MECHANICAL ENGINEERING

Administrator

BHAGWANT UNIVERSIRTY

BHAGWANT UNIVERSITY

Sikar Road, Ajmer

Rajasthan

Syllabus

(Yearly)

Institute of Engineering & Technology

Diploma

(Mechanical Engineering)

2nd YEAR

Subject Code	Subject Name	Distribution of Time				Distribution of Max. Marks					
		Hours per week				Theory			Practical		
		L	T	P	Tot	Internal	External.	Total	Internal	External	Total
02DYME101	STRENGTH OF MATERIAL	2	-	-	2	30	70	100	-	-	-
02DYME102	FLUID MECHANICS & MACHINES	2	-	-	2	30	70	100	-	-	-
02DYME103	ENGG. MATERIALS AND PROCESSES	2	-	-	2	30	70	100	-	-	-
02DYME104	THEORY OF MACHINES	2	-	-	2	30	70	100	-	-	-
02DYME105	BASIC AUTOMOBILE ENGG	2	-	-	2	30	70	100	-	-	-
02DYME106	ELECTRICAL & ELECTRONICS ENGG	2	-	-	2	30	70	100	-	-	-
02DYME107	THERMODYNAMICS & I.C. ENGINES	2	-	-	2	30	70	100	-	-	-
02DYME108	WORKSHOP TECHNOLOGY & METROLOGY	2	-	-	2	30	70	100			
02DYME109	C- PROGRAMMING	2	-	-	2	30	70	100			
PRACTICALS											
02DYME201	STRENGTH OF MATERIAL	-	-	2	2	-	-	-	50	50	100
02DYME202	FLUID MECHANICS & MACHINES	-	-	2	2	-	-	-	50	-	50
02DYME203	ENGG. MATERIALS AND PROCESSES	-	-	2	2				50	-	50
02DYME204	MACHINE DRAWING & COMPUTER AIDED DRAFTING	-	-	4	4	-	-	-	50	100	150
02DYME205	BASIC AUTOMOBILE	-	-	2	2	-	-	-	50		50

	ENGG									
02DYME206	ELECTRICAL & ELECTRONICS ENGG	-	-	2	2	-	-	-	50	-	50
02DYME207	THERMODYNAMICS & I.C. ENGINES	-	-	2	2	-	-	-	50		50
02DYME208	WORKSHOP TECHNOLOGY & METROLOGY	-	-	3	3	-	-	-	50	50	100
02DYME209	C- PROGRAMMING	-	-	2	2	-	-	-	50		50
02DYME301	DISCIPLINE AND EXTRA CURRICULAR ACTIVITIES	-	-	-	-	-	-	-	50	-	50
	TOTAL	**18**	**-**	**21**	**39**	**270**	**630**	**900**	**500**	**200**	**700**

Grand Total Marks - 1600

3rd YEAR

Subject Code	Subject Name	Distribution of Time				Distribution of Max. Marks					
		Hours per week				Theory			Practical		
		L	T	P	Tot	Internal	External.	Total	Internal	External	Total
03DYME101	REFRIGERATION AND AIR CONDITIONING	2	-	-	2	30	70	100	-	-	-
03DYME102	PROCESSES IN MANUFACTURING	2	-	-	2	30	70	100	-	-	-
03DYME103	THERMAL ENGINEERING & HEAT TRANSFER	2	-	-	2	30	70	100	-	-	-
03DYME104	CNC MACHINES & AUTOMATION	2	-	-	2	30	70	100	-	-	-
03DYME105	ADVANCE WORKSHOP TECHNIQUES	2	-	-	2	30	70	100	-	-	-
03DYME106	MACHINE DESIGN	2	-	-	2	30	70	100	-	-	-
03DYME107	POWER GENERATION	2	-	-	2	30	70	100	-	-	-
03DYME108	MECHANICAL ESTIMATING &COSTING	2	-	-	2	30	70	100	-	-	-
03DYME109	INDUSTRIAL ENGINEERING	2	-	-	2	30	70	100	-	-	-
03DYME110	MANAGEMENT &ENTREPRENEURSHIP	2	-	-	2	30	70	100	-	-	-
PRACTICALS											
03DYME201	REFRIGERATION AND AIR CONDITIONING	-	-	2	2	-	-	-	50	50	100
03DYME202	PROCESSES IN MANUFACTURING	-	-	2	2	-	-	-	50	-	50
03DYME203	THERMAL ENGINEERING &	-	-	2	2	-	-	-	50	-	50

	HEAT TRANSFER									
03DYME204	CNC MACHINES & AUTOMATION	-	-	2	2	-	-	-	50	-	50
03DYME205	ADVANCE WORKSHOP TECHNIQUES	-	-	2	2	-	-	-	50	50	100
03DYME206	PRACTICAL TRAINING	-	-	2	2	-	-	-	50	50	100
03DYME207	PROJECT	-	-	2	2	-	-	-	50	50	100
03DYME301	DISCIPLINE AND EXTRA CURRICULAR ACTIVITIES	-	-	-	-	-	-	-	50	-	50
	TOTAL	20	-	14	34	300	700	1000	400	200	600

Grand Total Marks - 1600

02DYME101   STRENGTH OF MATERIALS

Unit 1- Simple Stress and Strain
1.1 Various mechanical properties: Elasticity, Plasticity, Ductility, Brittleness, Toughness, Hardness.
1.2 Concept of stress and strain: Type of force - Direct, shear,Stress - Tensile, compressive, shear.
1.3 Hook's law: Statement of Hook's law, Young's modulus of elasticity, Tensile test diagram, Gauge length, Limit of proportionality , Elastic limit ,Yield point, Yield strength, Ultimate stress , Rupture strength , Nominal stress ,Proof stress.
1.4 Working stress and factor of safety.
1.5 Stress and strain calculations: Principle of superposition, Bar of homogeneous section, Bar of uniform cross-section, Bar of steeped cross-section, Bar of composite section.
1.6 Temperature stresses: Homogeneous section, Composite section.
1.7 Shear stresses: Modulus of rigidity, Complementary shear stress, Concept of single shear and double shear,Shear strain.
1.8 Poisson's ratio and volumetric strain: Lateral strain, Longitudinal strain, Volumetric strain,Bulk modulus.
1.9 Relationship between elastic constants (Derivation): $E=3K(1-2/m)$, $E=2N(1+1/m)$, $E=9KN/(3K+N)$.

