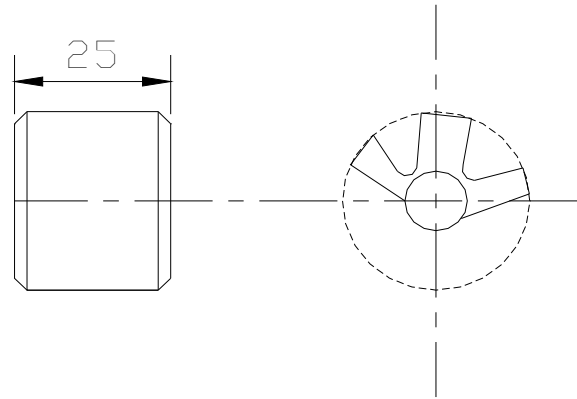
Material: Ø36mmx50mm M.S Round Rod

9. Slotting :

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

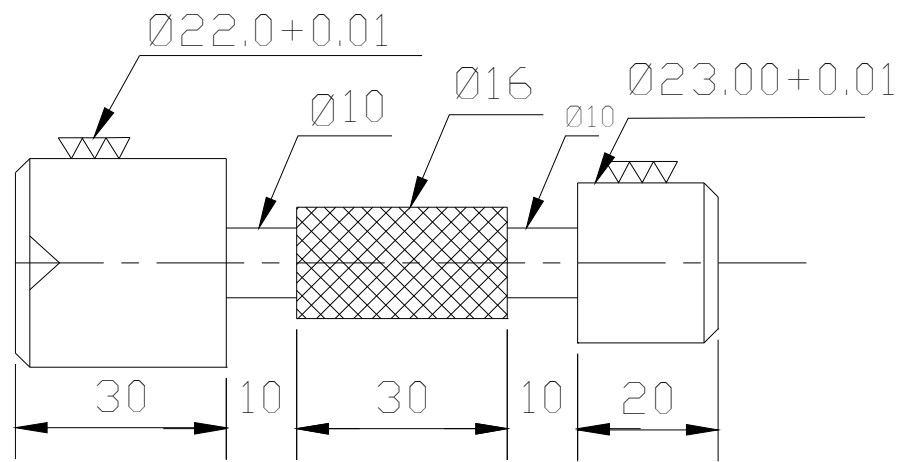


10. Gear Cutting in milling machine.



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

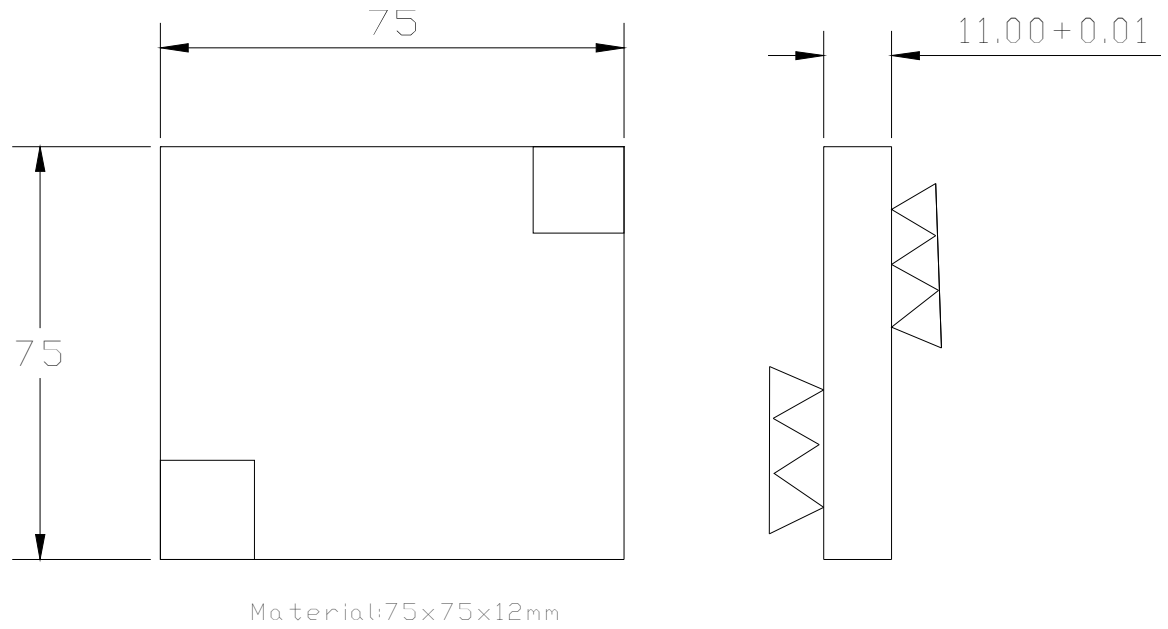
11. Grinding a cylinder in cylindrical Grinding machine.



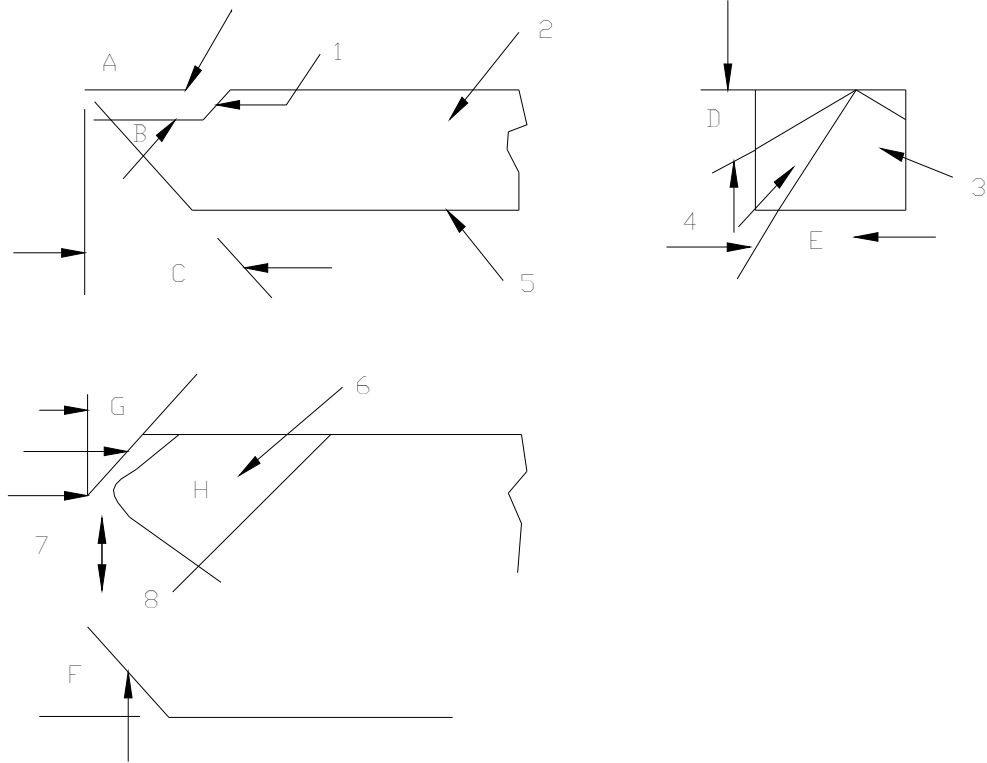
Material: $\varnothing 25 \times 100$ mm MS Round Rod.