Unit 2- Compound Stress
2.1 Introduction
2.2 Stress components on an inclined plane: Induced by direct stresses, Induced by simple shear, Induced by direct and simple shear stresses
2.3 Mohr's circle: For like direct stresses, For unlike direct stresses, For two perpendiculars direct stresses with state of simple shear
2.4 Principal stresses and planes: Major principal stress, Minor principal stress, Mohr's circle method for principal stresses

Unit 3- Strain Energy
3.1 Introduction
3.2 Strain energy from stress - strain diagram
3.3 Proof resilience
3.4 Types of loading - gradual, sudden, impact: Stress in gradual loading, Stress in sudden loading, Stress in impact loading

Unit 4- Bending Moments and Shear Force
4.1 Basic concept: Types of support, Movable hinge support (roller), Immovable hinge support, Fixed support, Types of beam, Cantilever beam, Simply supported beam, Fixed beam, Continuous beam, Overhanging beam, Types of load, Point load, Distributed load - uniformly and non uniformly.
4.2 Shear force and bending moment: Concept and calculation of shear force and bending moment, Sign convention for shear force and bending moment.
4.3 Bending moment and shear force diagrams (for point loads, U.D.L. and their combinations): Cantilever beam,Simply supported beam,Simply supported beam with over hang

Unit-5 Moment of Inertia
5.1 Concept of moment of Inertia.
5.2 Radius of gyration: Parallel axis theorem, Perpendicular axis theorem.
5.3 Moment of Inertia of various section: Rectangle, Triangle, Circle.
5.4 Moment of inertia of unsymmetrical section like: T-section, channel section, L-section etc.

Unit-6 Bending Stresses in Beams
6.1 Concept of bending stress
6.2 Theory of simple bending: Assumptions in theory of simple bending ,Use of equation.
6.3 Design criterion and section modulus: Section modulus, Calculation of max bending stress in beams of rectangular, circular, I and T section

Unit-7 Shear Stress in Beams
7.1 concept, use of equation
7.2 Shear stress distribution diagram of various sections: Rectangle, I section, T section, Channel section, H section, + section, Circular section

Unit-8 Deflection
8.1 Concept of deflection of a beam
8.2 Use of standard formula for calculating deflection (for point loads, U.D.L. and their combination): Cantilever beam, Simply supported beam

Unit-9 Columns and Struts
9.1 Concept of column and struts
9.2 Modes of failure
9.3 Types of column; long and short
9.4 Buckling loads
9.5 Slenderness ratio
9.6 Euler's formula (without proof):   Both ends hinged, One end fixed and other end free, Both ends fixed, One end fixed and other end hinged, Limitations of Euler's Formula, Equivalent length,
9.7 Rankine's formula

Unit-10 Torsion of Shaft
10.1 Concept of torsion: Angle of twist, Polar moment of Inertia, Assumptions in the theory of pure torsion.
10.2 Derivation and use of Torsion of shaft
10.3 Relation between power and torque
10.4 Combined stress due to bending and torsion in solid and hollow shaft

Unit-11 Springs
11.1 Introduction and classification of springs
11.2 Flat carriage springs: Application of flat carriage springs , Determination of number of leaves and their sections, deflection and radius of curvature , Quarter elliptical spring
11.3 Closely coiled helical springs: Application of closely coiled helical springs, Determination of deflection, angle of twist, number of coils and stiffness under axial loading in closely coiled helical springs.

Unit-12 Thin Cylindrical Shells
12.1 Use of cylinders
12.2 Stresses due to internal pressure: Circumferential stress or hoop stress, Longitudinal stress.
12.3 Design of thin cylinders - calculation of the various dimensions of a thin cylinder

Unit-13 Combined Direct and Bending Stress
13.1 Effect of eccentricity
13.2 Stress due to eccentric load
13.3 Middle third rule
13.4 Quarter rule

REFERENCE BOOKS:
1. Strength of Materials & Theory of Structures (vol. I)   B.C.Punmia

2 .Strength of Materials   Ramamurtham
3. Strength of Materials   Junarkar
4. Strength of Materials   R.S. Khurmi
5. Strength of Materials (Hindi)   Gurcharan singh

02DYME102   **FLUID MECHANICS & MACHINES**

Unit 1- Introduction
1.1 Introduction concepts: Fluids and solids, Liquid, gas and vapour.
1.2 Fluid mechanics: Kinematics, Dynamics.
1.3 Fluid properties: Density, Specific volume, Specific gravity, Viscosity, Newton's law of Viscosity, Dynamic and Kinematic Viscosity, Compressibility, Surface tension - soap bubble, drop, Capillarity, Vapour pressure and its importance.

Unit 2- Fluid Pressure and its Measurement
2.1 Definition and its units
2.2 Pascal's law: Intensity of pressure at a point in fluid at rest, Pressure head.
2.3 Pressure: Atmospheric pressure, Gauge pressure,Vacuum   pressure,   Absolute   pressure, Differentials pressure.
2.4 Law of hydrostatic pressure
2.5 Brahma's press
2.6 Pressure measurement: Manometers, Piezometer - its limitation, U-tube - simple, differential, inverted , Micro-manometers , Inclined tube micro-manometers ,Mechanical gauge, Bourdon gauge, Bellow gauge, Diaphragm gauge, Dead weight gauge

Unit 3- Hydrostatics
3.1 Total pressure
3.2 Centre of pressure
3.3 Total pressure and center of pressure in following cases: Plane surface immersed horizontally, Plane surface immersed vertically, Plane surface immersed at an angle, Curved surface (no proof).
3.4 Working of lock gates, sluice gate
3.5 Pressure on masonry dams of rectangular and trapezoidal sections and their condition of stability.

Unit 4- Hydrokinematics
4.1 Description of fluid flow: Eular approach, Lagrangian approach.
4.2 Definition of path line, stream line.
4.3 Types of flow: Steady - Non steady, Uniform - Non uniform, Laminar – Turbulent, One, Two, Three dimensional flow.
4.4 Continuity equation (no proof) : Assumption, Rate of discharge, For one dimensional flow

Unit 5- Hydrodynamics and Measurement of Flow
5.1 Energy of fluid - pressure, kinetic and potential
5.2 Bernoulli's theorem (no proof): Assumptions and its limitation, Conversion of pressure into pressure head, velocity into kinetic head.
5.3 Applications of Bernoulli's theorem: Pitot-tube, Venturimeter, Orificemeter

Unit 6- Orifices
6.1 Definition and classification
6.2 Discharge through small orifices: Coefficient of contraction, Coefficient of velocity, Coefficient of discharge, Coefficient of resistance
6.3 Time of emptying a vessel of uniform cross section through an orifice at bottom.

(Simple Numerical Problem).

Unit 7- Flow Through Pipes
7.1 Types of flow in pipes (Reynold's experiment): Laminar flow, Turbulent flow, Transient flow
7.2 Law of fluid friction: Laminar flow, Turbulent flow
7.3 Loss of head due to friction (No. proof): Darcy's Weisbach equations, Chezy's formula, Manning formula
7.4 Other energy losses in pipe (only expressions)
7.5 Total energy line and hydraulic gradient line
7.6 Pipe arrangement: Pipes in series, Pipes in parallel
7.7 Transmission of power through pipes
7.8 Siphon
7.9 Water hammer

Unit 8- Impact of Free Jet
8.1 Impulse momentum equation (no proof)
8.2 Force exerted by a fluid jet on stationery flat plate: Plate normal to the jet, Plate inclined to the jet.
8.3 Force exerted by fluid jet on moving flat plate: Plate normal to the jet,Plate inclined to the jet.
8.4 Force exerted by fluid jet on stationary curved vane: Jet strikes at the centre of symmetrical cured vane, Jet strikes tangentially at one.
8.5 Force exerted by a fluid jet on moving curved vane.