12. Grinding a Flat surface in surface grinder

75



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

14. 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.

2061 INDUSTRIAL ENGINEERING AND MANAGEMENT

6 Hrs/Week

16 Weeks/Sem.

Total Hrs : 96

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.

SCHEME OF INSTRUCTION AND EXAMINATION.

Subject	Instruction		Examination		
	Hours/week	Hours/Semester	Assessment Marks		
2061 Industrial Engineering And Management	6	96	Internal	Board Exam	Total
			25	75	100

TOPICS AND ALLOCATION

UNIT	TOPIC	TIME (Hours)
I.	Plant Engineering and Plant safety	18
II.	Work study, Method study and Work measurement	18
III.	Production planning and quality control	18
IV.	Principles of Management and Personal Management	18
V.	Financial Management and Material Management	18
	Revision Test	6
	TOTAL	96

UNIT – I : PLANT ENGINEERING AND PLANT SAFETY

1.1 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.

1.2 Plant Safety

Importance – accident – cost and causes of accident – accident proneness – Planning for accident prevention – Safety laws and regulations – Indian factories act 1948 and provision – Industrial disputes – settlement of industrial disputes.

UNIT – II : WORK STUDY, METHOD STUDY AND WORK MEASUREMENT

2.1 Work Study

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

2.2 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.

2.3 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 CONTROL

3.1 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). Production – types – Characteristics – Economic Batch Quantity(EBQ) – Principles of product and process planning – make or buy decision – problems.

3.2 Quality Control

Definition – Objectives – Types of inspection – First piece, Floor and centralized inspection – Advantages and disadvantages. Quality control – Statistical quality control – Types of measurements – Method of variables – Method of attributes – Uses of X, R, p and c charts – Operating Characteristics curve (O.C curve) – Sampling inspection – Single and double sampling plan.

UNIT – IV : PRINCIPLES OF MANAGEMENT AND PERSONNEL MANAGEMENT

4.1 Principles of Management

Definition of management – Administration – Organization – F. 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 – Management Information Systems – Ethics – Professional ethics.

4.2 Personnel Management

Responsibility of human resource management – Selection procedure – Training of workers – Apprentice training – On the job training and vestibule school 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

5.1 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.

5.2 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.

Text Book:

1. Industrial Engineering and Management - **O. P. Khanna**
2. Engineering Economics and Management - **T. R. Banga & S. C. Sharma**

2062 COMPUTER AIDED DESIGN AND MANUFACTURING

6 Hrs/Week

16 Weeks /Sem.

Total Hrs : 96

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.

SCHEME OF INSTRUCTION AND EXAMINATION

Subjects	Instructions		Examinations		
	Hours/Week	Hours/Semesters	Internal	Board Exam	Total
2062- Computer Aided Design and Manufacturing	6	96	25	75	100

TOPICS AND ALLOCATION

Unit	Topic	TIME (Hrs)
I	Computer Aided Design and Geometric Modeling	18
II	Computer Aided Manufacturing	16
III	CNC Machines	16
IV	CNC Components and Part Programming	18
V	GT-FMS-CIM-AGV and Robotics	16
	Revision and Test	12
	Total	96

UNIT – I Computer Aided Design and Geometric Modeling

- 1.1 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.
- 1.2 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).
- 1.3 Geometric modeling techniques: wire frame, surface, solid modeling – graphics standards: Need, GKS – IGES – DXF.
- 1.4 Introduction to finite element methods – procedure of finite element analysis (brief description only).

UNIT II – Computer Aided Manufacturing

- 2.1 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).
- 2.2 Product Development Cycle – sequential engineering – concurrent engineering – rapid proto typing: concept and applications – 3D printing.

UNIT-III CNC Machines

- 3.1 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.
- 3.2 CNC EDM machine – Coordinate measuring machines: construction, working principles and specifications – maintenance of CNC machines.

UNIT-IV CNC Components and Part Programming

4.1 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.

4.2 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.

4.3 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

5.1 GT – concept of part family – parts classification and coding – coding structure – MICLASS – OPITZ – benefits of GT.

5.2 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.

5.3 Integrated material handling – AGV: working principle and benefits – Automatic Storage and Retrieval Systems (ASRS).

5.4 ROBOT – definition – robot anatomy and classifications – robot configurations – industrial applications: characteristics, material transfer, machine loading, welding, spray coating, assembly and inspection

Text Books:

S.No.	Author(s)	Title	Edition / Year	Publisher
1	R.Radhakrishnan, S.Subramanian, V.Raju	CAD/CAM/CIM	2 nd , 2003	New Age International Pvt. Ltd.
2	Mikell P.Groover Emory Zimmers Jr.	CAD/CAM	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

S.No.	Author(s)	Title	Edition / Year	Publisher
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	Automation, Production Systems, and Computer-Integrated Manufacturing	Mikell P. Groover	2 nd Edition Reprint 2002	Pearson Education Asia
4	Yoram Koren	Computer control of manufacturing systems	International Edition 1983	McGraw Hill Book Co.

2063 A AUTOMOBILE TECHNOLOGY

5 Hrs/Week

16 Weeks /Sem.

Total Hrs : 80

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.

SCHEME OF INSTRUCTION AND EXAMINATION

Subjects	Instructions		Examinations		
	Hours/Week	Hours/Semesters	Internal	Board Exam	Total
2063A- Automobile Technology	5	80	25	75	100

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
	Revision and test	5
	TOTAL	80

UNIT I Automotive Engines

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-fly wheel-cam shaft-methods of cam shaft drive arrangements-valve and valve arrangements-LIFT.

Stages of combustion-delay period-variables affecting delay period-combustion chamber-methods of generating air swirl in diesel combustion chamber-types of combustion chamber-merits and demerits.

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

Lubrication systems-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 systems-oil pumps-troubles in lubrication system-oil leakage, low oil pressure and excessive oil consumption-causes.

UNIT II Fuel and Fuel Feed Systems

Requirement 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, methanol, ethanol, natural gas, LPG, vegetable oils and bio-gas.

Layout of fuel feed system of petrol engine-types of fuel feed system-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-MPFI system-necessity-merits and demerits.