Unit 9- Hydraulic Turbines
9.1 Classification of water turbines.
9.2 Pelton turbine: Working principle, Constructional features.
9.3 Francis turbine and Kaplan turbine: Working principle, Constructional features.
9.4 Draft tube
9.5 Cavitation
9.6 Governing of Turbines: Need for governing, Simple governing mechanism.
9.7 Surge tank
9.8 Turbine performance: Heads - gross, net. Efficiency - Hydraulic, Mechanical, Volumetric, Overall, Unit quantities, Specific speed, Introduction to characteristics curve (no numerical problems).
9.9 Numerical problems on turbines.

Unit 10- Centrifugal Pump
10.1 Introduction and working principles
10.2 Advantages over reciprocating pump
10.3 Classification
10.4 Constructional features: Mechanical manometric and overall efficiency.
10.5 Head of a pump - static, manometric: Power required to drive the pump.
10.6 Losses in pump and efficiency
10.7 Minimum stating speed
10.8 Pumps in series and parallel
10.9 Priming
10.10 Description and working of multistage centrifugal pump, submersible, deepwell pump and gear pump.
10.11 Numerical problems

Unit 11- Reciprocating Pump
11.1 Types of pump
11.2 Main components and working
11.3 Slip: Percentage slip, Negative slip.
11.4 Work down by a reciprocating pump

11.5 Acceleration of piston: Its effect on velocity and pressure.
11.6 Air vessel
11.7 Troubles in Reciprocating pump and their remedies.
11.8 Numerical problems
\
Unit 12- Miscellaneous Hydraulic Machines
12.1 Description, working principle of following machines: Hydraulic accumulator,   Hydraulic intensifier, Hydraulic press, Hydraulic coupling and torque converter.

REFERENCE BOOKS:
1. Fluid Mechanics & Machines	Dr. Jagdish Lal
2. Fluid Mechanics & Machines	Dr. R.K.Bansal
3. Fluid Mechanics & Machines	R.S.Khurmi.
4. Hydraulics & Pneumatics	H.L. Stewart.
5. Fluid Machines	S.S. Ratan

02DYME103   ENGG. MATERIALS AND PROCESSES

(A) Engineering Materials

Unit-1 Classification and Properties of Materials
1.1 Introduction to engineering materials
1.2 Classification of materials
1.3 Thermal, chemical, electrical, mechanical properties of various materials
1.4 Selection criteria for use in industry

Unit-2 Structure of Metals and Their Deformation
2.1 Metal structure
2.2 Arrangement of atoms in metals
2.3 Crystalline structure of metals
2.4 Crystal imperfections
2.5 Deformation of metal

Unit-3 Ferrous Metals
3.1 Classification of iron and steel
3.2 Sources of Iron ore and its availability
3.3 Manufacture of pig iron, wrought iron, cast iron and steel
3.4 Effect of various alloying elements on steel

Unit-4 Non Ferrous Metals
4.1 Important ores and properties of aluminum, copper, zinc, tin, lead
4.2 Properties and uses of nonferrous alloys

Unit-5 Engineering Plastics and Fibers
5.1 Introduction and use of plastics and fibers
5.2 Classification of plastic (Thermoplastic and thermosetting)
5.3 Classification of fibers (Inorganic and organic fibers

Unit-6 Insulating Materials
6.1 Various heat insulating material like asbestos, glass, wool thermocole, cork, puf, china clay and their use.

Unit-7 Testing of Metals and Alloys
7.1 Identification tests : appearance, sound, spark, weight, magnetic, microstructure, filing

Unit-8 Fundamentals of Heat Treatment
8.1 Principles of heat treatment
8.2 Iron-carbon diagram
8.3 TTT curve in steels and its importance
8.4 Introduction of various heat treatment processes

(B) Manufacturing Processes

Unit-9 Welding Process

9.1 Principle of welding
9.2 Classification of welding process
9.3 Advantage and limitation of welding
9.4 Industrial applications of welding.

Unit-10 Gas Welding
10.1 Principle of operation of oxy-acetylene gas welding
10.2 Gas welding equipments : gas welding troch, blow pipe, pressure regulators
10.3 Oxy- acetylene gas cutting, construction of gas cutting torch

Unit-11 Electric Arc Welding
11.1 Principle of operation
11.2 A.C and D.C arc welding
11.3 Arc welding machine and equipment
11.4 Effect of polarity
11.5 Electrodes (Metal and Carbon), Flux and their functions

Unit-12 Other Welding Processes
12.1 Resistance welding : Spot, butt, flash, Seam, percussion and projection welding
12.2 Submerged arc welding
12.3 Welding distortion, welding defects, method of controlling welding defects and inspection of welded joints

Unit-13 Modern Welding Methods
13.1 Principle of operation, advantage, disadvantages, application: Tungsten inert gas welding (TIG), Metal inert gas welding (MIG)
13.2 Brief concept of following: Thermit welding, Electroslag welding, Electron beam welding, Ultrasonic welding, Laser beam welding

Unit-14 Foundry
14.1 Pattern - Types, materials and allowances.
14.2 Molding sends : Types and Properties (permeability, refractoriness, adhesiveness, cohesiveness, strength, flowability, collapsibility)
14.3 Molds: Types of molds, Steps involved in making a molds, Elementary idea of gating & risering
14.4 Core : Function of core, Type of core according to shape & position of core.
14.5 Molding Furnaces: Construction & Cupola, Introduction of tilting type Crucible Furness.
14.6 Elementary Idea, Advantages, Disadvantages and Application of following special Casting Techniques : Die casting - Hot chamber, cold chamber process, Investment or lost wax process, Centrifugal casting - True, Semi centrifugal, centrifugal, Shell moudling.
14.7 Types of Casting defects

REFERENCE BOOKS:

1. Engineering Material   B.K. Agarwal
2. Elements of Metallurgy   H.S. Bawa
3. Materials and Metallurgy Lab Manual   Adithan & Bahl
4. Engineering Materials   O.P. Khanna
5. Material Science   R.K. Rajput

02DYME104   **THEORY OF MACHINES**

Unit-1 Simple Mechanism
1.1 Introduction to link, kinematic pair, kinematic chain, structure, mechanism, machine
1.2 Slider crank mechanism and its inversion
1.3 Double slider crank chain
1.4 Example of mechanism with higher pairs

Unit-2 Velocity and Acceleration in Mechanism
2.1 Velocity diagrams of four bar and single slider crank mechanisms by relative velocity method and instantaneous centre method
2.2 Acceleration diagram of four bar chain and reciprocating engine mechanism, coriolis components

Unit-3 Dynamics of Reciprocating Parts
3.1 Analytical method for velocity and acceleration of piston
3.2 Piston effort, crank pin effort, turning moment diagrams
3.3 Fluctuation of energy and speed
3.4 Energy of a flywheel
3.5 Calculating the weight of flywheel.

Unit-4 Friction
4.1 Friction of collars and pivots
4.2 Friction clutches-plate clutch and centrifugal clutch
4.3 Friction in journal bearings
4.4 Rolling friction

Unit-5 Transmission of Power
5.1 Flat and V-belt drives
5.2 Velocity ratio of belt drives, slip in belt, and creep in belt.
5.3 Length of open and cross belt drives
5.4 Power transmitted by a belt
5.5 Ratio of driving tension, centrifugal tension, Condition for the maximum power transmission, initial tension in the belt.
5.6 Chain drives - types of chain drives roller chain and inverted tooth chain.
5.7 Gear drives - Types of gear wheels, proportions of gear tooth
5.8 Gear trains - Simple gear train, compound gear train, reverted gear train and simple epicyclical gear train.

Unit-6 Balancing
6.1 Static and dynamic balancing, need of balancing
6.2 Balancing of single rotating mass by a single mass in the same plane, by two masses rotating in different planes.

6.3 Partial primary balancing of a single cylinder reciprocating engine

Unit-7 Vibration
7.1 Causes of vibrations in machine, their effects and method of reducing them
7.2 Free or natural vibration
7.3 Forced vibration
7.4 Damped vibration.

Unit-8 Governors (No derivation & numerical)
8.1 Introduction and classification
8.2 Methods of governing (Quality, Quantity and hit and miss governing)
8.3 Dead wt governors (watt , porter and proell)
8.4 Spring control governors (hartnell and Wilson hartnell)
8.5 Concept of sensitivity, stability, isochronism , hunting, effort and power.

Unit-9 Brakes and Dynamometer
9.1 Introduction, function, capacity of brakes : Block and shoe brake, Band brake, Internal expanding brake
9.2 Functions of dynamometer, Prony brake, Rope brake and Froude's hydraulic dynamometer.

Unit-10 Gyroscope
10.1 Introduction and principle
10.2 Gyroscopic couple

REFERENCE BOOKS :
1.	e'khu dk fl)kr	dij ,oadekj
2.	Theory of Machines	Jagdishlal
3.	Theory of Machines	R.S.Khurmi
4.	Theory of Machines	Abdullah Sharif
5.	Theory of Machines	Malhotra, Gupta
6.	Theory of Machines	S.S. Ratan

02DYME105   BASIC AUTOMOBILE ENGINEERING

Unit-1 Introduction
1.1 Classification of Automobiles
1.2 Chassis and body
1.3 Components of vehicle - basic structure, power unit, transmission system, accessories, superstructure. (Basic functions and arrangements)
1.4 Layout of conventional type vehicle (front engine rear wheel drive)
1.5 Vehicle dimensions - wheel base, wheel track, front & rear overhang, overall dimensions, ground clearance, minimum turning radius.

Unit-2 Suspension System
2.1 Basic functions of suspension system
2.2 Types - Independent and rigid, coil, leaf, torsion bar, air, rubber suspension (Elementary idea)
2.3 Conventional leaf spring rigid beam suspension for light vehicle and with helper spring for heavy vehicles.
2.4 Function, construction and working of Telescopic type shock absorber.
2.5 Sprung and unsprung weight.

Unit-3 Braking Systems

3.1 Purpose, principle, classification of brakes.
3.2 Layout and description of mechanical brakes.
3.3 Hydraulic brakes: Principle, layout, Construction & working of single and tandem master cylinder, wheel cylinder, Bleeding of hydraulic brakes, Brake fluids and characteristics.
3.4 Maintenance of brakes, brake troubles and remedies.
3.5 Hand brakes

Unit-4 Wheels and Tyres
4.1 Wheels: Requirements of wheel, Types- pressed steel disc, wire, light alloy cast wheels.
4.2 Tyres: Types (Tubed, Tubless, Cross ply, Radial ply), Cross section of a pneumatic tyre, Specification of tyres, Tyre maintenances, tyre trouble and repair.

Unit-5 Front axle and Steering System
5.1 Front axle - types and construction, front wheel stub axle assembly
5.2 Purpose and requirements of steering system
5.3 General arrangement of steering systems steering gear ratio
5.4 Steering system components - steering wheel, steering column, conventional steering linkage, steering and ignition lock.
5.5 Construction and working details of different types of steering gear boxes

Unit-6 Power Transmission System
6.1 Clutch : Purpose and requirements of clutch, Construction of working detail of single plate, coil spring, clutch, multi plate clutch, Dry and wet clutch, Construction of clutch plate
6.2 Gear Box : Functions and types of gear boxes, Constructional and working of sliding mesh, constant mesh and synchronous mesh gear boxes, Construction and working of selector and inter locking mechanism.
6.3 Final Drive: Function and constructional details of - Propeller shafts, Universal joints, Sliding joint, Differential - Principles, function, construction and working of conventional differential, Different types of rear axles according to methods of supporting.

Unit-7 Frame and Body
7.1 Frame: Function of frame, loads or frame, Frame construction, sub-frame, Defects in frame chassis repair and alignment, Frame less construction.
7.2 Body: Types and construction (parts of body), Main features - strength, stiffness, space air drag, stream lining , weight, vibration, protection against weather, corrosion, safety and economy considerations, Body alignment, Bumpers - types and functions.

REFERENCE BOOKS:
1. Automotive Chassis & Body.
2. Vehicle & Engine Technology (Vol. I & II)
 3. Basic Automobile Engineering
4. Automobile Engineering.

02DYME106   ELECTRICAL AND ELECTRONICS ENGINEERING

Unit-1 D.C. Machines
1.1 Construction
1.2 Operation of D.C. generator
1.3 Operation of D.C. motor
1.4 Types of D.C. generator and motor
1.5 Starters
1.6 Speed control methods
1.7 Characteristics of D.C. motors

Unit-2 Transformer
2.1 Construction of single phase transformer
2.2 Types of transformer
2.3 Principle of operation
2.4 E.M.F equation
2.5 Testing of T/F: Polarity test, Open circuit test, Short circuit test.
2.6 Efficiency and losses
2.7 Voltage regulation
2.8 Single phase auto transformer
2.9 Types of 3 phase transformers
2.10 Cooling methods

Unit-3 Induction Motor
3.1 Construction and working principle of single-phase induction motor
3.2 Types of single phase induction motors (description only)
3.3 Production of rotating magnetic field by three phase currents.
3.4 Construction and working principle of three-phase induction motor
3.5 Torque equation
3.6 Torque slip characteristics
3.7 Starting and speed control of 3-phase induction motor
3.8 Various types of starters
3.9 Methods of increasing starting torque
3.10 Application

Unit-4 Industrial Drives
4.1 Elementary idea for industrial drives
4.2 Application of industrial drives in following fields: Rolling mill, Textile mills, Paper mill, Crane, Mines, Lathe machine, Pumps, Food processor, refrigerators punches.