Layout of diesel fuel feed system-single acting fuel feed pump-injection pumps-construction and working of distributed type pump-fuel injectors-purpose-types-single and multiple-pintle and pintaux-governors-necessity-types of governors-mechanical and pneumatic-fuel filters-primary and secondary filters-location and importance.

UNIT III Transmission and Power Trains

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, multiplate wet and dry clutches and diaphragm clutch-fluid coupling-clutch troubles and their causes.

Gear box-purpose-various resistance to motion-types of gear boxes-sliding mesh, constant mesh and synchromesh-floor shift and steering column gear change-mechanical and hydraulic control system-variator-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 and 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 troubles and their causes-forces in rear axles-rear axles-semi floating, three quarter floating and full floating axle-axle housing-types.

UNIT IV Automotive Chassis

Front axle-types-stub axle-elliot and reverse elliot-lemoine and lemoine inverted-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-types of springs-leaf, coil and Torsion bar-front suspension systems-independent front suspension-merits and demerits-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-brake shoe adjustment mechanism-air assisted hydraulic brakes-air brake-layout, functions of each components and application only-disc brakes-construction and working-comparism of disc and drum type-brake troubles and their causes-antilock brake system.

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

UNIT V Automobile Electrical Equipment and Pollution Control

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-alternator construction and operation-regulators-Dynamo.

Ignition system-types-battery coil ignition system-circuit-high-tension magneto-principle of operation of flywheel magneto-electronic ignition-ignition system troubles and remedies.

Lighting system- circuit-head light-aiming adjustment-sealed beam head lights-fluorescent lamp-traffic indicator-directional signal circuits-horn circuits-wind screen wiper.

Pollution-pollutants-sources of pollutants-pollution control techniques for petrol and diesel engine emissions-controlling crankcase emission (PCV)-controlled evaporative emission (VRS, VSS, VRR, ECS and EES)-treatment of exhaust gas (catalytic converter, EGR).

Introduction to automotive electronics, radio-interference-suppressors-audio systems.

TEST AND REVISION:

TEXT BOOKS:

1. Kirpal Singh, "Automobile Engineering", Vol.I and II.
2. Banga and Singh, "Automobile Engineering", Khanna Publishers, New Delhi, 1998.
3. Narang. G.B.S., "Automobile Engineering", Khanna Publishers, New Delhi, 1998.
4. Automobile Transmission and Power systems- William.H.Grouse.
5. Automobile Electrical Equipments- William.H.Grouse.

REFERNCE BOOKS:

1. Dolan.J.A., "Motor vehicle technology and practical work", ELBS, 1978.
2. Dr.Giri.N.K,"Automobile Mechanics", Khanna Publishers, New Delhi, 1998.

2063B 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.

SCHEME OF INSTRUCTION AND EXAMINATION

Subjects	Instructions		Examinations		
	Hours/Week	Hours/Semesters	Internal	Board Exam	Total
2063 B-Mechatronics	5	80	25	75	100

TOPICS AND ALLOCATION

UNIT	TOPIC	TIME (Hrs)
I	Introduction, Sensors & Transducers	16
II	Actuation Systems (Mechanical, Electrical, Pneumatic & Hydraulic)	18
III	Basic System Models, Input/Output Systems	16
IV	Programmable Logic Controller (PLC)	18
V	Design Examples & Advanced Applications in Mechatronics	16
	Revision, Test	12
	Total	96

UNIT-I Introduction, Sensors & Transducers

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

1.2 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)

2.1 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.

2.2 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.

2.3 Pneumatic & Hydraulic Systems – Power supplies – DCV – PCV – Cylinders – Rotary actuators.

UNIT-III Basic System Models, Input/Output Systems

3.1 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.

3.2 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)

4.1 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

5.1 Design process stages - Traditional Vs Mechatronics designs - Possible design solutions: Timed switch, Wind-screen 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.

5.2 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.

Text Books:

S.No.	Author(s)	Title	Edition / Year	Publisher
1	W.Bolton	Mechatronics	2nd Edition 2001	Pearson Education, New Delhi.
2	R.K.Rajput	A Text Book of Mechatronics	1 st Edition 2007	S.Chand & Co. Ltd., New Delhi.

Reference Books:

S.No.	Author(s)	Title	Edition / Year	Publisher
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.
3	James H.Harter	Electromechanics	1st Edition 2003	Prentice-Hall of India, New Delhi.
4	M.D.Singh & J.G.Joshi	Mechatronics	1 st Edition 2006	Prentice-Hall of India, New Delhi.

2064 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.

SCHEME OF INSTRUCTION AND EXAMINATION

Subjects	Instructions		Examinations		
	Hours/Week	Hours/Semesters	Internal	Board Exam	Total
2064- Computer Aided design and manufacturing Practical	6	96	25	75	100

PART-1 CAD Practical

(50 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
4. Solid Rendering – material attaching and detaching – shade with color – slice and sectioning – script – 3D orbit – calculating mass properties
5. Developing LISP program – constructing a list – input/output functions – control structures - arithmetic operations – trigonometric functions – special functions.

3D solid modeling and LISP programming practice (40 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

(38 Hours)

Introductions (8 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 (30 Hours)

CNC Lathe

1. Develop a part program for step turning and simulate
2. Develop a part program for taper turning and simulate
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 a part program for grooving and simulate
2. Develop a part program for drilling (canned cycle) and simulate
3. Develop a part program for mirroring with subroutines and simulate
4. Develop a part program for rectangular and circular pocketing and simulate

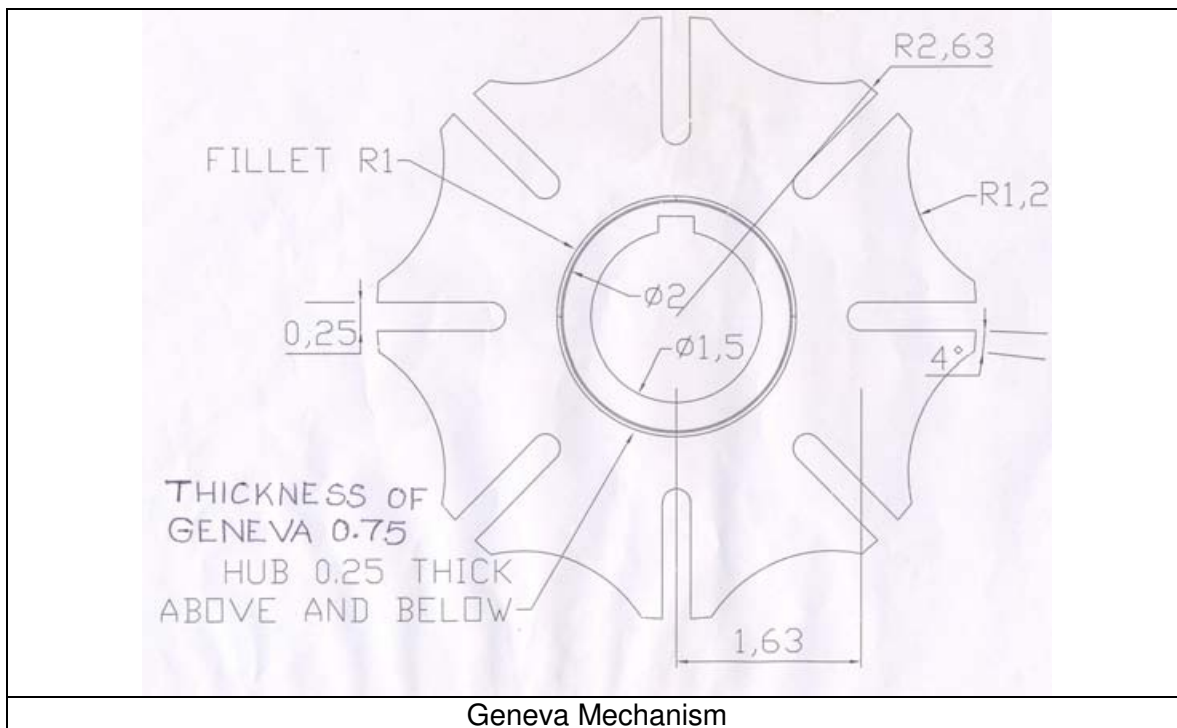
Model exam / Revision (8 Hours)

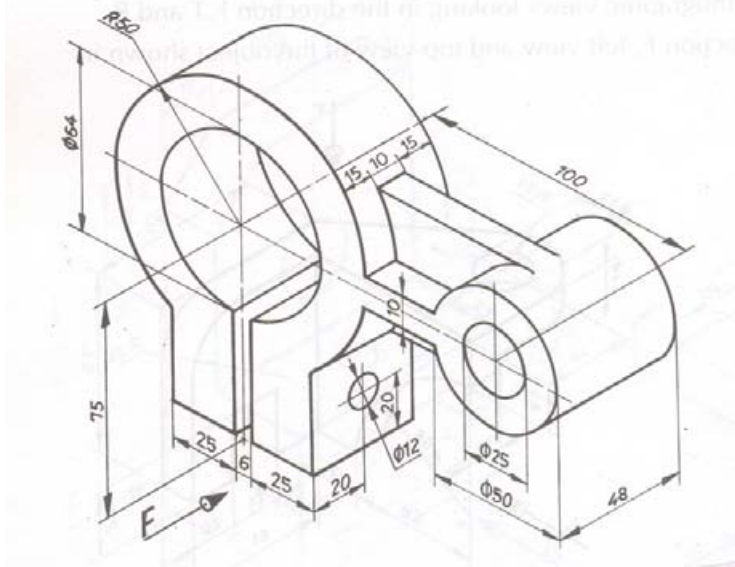
Facilities for imparting training:

1. Personal computer (Pentium processor)
2. MS Windows OS (Version 2000 or above)
3. AutoCAD software (release 2000 or above)
4. CNC Lathe and Milling simulation softwares
5. Laser jet printer for getting hard copies of student work

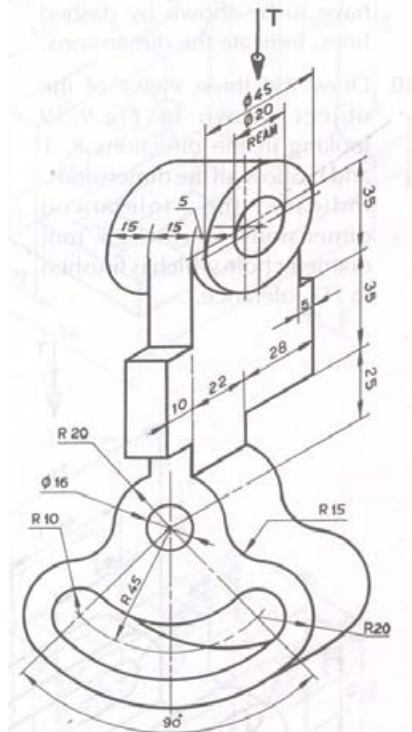
Scheme of Examination

S.No	Detail	Mark allotted
1	Solid modeling (creating model and writing mass properties)	40 marks
2	CNC Program writing and execution	30 marks
3	Viva Voce	5 marks
	Total	75 marks
	Internal assessment marks	25 marks
	Grand Total	100 marks