Unit-5 Electric Heating
5.1 Advantages of electric heating over other types of heating
5.2 Principle of operation, construction and uses of electrical heating in: Resistance heating, Induction heating, Arc heating.
5.3 Brief idea of high frequency heating, dielectric heating and its application.

Unit-6 Illumination
6.1 Nature of light
6.2 Standard terms and definitions
6.3 Laws of illumination
6.4 Types of lamps: Tungsten, Halogen, Sodium, Neon, Mercury vapour lamp, Fluorescent tubes.

Unit-7 Instrumentation and Measurement
7.1 Principle, construction and working of the following measuring instruments: Ammeter and voltmeter (moving coil and moving iron type), Dynamometer types wattmeter, Single phase AC energy meter, Multimeter and megger.
7.2 Transducers
7.3 Measurements of mechanical quantities like pressure, strain, temperature

Unit-8 Semiconductor and P-N Junction Diode
8.1 Intrinsic and extrinsic semiconductor
8.2 Description of conductor, insulator and semiconductor
8.3 P-N junction diode
8.4 Space charge and barrier potential
8.5 Volt-ampere characteristics (forward and reverse bias)
8.6 Zener and avalanche breakdown

8.7 LED and LCD

Unit-9 Bipolar Junction Transistor
9.1 Fundamentals of BJT operation
9.2 Amplification phenomenon
9.3 CE, CB and CC configuration and DC current relationship
9.4 Input and output characteristic of CE, CC and CB.

Unit-10 Digital Electronics
10.1 Binary, Decimal, Octal and Hexadecimal number system
10.2 Logic gates - OR, AND, NOT, NAND, NOR, Ex-OR, Ex-NOR

Unit-11 Power Electronics
11.1 Introduction of SCR's, Diac, Triac, UJT
11.2 Series and parallel connection of SCR's
11.3 Half wave and full wave rectifiers using SCR's with resistive and inductive load
11.4 Snubber circuit
11.5 Application of SCR's in speed control of AC and DC motors.

Unit-12 Relays Contactors and Timers
12.1 Type of relays
12.2 Relay parts
12.3 Construction and working of relays, contactors and timers.
12.4 DC operated time delay relay
12.5 AC operated time delay relay.

Unit-13 Photo Electric Devices
13.1 Photo cells
13.2 Photo transistors
13.3 LDR's
13.4 Solar cells - working principle and applications

REFERENCE BOOKS:
1. Power Electronics	P.S. Bhimbara
2. Electronics	V. K. Mehta
3. Integrated Electronics	Millman Halkias
4. Industrial Electronics	Bhattacharya
5. Basic Electronics	B.L. Theraja
6. Electronics Principles (For Mechanical)	L.M. Shaikh

02DYME107   THERMODYNAMICS AND I. C. ENGINES

Unit-1 Basic Concept and Gas Laws
1.1 Thermodynamics, property-Intensive and Extensive, system - open, closed and isolated.
1.2 Energy - Internal energy, potential energy, kinetic energy, heat, work, specific heat, enthalpy.
1.3 Boyle's law, Charle's law, Joule's law
1.4 Characteristics gas equation, gas constant, mol, universal gas constant and molar specific heats
1.5 Simple numerical problems

Unit-2 Laws of Thermodynamics
2.1 Zeroth law of thermodynamics
2.2 First law of thermodynamics.

2.3 Second law of thermodynamics Concept of entropy
2.4 Constant volume, constant pressure, isothermal, adiabatic polytropic processes, throttling expansion, work done during these processes.
2.5 Simple numerical problems

Unit-3 Availability
3.1 Available and unavailable energy
3.2 Effectiveness
3.3 Irreversibility in flow and non-flow process.

Unit-4 Formation of Steam and its Properties
4.1 Generation of steam at constant pressure, various stage of steam- wet steam, dry steam saturated , steam. Dryness fraction, super heated steam, degree of super heat.
4.2 Critical point, triple point, thermodynamic properties of steam - specific volume, specific enthalpy, specific internal energy, specific entropy.
4.3 Steam property diagram: temperature - entropy diagram, enthalpy- entropy diagram, pressure enthalpy diagram.
4.4 Heating and expansion of steam during thermodynamic processes, Change of internal energy and entropy of steam during processes.
4.5 Simple numerical problems Use of steam tables and Mollier charts.

Unit-5 Steam Generators
5.1 Definition of boiler according to I.B.R., classification of boilers, Comparison of water tube and fire tube boilers.
5.2 Special characteristics of high-pressure boilers
5.3 Introduction to Indian Boiler Act.

Unit-6 Boiler Performance
6.1 Actual evaporation, Equivalent evaporation, Factor of evaporation, Boiler efficiency
6.2 Heat losses in boiler plants, Boiler power, Energy balance sheet of boiler.
6.3 Simple numerical problems

Unit-7 Gas Power Cycles
7.1 Otto cycle, Diesel cycle, Dual combustion cycle, Atikinson cycle, Joule / Brayton cycle
7.2 Air standard efficiency
7.3 Effect of compression ratio on efficiency
7.4 Numerical Problems

Unit-8 Principles of Internal Combustion Engines
8.1 Introduction and Classification of I.C Engines
8.2 Working principle of four stroke and two stroke cycle and their comparison
8.3 Working and special features of petrol and diesel engines and their comparison and applications
8.4 I.C. engine terms - Bore, stroke, dead centers, crank throw, compression ratio, clearance volume, piston displacement and piston speed
8.5 Valve timing diagrams (Theoretical & Actual), firing order
8.6 Super charging of I.C. engines

Unit-9 Petrol Engines
9.1 Concept of Carburation, Air fuel ratio
9.2 Simple carburetors and its limitations
9.3 Description of Solex carburetors
9.4 Multi point fuel injection system
9.5 Mechanical and electrical feed pump
9.6 Description of coil ignition system and Magneto ignition system

Unit-10 Diesel Engines
10.1 Description and working of Fuel feed pump
10.2 Injection of fuel, air and airless injection and fuel injectors
10.3 Introduction to swirl and open combustion chambers

Unit-11 Cooling, Lubrication and Governing
11.1 Necessity of engine cooling
11.2 Properties of coolants
11.3 Methods of cooling and their merits and demerits
11.4 Function of Lubrication, lubrication systems of I.C. Engines
11.5 Properties of lubricants
11.6 Governing methods of I.C. Engines.

Unit-12 I.C. Engines Performance
12.1 Introduction to basic performance parameters
12.2 Measurement of brake power by rope brake, prony brake and hydraulic dynamometer
12.3 Measurement of Indicated power by engine indicator and Morse test method.
12.4 Energy balance sheet of I.C. engines and finding various efficiencies
12.5 Numerical problems

Unit-13 Gas Turbines (No numerical problem)
13.1 Classification and application of gas turbines
13.2 Description of constant pressure (open cycle and closed cycle) and constant volume gas turbines.
13.3 Methods of increasing thermal efficiency of gas turbines, regeneration, inter cooling, re-heating.