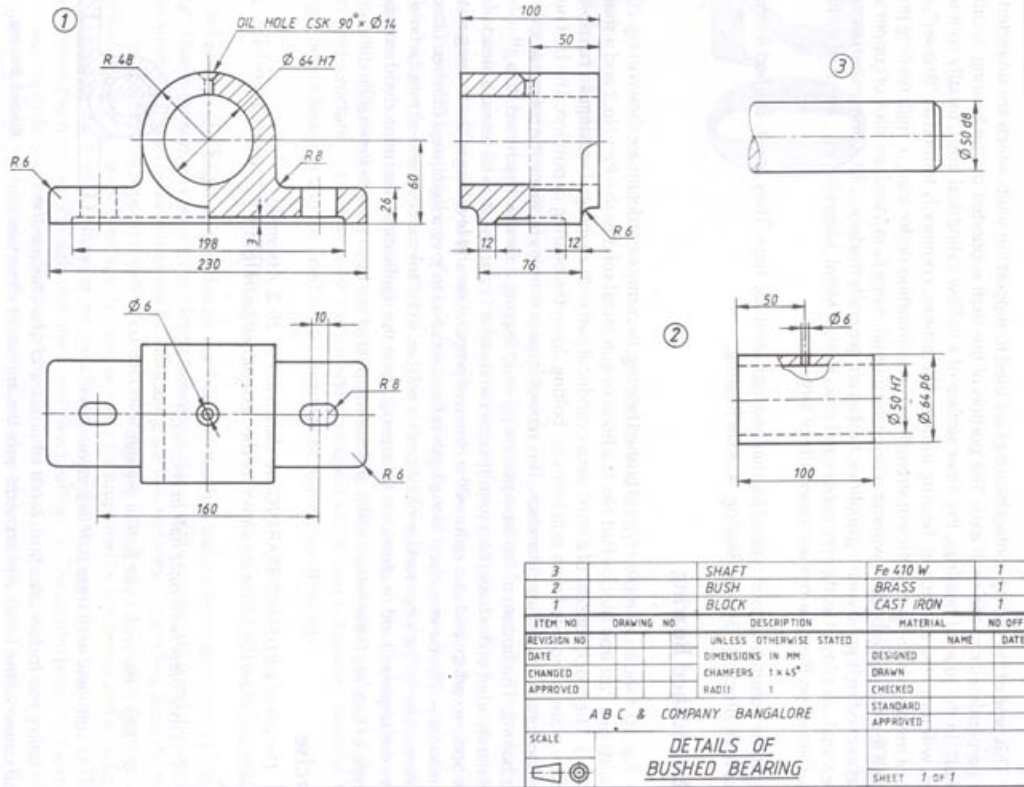




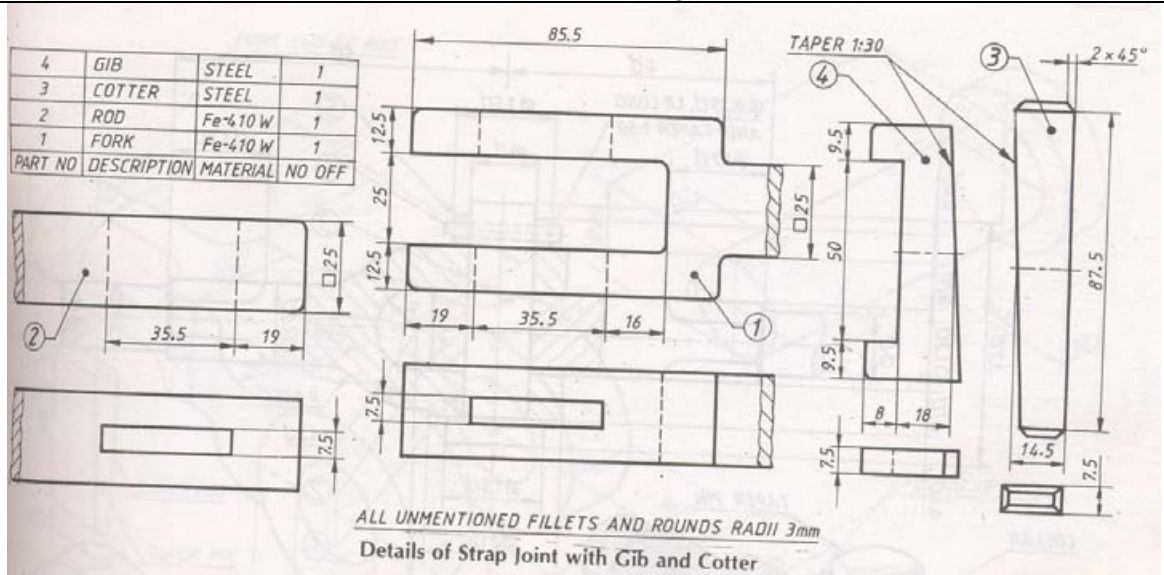
Cast iron Block



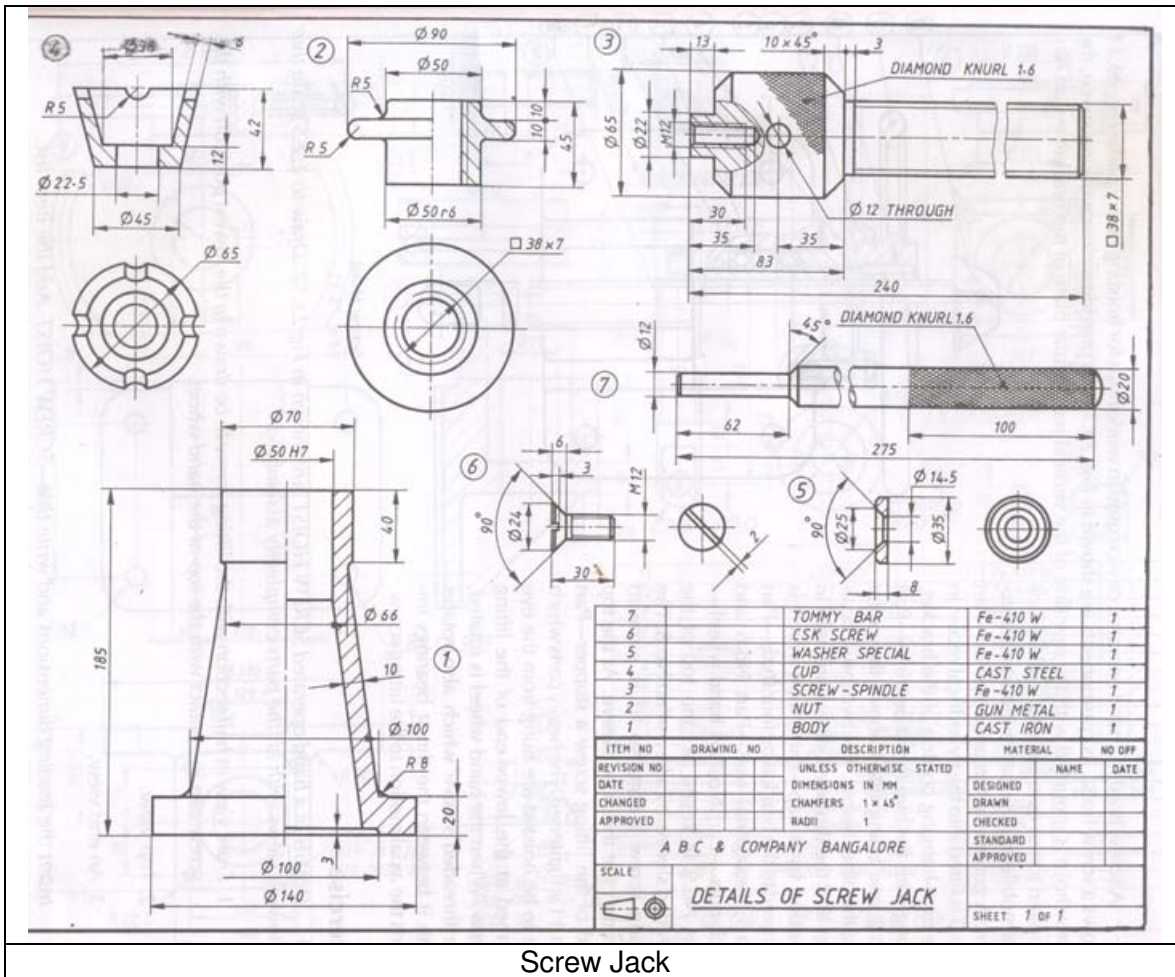
Bearing Block



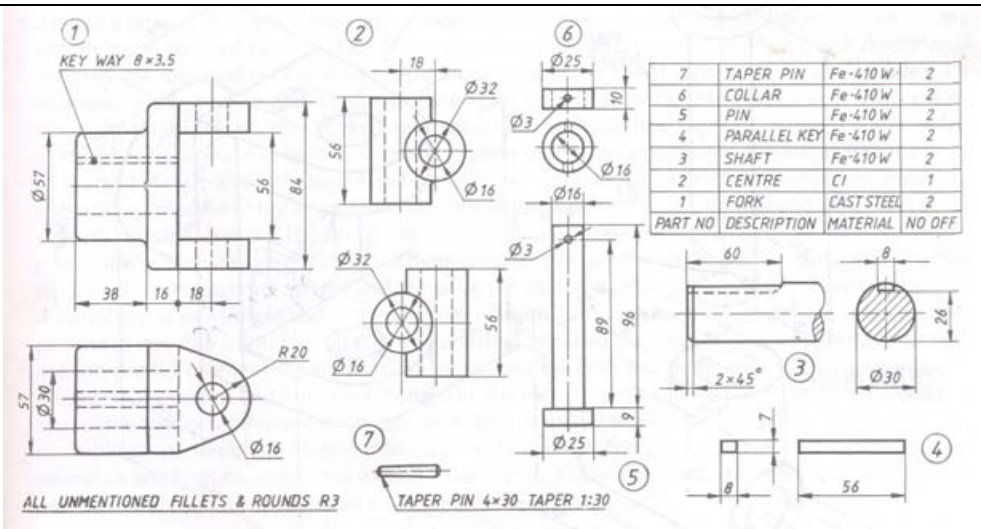
Bushed Bearing



Gib and Cotter Joint



Screw Jack

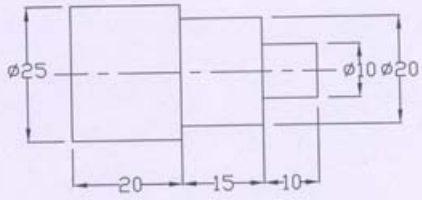


Details of Universal Coupling

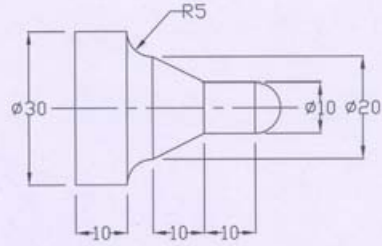
Universal Coupling

CAM Practicals – Lathe

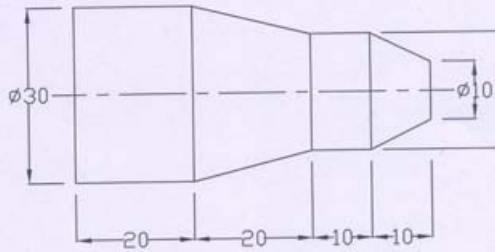
STEP TURNING



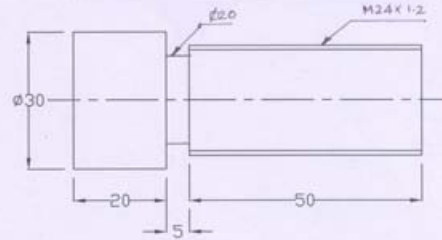
MULTIPLE TURNING CYCLE



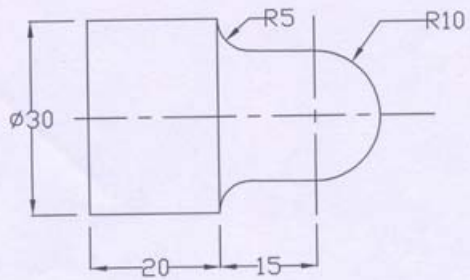
TAPER TURNING



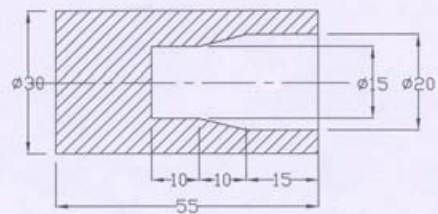
THREADCUTTING & GROOVING



CIRCULAR INTERPOLATION

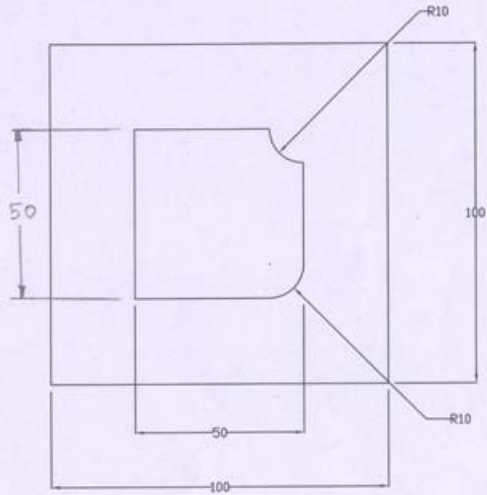


INTERNAL DRILLS & BORES

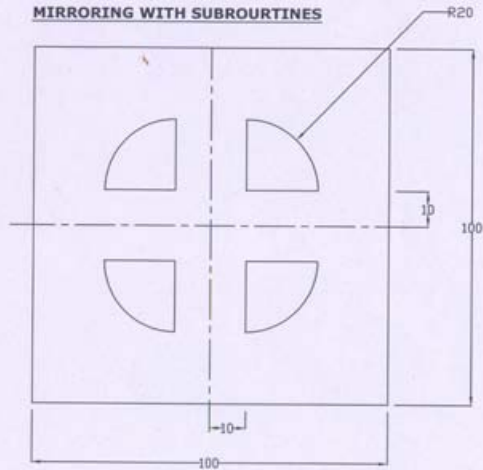