Unit-14 Air Compressors (No numerical problem)
14.1 Classification of compressors, uses of compressed air
14.2 Description of single stage and multi stage reciprocating compressors
14.3 P.V. diagram of single and multi stage reciprocating compressor with inter cooling
14.4 Description of rotary and centrifugal compressors

REFERENCE BOOKS:
1. Thermal Engineering (Hindi)   Verma & Gulecha
2. Thermal Engineering Vol.1   Mathur & Mehta .
3. Thermal Engineering   R.K.Purohit.
4. Thermal Engineering   R.S. Khurmi

02DYME108   WORKSHOP TECHNOLOGY AND METROLOGY

(A)   Workshop Technology
Unit-1 Cutting Tools and Materials

1.1 Cutting tools: Standard shape of single point tool, Cutting angles, effect of rake angle, importance of clearance angle, Heat produced by cutting and its effect, Cutting speed, feed and depth of cut.
1.2 Materials: Materials of cutting tools and their properties, High-speed steel, cobalt steel, tungsten carbide, cemented carbide, stellite, diamond, ceramics.

Unit-2 Lathe Machine
2.1 Specifications and Classification of lathe machines
2.2 Constructional features of a centre lathe and its function

2.3 Functions of various parts of lathe
2.4 Different operations, which can be performed on the centre, lathe with and without attachments.
2.5 Calculation of gear trains for thread cuttings
2.6 Lathe attachments and lathe accessories.

Unit-3 Drilling Machines

3.1 Description, working and uses of different drilling machines, Multi spindle drill, gang drill, deep hole drill and small diameter hole drill machines.
3.2 Specifications and constructional features of radial arm and upright drilling machines
3.3 Work holding devices, tool holding devices
3.4 Various operations of drilling machines e.g. drilling, reaming, boring, counter-boring, counter sinking, spot facing, tapping.
3.5 Selection of drill

Unit-4 Shaping, Planning and Slotting Machines

4.1 Specification, constructional features working and uses of various types of shapers, planers and slotters.
4.2 Mechanism used in shaper - crank and slotted link, whitworth quick return and hydraulic mechanism
4.3 Mechanism of planner
4.4 Various works holding devices and clamping devices used on shaper and planner
4.5 Various shaper and planner operations
4.6 Shaper and planner tools
4.7 Cutting speed, feed and depth of cut on shaper
4.8 Difference between shaper, planner and slotter

Unit-5 Cutting Fluids and Cooling Process

5.1 Types of cutting fluids and coolants
5.2 Functions of cutting fluid and its action
5.3 Difference between cutting fluid and coolant
5.4 Selection of cutting fluids for different material and operations.

(B) Metrology
Unit-6 Introduction to Metrology

6.1 Units and standards of measurement
6.2 International, National and company standards
6.3 Line and end standards
6.4 Errors in measurement
6.5 Precision and accuracy

Unit-7 Linear and Angular Measurement

7.1 Vernier calliper, micrometers, height and depth gauges
7.2 Bevel protractor, sine bar, slip gauges, angle gauges and clinometers
7.3 Auto collimator, angle dekkar,
7.4 Taper measurements
7.5 Cylinder bore gauge, Telescopic gauge, feeler and wire gauge

Unit-8 Measurement of Surface Finish

8.1 Meaning of surface texture, primary and secondary texture
8.2 Terminology of surface roughness
8.3 Factors affecting surface finish
8.4 Representation of surface roughness parameters CLA and RMS values
8.5 Comparison and direct instrument methods of surface finish measurements.

Unit-9 Comparators

9.1 Classification, advantages and working mechanism of dial indicators, passmeters
9.2 Mechanical, Electrical, Electronic and pneumatic comparators

Unit-10 Light Wave Interference
10.1 Principle of interference
10.2 Interferometry applied to flatness testing
10.3 N.P.L. flatness interferometer

Unit-11 Gear and Screw Measurement
11.1 Screw thread terminology, errors in threads
11.2 Effective diameter measurement by two wire and three wire methods
11.3 Major and minor diameter measurement, Thread micrometers
11.4 Gear tooth terminology
11.5 Gear tooth vernier calliper and its application
11.6 Measurement of gear pitch.

Unit-12 Limits, Fits and Tolerance
12.1 Interchangeability - control and need
12.2 Definitions and Terminology of limits, fits and tolerances
12.3 Basis of limit system
12.4 Type of fits
12.5 Limit gauges

Unit-13 Machine Tool Metrology
13.1 Alignment tests
13.2 Performance tests
13.3 Alignment test on lathe and drilling machine

REFERENCE BOOKS:
1. Workshop Technology (Hindi) - II   Tahil Manghnani
2. Workshop Technology (Hindi) - II   B.S.Raghuvanshi
3. Workshop Technology - II   Hazra & Chaudhary.
4. Workshop Technology (Hindi)   S.K.Bhatnagar
5. Production Technology   R.K. Jain

02DYME109   'C' PROGRAMMING

Unit-1 Introduction
1.1   Scope of 'C' Language
1.2   Distinction and similarities with other HLLs
1.3   Special features and Application areas

Unit-2 Elements of 'C'
2.1 Character set
2.2 Key words
2.3 Data types
2.4 Constants and Variables
2.5 Operators: unary, binary, ternary
2.6 Operator precedence

Unit-3 Console Input-Output
3.1 Types of I-O
3.2 Console I-O
3.3 Unformatted console I-O: getchar(),putchar(), gets(), puts(), getch(),getche()

3.4 Formatted I-O: scanf(), printf()

Unit-4 Control Flow
4.1 Statements and blocks
4.2 if
4.3 switch
4.4 Loops: for, while, do-while
4.5 goto and labels
4.6 break, continue, exit
4.7 Nesting control statements

Unit-5 Arrays
5.1 Basic concepts
5.2 Memory representation
5.3 One dimensional array
5.4 Two dimensional array

Unit-6 Functions
6.1 Basic concepts
6.2 Declaration and prototypes
6.3 Calling
6.4 Arguments
6.5 Scope rules
6.6 Recursion
6.7 Storage classes types
6.8 Library of functions: math, string, system

Unit-7 Pointers
7.1 Basic concepts
7.2 &, * operator
7.3 Pointer expression: assignment, arithmetic, comparison
7.4 Dynamic memory allocation
7.5 Pointer v/s Arrays

Unit-8 Structure and Enumerated Data Types
8.1 Basic concepts
8.2 Declaration and memory map
8.3 Elements of structures
8.4 Enumerated data types : typedef, enum
8.5 Union

02DYME201   STRENGTH OF MATERIAL PRACTICALS

1. Study of extensometers
2. Study and operation of UTM
3. Tensile test on mild steel specimen and plotting stress strain curve.
4. Bending test on timber beams.
5. Compression test on common structural materials viz. timber, cast iron etc.
6. Determination of toughness of cast iron and mild steel specimen by Charpy and Izod test.
7. Hardness test by Brinell and Rockwell test.
8. Determination of deflection for various types of loading
9. Torsion test on brass and mild steel
10. Determination of stiffness of close coiled spring

02DYME202   **FLUID MECHANICS & MACHINES PRACTICALS**

1. Study of different types of manometers and pressure gauges
2. Verification of Bernoulli's theorem
3. Determination of C_d for Venturimeter
4. Determination of C_d for Orificemeter
5. Determination of C_c, C_v and C_d of small orifice
6. Determination of coefficient of friction for pipes
7. Determination of slip, coefficient of Discharge for a reciprocating pump
8. Study of construction and working of following :
8.1 Centrifugal pump
8.2 Pelton wheel turbine
8.3 Francis turbine
9. Study of model of Kaplan turbine
10. Study of submersible pump, jet pump, deepwell pump.

02DYME203   **ENGINEERING MATERIALS AND PROCESSES PRACTICALS**

1. Identification of different metals (ferrous & Non Ferrous) by various methods. (e.g.
appearance, sound, spark, weight, magnetic, microstructure, filing
2. Study of heat treatment furnace.
3. Study of metallurgical microscope.
4. Exercise of TIG welding
5. Exercise of MIG welding
6. Exercise on spot welding
7. Study of pattern making procedure.
8. Study of mold making procedure
9. Study of Cupola furnace
10. Study of thermocouple and pyrometer.
11. Study casting procedure and inspection of casting defects (visual inspection)

02DYME204   **MACHINE DRAWING AND COMPUTER AIDED DRAFTING**

Unit-1 Machining Symbols and Tolerances
1.1 Introduction of limits, fits, tolerances.
1.2 Machining symbol: Application of machining symbol, Indication of machining allowance, Indication of surface roughness.
1.3 Tolerancing: Unilateral and Bilateral tolerance, Standard tolerance, Symbols for tolerance, deviation and fits

Unit-2 Working Drawing
2.1 Piston and Connecting rod
2.2 Crankshaft
2.3 Bush bearing, ball bearing and roller bearing
2.4 Lathe spindle

Unit-3 Assembly Drawing
3.1 Drilling jigs, milling jigs
3.2 Stepped pulley, fast and loose pulley, V - belt pulley,
3.3 Footstep bearing, Plummer block and Universal coupling

3.4 Lathe tail stock and Shaper tool head
3.5 Fuel injector and Fuel injection pump (jerk type)
3.6 Machine vice and screw jack

Unit-4 Gear tooth profile
4.1 Gear types and gear nomenclature (spur, helical and bevel gears)
4.2 Drawing involute tooth profile (spur gear only) by- Approximate method, Prof. Unwin's method

Unit-5 Cam profile
5.1 Types of cams and followers
5.2 Types of follower motions
5.3 Construction of disc cam profile with knife edge follower

Unit-6 Computer Graphics
6.1 Application software:- Introduction of CAD and similar software application like CATIA , Pro / Engineer and other
6.2 Getting Started – I: Starting AutoCAD - AutoCAD screen components - Starting a drawing, Open drawings, Create drawings (Start from scratch, Use a template & Use a wizard) - Invoking commands in AutoCAD - Drawing lines in AutoCAD - Co-ordinate systems: Absolute co-ordinate system, Relative co-ordinate system - Directdistance method - Saving a drawing: Save & Save As - Closing a drawing - Quitting AutoCAD
6.3 Getting Started – II: Opening an existing file - Concept of Object - Object selection methods: Pick by box, Window selection,Crossing Selection, All, Fence, Last, Previous, Add, Remove - Erasing objects: OOPS command, UNDO /REDO commands - ZOOM command - PAN command, Panning in real time - Setting units - Object snap, running object snap mode - Drawing circles
6.4 Draw Commands: ARC command - RECTANG command - ELLIPSE command, elliptical arc - POLYGON command (regular polygon) - PLINE command - DONUT command - POINT command - Construction Line: XLINE command, RAY command - MULTILINE command
6.5 Editing Commands: MOVE command - COPY command - OFFSET command - ROTATE command - SCALE command -STRETCH command - LENGTHEN command -TRIM command - EXTEND command - BREAKcommand - CHAMFER command - FILLET command - ARRAY command - MIRROR command -MEASURE command - DIVIDE command - EXPLODE command - MATCHPROP command - Editing with grips: PEDIT
6.6 Drawing Aids: Layers - Layer Properties Manager dialog box - Object Properties: Object property toolbar, Properties Window - LTSCALE Factor - Auto Tracking - REDRAW command, REGEN command
6.7 Creating Text: Creating single line text - Drawing special characters - Creating multiline text - Editing text - Text style
6.8 Basic Dimensioning: Fundamental dimensioning terms: Dimension lines, dimension text, arrowheads, extension lines, leaders, centre marks and centrelines, alternate units - Associative dimensions - Dimensioning methods - Drawing leader
6.9 Inquiry Commands: AREA - DIST - ID - LIST - DBLIST - STATUS - DWGPROPS
6.10 Editing Dimensions: Editing dimensions by stretching - Editing dimensions by trimming & extending - Editing dimensions: DIMEDIT command - Editing dimension text: DIMTEDIT command - Updating dimensions - Editing dimensions using the properties window - Creating and restoring Dimension styles: DIMSTYLE
6.11 Hatching: BHATCH, HATCH commands - Boundary Hatch Options: Quick tab, Advance tab - Hatching around Text, Traces, Attributes, Shapes and Solids - Editing Hatch Boundary - BOUNDARY command
6.12 Blocks:The concept of Blocks - Converting objects into a Block: BLOCK, _BLOCK commands - Nesting of Blocks - Inserting Blocks: INSERT, MINSERT commands - Creating drawing files: WBLOCK command- Defining Block Attributes - Inserting Blocks with Attributes - Editing Attributes

6.13 Plotting Drawings in AutoCAD: PLOT command - Plot Configuration - Pen Assignments - Paper Size & Orientation Area - Plot Rotation & Origin - Plotting Area - Scale
6.14 Draw isometric views of simple objects.
6.15 Introduction of 3D modeling, Wire frame and surface modeling

02DYME205   BASIC AUTOMOBILE ENGINEERING PRACTICALS

1. Study of various tools used in Auto workshop.
2. Study of conventional layout of vehicle.
3. Study and inspection of suspension system of light and heavy vehicles.
4. Study of mechanical and hydraulic braking system and bleeding of hydraulic braking system.
5. Study of Steering system of four wheeler.
6. Study of clutch (single plate & multi plate).
7. Study of sliding mesh, constant mesh and synchronous mesh gear boxes.
8. Study of Propeller shafts, Universal joints, Sliding joint, differential and rear axle.
9. Study of frame & body of vehicle.
10. Visit to nearby auto workshop and service station.