CAM Practical - Milling

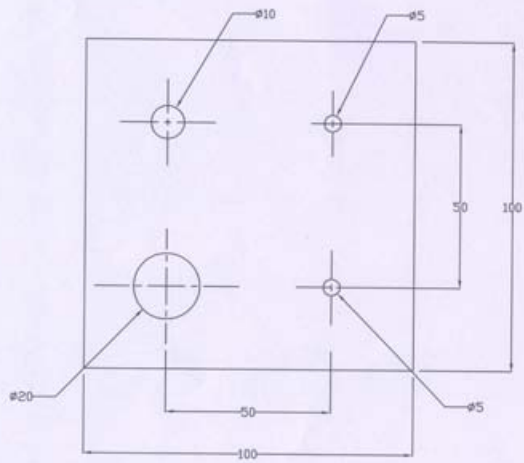
GROOVING



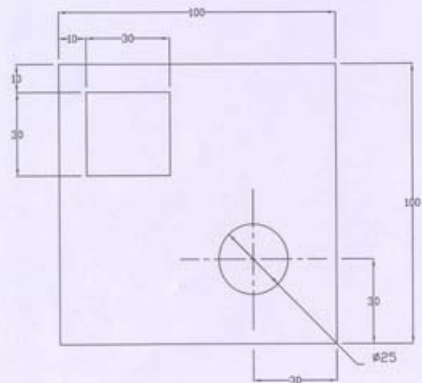
MIRRORING WITH SUBROUTINES



DRILLING



RECTANGULAR POCKETING & CIRCULAR POCKETING-POCKET DEPTH 5mm



2065A AUTOMOBILE LAB**6 Hrs/Week****16 Weeks /Sem.****Total Hrs : 96****Objectives:**

- Identify the various tools and their applications used in Automobile.
- Dismantle and assemble parts of petrol engine.
- Dismantle and assemble parts of diesel Engine.
- Service oil pump and water pump.
- Service AC fuel pump
- Service carburetor.
- Dismantle and assemble fuel injection pump.
- Dismantle and assemble of power transmission and differential system.
- Overhauling of starter motor and dynamo.
- Troubleshoot the Electrical circuit in automobile.

SCHEME OF INSTRUCTION AND EXAMINATION

Subjects	Instructions		Examinations		
	Hours/Week	Hours/Semesters	Internal	Board Exam	Total
2065A- Automobile Lab	6	96	25	75	100

1. Identification and application of mechanic's tools.
2. Dismantling and assembling of four stroke petrol and diesel engines and identification of parts.
3. Cleaning, inspecting and measuring cylinder bore using cylinder bore dial gauge and suggesting the next over size.
4. Removing decarbonising, inspecting and replacing systems and connecting rods and adjusting the bearings.
5. Removing camshaft, replacing timing gears, removing valves, lapping and adjusting valve clearance.
6. Removing, servicing and replacing oil pump and water pump.
7. Removing, servicing and replacing of A.C. fuel pump / S.U. electric fuel pump.
8. Removing, servicing SOLEX, S.U. and Maruthi carburetors.
9. Dismantling and assembling of inline F.I.P.
10. Dismantling and assembling of injectors.
11. Removing and replacing of pressure plate and clutch plate, fingers adjustment.
12. Dismantling, inspecting and assembling of gear box and finding out the gear ratios.
13. Dismantling, assembling and adjusting of steering gearbox. Finding the gear ratio.
14. Dismantling and assembling dismantling, inspecting and assembling of final drive and differential units. Adjusting of backlash
15. Study of general electrical system in an automobile. (From the service manual).
16. Study of the battery charger and charging the (Discharged) run down battery.
17. Dismantling and overhauling of a starter motor.
18. Dismantling and overhauling of a dynamo.

2066 PROJECT WORK, ENTREPRENEURSHIP, ENVIRONMENTAL MANAGEMENT & DISASTER MANAGEMENT

Project Work

The students of all the Diploma Programmes (except Diploma in Modern Office Practice) have to do a Project Work as part of the Curriculum and in partial fulfillment for the award of Diploma by the State Board of Technical Education and Training, Tamilnadu. In order to encourage students to do worthwhile and innovative projects, every year prizes are awarded for the best three projects i.e. institution wise, region wise and state wise. The selection of Project work should be taken up in V Sem. of study. The First Project review should be done in 14th week of study in V Semester. The Second Project Review should be done in the 8th week of study in the VI Semester.

b) Internal Assessment mark for Project Work & Viva Voce:

Project Review I	(V Sem.)	...	05 marks
Project Review II	(VI Sem.)	...	05 marks
Project Review III	(VI Sem.)	...	10 marks
Attendance			<u>05 marks</u>
Total	....	....	<u><u>25 marks</u></u>

b) Project Work & Viva Voce Board Examination

The allocation of Mark:

Viva Voce	...	15 marks
Project Report	...	10 marks
Demonstration	...	15 marks
Applicability of the Project	...	<u>05 marks</u>
Total	...	<u><u>45 marks</u></u>

Written Test in 3 topics for 1 hour:

a) Entrepreneurship	5 questions X 2 marks	= 10 marks
b) Environment Management	5 questions X 2 marks	= 10 marks
c) Disaster Management	5 questions X 2 marks	= <u>10 marks</u>
		<u><u>30 marks</u></u>

Selection of Questions from Question Bank by the External Examiner, no choice need be given to the candidates.

2. ENTREPRENEURSHIP

10 Marks

Qualities of an entrepreneur
Expectations of entrepreneurship
Importance of SSI
Assistances offered to SSI
Feasibility study
Services of finance for SSI

3. ENVIRONMENTAL MANAGEMENT:

- (a) Introduction – Environmental Ethics – Assessment of Socio Economic Impact – Environmental Audit – Mitigation of adverse impact on Environment – Importance of Pollution Control – Types of Industries and Industrial Pollution.
- (b) Solid waste management – Characteristics of Industrial wastes – Methods of Collection, transfer and disposal of solid wastes – Converting waste to energy – Hazardous waste management Treatment technologies.
- (c) Waste water management – Characteristics of Industrial effluents – Treatment and disposal methods – Pollution of water sources and effects on human health.
- (d) Air pollution management – Sources and effects – Dispersion of air pollutants – Air pollution control methods – Air quality management.
- (e) Noise pollution management – Effects of noise on people – Noise control methods.

4. DISASTER MANAGEMENT:

- (a) Introduction – Disasters due to natural calamities such as Earthquake, Rain, Flood, Hurricane, Cyclones etc – Man made Disasters – Crisis due to fires, accidents, strikes etc – Loss of property and life.
- (b) Disaster Mitigation measures – Causes for major disasters – Risk Identification – Hazard Zones – Selection of sites for Industries and residential buildings – Minimum distances from Sea – Orientation of Buildings – Stability of Structures – Fire escapes in buildings - Cyclone shelters – Warning systems.
- (c) Disaster Management – Preparedness, Response, Recovery – Arrangements to be made in the industries / factories and buildings – Mobilization of Emergency Services - Search and Rescue operations – First Aids – Transportation of affected people – Hospital facilities – Fire fighting arrangements – Communication systems – Restoration of Power supply – Getting assistance of neighbours / Other organizations in Recovery and Rebuilding works – Financial commitments – Compensations to be paid – Insurances – Rehabilitation.

List of Questions

1. ENVIRONMENTAL MANAGEMENT:

1. What is the responsibility of an Engineer-in-charge of an Industry with respect to Public Health?
2. Define Environmental Ethic.
3. How Industries play their role in polluting the environment?
4. What is the necessity of pollution control? What are all the different organizations you know, which deals with pollution control?
5. List out the different types of pollutions caused by a Chemical / Textile / Leather / Automobile / Cement factory.
6. What is meant by Hazardous waste ?
7. Define Industrial waste management.
8. Differentiate between garbage, rubbish, refuse and trash based on their composition and source.
9. Explain briefly how the quantity of solid waste generated in an industry could be reduced.
10. What are the objectives of treatments of solid wastes before disposal ?
11. What are the different methods of disposal of solid wastes ?
12. Explain how the principle of recycling could be applied in the process of waste minimization.
13. Define the term 'Environmental Waste Audit'.
14. List and discuss the factors pertinent to the selection of landfill site.
15. Explain the purpose of daily cover in a sanitary landfill and state the minimum desirable depth of daily cover.
16. Describe any two methods of converting waste into energy.
17. What actions, a local body such as a municipality could take when the agency appointed for collecting and disposing the solid wastes fails to do the work continuously for number of days?
18. Write a note on Characteristics of hazardous waste.
19. What is the difference between municipal and industrial effluent ?
20. List few of the undesirable parameters / pollutants anticipated in the effluents from oil refinery industry / thermal power plants / textile industries / woolen mills / dye industries / electroplating industries / cement plants / leather industries (any two may be asked)
21. Explain briefly the process of Equalization and Neutralization of waste water of varying characteristics discharged from an Industry.
22. Explain briefly the Physical treatments "Sedimentation" and "Floatation" processes in the waste water treatment.
23. Explain briefly when and how chemical / biological treatments are given to the waste water.
24. List the four common advanced waste water treatment processes and the pollutants they remove.
25. Describe refractory organics and the method used to remove them from the effluent.
26. Explain biological nitrification and de-nitrification.
27. Describe the basic approaches to land treatment of Industrial Effluent.
28. Describe the locations for the ultimate disposal of sludge and the treatment steps needed prior to ultimate disposal.
29. List any five Industries, which act as the major sources for Hazardous Air Pollutants.
30. List out the names of any three hazardous air pollutants and their effects on human health.
31. Explain the influence of moisture, temperature and sunlight on the severity of air pollution effects on materials.
32. Differentiate between acute and chronic health effects from Air pollution.
33. Define the term Acid rain and explain how it occurs.
34. Discuss briefly the causes for global warming and its consequences

35. Suggest suitable Air pollution control devices for a few pollutants and sources.
36. Explain how evaporative emissions and exhaust emissions are commonly controlled.
37. What are the harmful elements present in the automobile smokes? How their presence could be controlled?
38. What is the Advantage of Ozone layer in the atmosphere? State few reasons for its destruction.
39. Explain the mechanism by which hearing damage occurs.
40. List any five effects of noise other than hearing damage.
41. Explain why impulsive noise is more dangerous than steady state noise.
42. Explain briefly the Source – Path – Receiver concept of Noise control.
43. Where silencers or mufflers are used ? Explain how they reduce the noise.
44. Describe two techniques to protect the receiver from hearing loss when design / redress for noise control fail.
45. What are the problems faced by the people residing along the side of a railway track and near to an Airport? What provisions could be made in their houses to reduce the problem?

2. DISASTER MANAGEMENT:

1. What is meant by Disaster Management? What are the different stages of Disaster management?
2. Differentiate Natural Disasters and Man made Disasters with examples.
3. Describe the necessity of Risk identification and Assessment Surveys while planning a project.
4. What is Disasters recovery and what does it mean to an Industry?
5. What are the factors to be considered while planning the rebuilding works after a major disaster due to flood / cyclone / earthquake? (Any one may be asked)
6. List out the public emergency services available in the state, which could be approached for help during a natural disaster.
7. Specify the role played by an Engineer in the process of Disaster management.
8. What is the cause for Earthquakes ? How they are measured ? Which parts of India are more vulnerable for frequent earthquakes ?
9. What was the cause for the Tsunami 2004 which inflicted heavy loss to life and property along the coast of Tamilnadu ? Specify its epicenter and magnitude.
10. Specify the Earthquake Hazard Zones in which the following towns of Tamilnadu lie : (a) Chennai (b) Nagapattinum (c) Coimbatore (d) Madurai (e) Salem.
11. Which parts of India are experiencing frequent natural calamities such as (a) heavy rain fall (b) huge losses due to floods (c) severe cyclones
12. Define basic wind speed. What will be the peak wind speed in (a) Very high damage risk zone – A, (b) High damage risk zone, (c) Low damage risk zone.
13. Specify the minimum distance from the Sea shore and minimum height above the mean sea level, desirable for the location of buildings.
14. Explain how the topography of the site plays a role in the disasters caused by floods and cyclones.
15. Explain how the shape and orientation of buildings could reduce the damages due to cyclones.
16. What is a cyclone shelter ? When and where it is provided ? What are its requirements ?
17. What Precautionary measures have to be taken by the authorities before opening a dam for discharging the excess water into a canal/river ?
18. What are the causes for fire accidents ? Specify the remedial measures to be taken in buildings to avoid fire accidents.
19. What is a fire escape in multistoried buildings ? What are its requirements ?
20. How the inmates of a multistory building are to be evacuated in the event of a fire/Chemical spill/Toxic Air Situation/ Terrorist attack, (any one may be asked).
21. Describe different fire fighting arrangements to be provided in an Industry.
22. Explain the necessity of disaster warning systems in Industries.
23. Explain how rescue operations have to be carried out in the case of collapse of buildings due to earthquake / blast / Cyclone / flood.
24. What are the necessary steps to be taken to avoid dangerous epidemics after a flood disaster ?
25. What relief works that have to be carried out to save the lives of workers when the factory area is suddenly affected by a dangerous gas leak / sudden flooding ?
26. What are the difficulties faced by an Industry when there is a sudden power failure? How such a situation could be managed?
27. What are the difficulties faced by the Management when there is a group clash between the workers? How such a situation could be managed?

28. What will be the problems faced by the management of an Industry when a worker dies because of the failure of a mechanical device due to poor maintenance? How to manage such a situation ?
29. What precautionary measures have to be taken to avoid accidents to labourers in the Industry in a workshop / during handling of dangerous Chemicals / during construction of buildings / during the building maintenance works.
30. Explain the necessity of medical care facilities in an Industry / Project site.
31. Explain the necessity of proper training to the employees of Industries dealing with hazardous products, to act during disasters.
32. What type of disaster is expected in coal mines, cotton mills, Oil refineries, ship yards and gas plants?
33. What is meant by Emergency Plan Rehearsal? What are the advantages of such Rehearsals?
34. What action you will take when your employees could not reach the factory site because of continuous strike by Public Transport workers?
35. What immediate actions you will initiate when the quarters of your factory workers are suddenly flooded due to the breach in a nearby lake / dam, during heavy rain?
36. What steps you will take to avoid a break down when the workers union of your Industry have given a strike notice?
37. List out few possible crisis in an organization caused by its workers? What could be the part of the middle level officials in managing such crisis?
38. What types of warning systems are available to alert the people in the case of predicted disasters, such as floods, cyclone etc.
39. Explain the necessity of Team work in the crisis management in an Industry / Local body.
40. What factors are to be considered while fixing compensation to the workers in the case of severe accidents causing disability / death to them?
41. Explain the legal / financial problems the management has to face if safety measures taken by them are found to be in-adequate.
42. Describe the importance of insurance to men and machinery of an Industry dealing with dangerous jobs.
43. What precautions have to be taken while storing explosives in a match/ fire crackers factory?
44. What are the arrangements required for emergency rescue works in the case of Atomic Power Plants?
45. Why residential quarters are not constructed nearer to Atomic Power Plants ?