02DYME206   ELECTRICAL AND ELECTRONICS ENGINEERING PRACTICALS

1. Study of D.C. machines
2. Study of D.C. starter
3. Connecting starting and reversing the direction of D.C. motor
4. Determination of turn ratio of transformer
5. Open circuit and short circuit test on a single phase transformer
6. Connecting, starting and reversing the direction of 1-phase induction motor
7. Starting of 3 phase Induction motor by D.O.L. starter / star- delta starter motor.
8. Study of various types of transducers.
9. Use of megger and multimeter.
10. To plot V-I characteristics of P-N diode.
11. To plot V-I characteristics of Zener diode.
12. To plot V-I characteristics of NPN transistor in CE, CB, CC configuration.
13. To plot V-I characteristics of PNP transistor as above
14. Study of logic gates of- AND, OR, NOT , NAND, NOR, Ex-OR, Ex-NOR
15. Study and testing of solar cell and photo cells

02DYME207   THERMODYNAMICS AND I. C. ENGINES PRACTICALS

1. Study by models/charts/actual units of the following:
1.1 Cochrans boiler
1.2 Lancashire boiler
1.3 Babckcock & Wilcox boiler
1.4 Boiler mountings
1.5 Boiler accessories
1.6 Lamonl boiler
1.7 Benson boiler
1.8 Schmiedt hartmann boiler
2. Study of Two-stroke and Four stroke petrol engine.

3. Study of 4-stroke diesel engine
4. Study of carburetors
5. Study of MPFI system of petrol engine
6. Dismantling and Assembly of - A. C.mechanical and electrical feed pumps of a petrol engine
7. Dismantling and assembly of diesel engine fuel pumps and injector.
8. To draw the energy balance sheet of diesel engine. Find I.P. determining various efficiencies.
9. To draw energy balance sheet of a multi cylinder petrol engine (I.P.   by Morse   test). determining various efficiencies.
10. Study of an air compress.

02DYME208   WORKSHOP TECHNOLOGY AND METROLOGY PRACTICALS

(A) Workshop Technology.

1. Grinding of various types of single point cutting tool
2. Simple exercise on Lathe Machine involving following operation
2.1 Simple turning, facing, step turning, Grooving and knurling and taper turning by compound rest
2.2 Facing, drilling, boring and step turning, parting off.
2.3 Taper turning by tails tock off set method
2.4 V threading, square threading and taper threading by attachment
2.5 A utility job on lathe machine with an accuracy of $\pm$ 0.2 mm
3. Preparing a M.S. block with all faces finished and V grooved on shaper machine
4. Planning practice on a planner on a rectangular C.I plate.
5. Internal slot cutting on the slotter machine

(B) Metrology.

6. Internal and External measurement with the vernier calliper
7. Internal and External measurement with micrometer
8. Measurement with height and depth gauges.
9. Measurement with dial indicator using surface plate and accessories for -
9.1 Flatness
9.2 Concentricity
10. Measurement with combination set and bevels protractor
11. Measurement of thread characteristics
12. Study and use of slip gauges and limit gauges.
13. Internal and external taper measurement.
14. Measurement of gear characteristics
15. Measurement of angle with sine bar and slip gauges
16. Study and use of comparators and tool room microscopes.
17. Measurement of bore with cylinder dial gauge for ovality and taper.
18. Measurement of worn out I.C. Engine piston, clearance between cylinder and piston and between bearing and journal
Note :   Industrial visit can be arranged to show these practicals to the students.

02DYME209   'C' PROGRAMMING PRACTICALS

1. Problems based on arithmetic expression, fixed mode arithmetic.
2. Problems based on conditional statements and control structures.
3. Problems based on arrays (1-D, 2-D), functions and pointers.
4. Problems based on engineering applications.

03DYME101   **REFRIGERATION AND AIR CONDITIONING**

Unit-1 Principles of Refrigeration
1.1 Meaning: heat pump, refrigeration
1.2 Refrigeration methods
1.3 Units of refrigeration machines
1.4 Rating of refrigeration machines

Unit-2 Refrigeration System
2.1 Air Refrigeration System: Reversed Carnot cycle, theoretical and actual. Reversed Brayton cycle-closed and open system, Applications and limitations, Advantages and disadvantages of air refrigeration cycle.
2.2 Vapour Compression System: Theoretical vapour compression cycle,Effect of sub- cooling, super heating on compression cycle, Deviation of actual cycle from theoretical cycle, Coefficient of performance, Effect of varying condensing and suction temperatures and pressure on C.O.P, Use of p-h chart. Simple numerical problems
2.3 Methods of improving C.O.P. : Flash chamber, Sub cooling of liquid refrigerant by using vapour refrigerant, Sub cooling by external cooling source, Sub cooling with liquid refrigerant
2.4 Vapour Absorption System : Simple vapour absorption systems, Comparison with vapour compression system, Electrolux refrigerator

Unit-3 Refrigerants
3.1 Classification
3.2 Important properties of refrigerants
3.3 Nomenclature of refrigerants.
3.4 Refrigerants - primary refrigerants, secondary refrigerants.
3.5 New refrigerants viz : Tetraflouroethane, propone and isobutene

Unit-4 Refrigeration System, Components and Controls
4.1   Reciprocating   compressors,   rotary
compressors centrifugal compressors
4.2 Condensers of various types
4.3 Cooling towers, spray ponds,
4.4 Evaporators of various types
4.5 Defrosting and throttling devices
4.6 Automatic expansion valve, thermostatic expansion
valve and capillary tube, solenoid valve.

Unit-5 Refrigeration Applications
5.1 Domestic and commercial refrigerators, their systems, specifications and types
5.2 Water coolers of various types
5.3 Effect of moisture in refrigeration system and methods of removing it.

Unit-6 Production of Low Temperature
6.1 Introduction
6.2 Limitation of vapour compression system in creating of low temperature
6.3 Two stage cascade refrigeration system (no analysis)

6.4 Manufacturing of dry ice (no numerical problems)

Unit-7 Pshychrometry
7.1 Properties of air vapour mixture
7.2 Saturation of air, dry and wet bulb temperatures, dew point temperature, specific humidity, degree of saturation and relative humidity.
7.3 Enthalpy of moist air
7.4 Psychometric chart and its uses.
7.5 Psychometric processes, sensible heating and cooling, cooling with dehumidification and humidification, evaporative cooling,
7.6 Mixing of air streams.

Unit-8 Air-conditioning
8.1 Physiological basis of air conditioning
8.2 Human comfort, metabolism in human body, comfort chart and effective temperature.
8.3 Summer and winter design conditions
8.4 Classification of air-conditioning systems, room air conditioners, package air conditioners.
8.5 Air distribution system.

Reference books:

1. Refrigeration & Air Conditioning	R.K.Rajput
2. Refrigeration & Air Conditioning	R.S.Khumi
3. Refrigeration & Air Conditioning	Domkundwar
4. Refrigeration & Air Conditioning	C.P.Arora

03DYME102   **PROCESSES IN MANUFACTURING**

Unit-1 Metal Forming Process
1.1 Forging : Forging process, open die forging, closed die forging (drop forging), Press forging, upset forging, Swaging, up setters, roll forging ,Cold and hot forging, forging defects and their remedies
1.2 Rolling: Elementary theory of rolling, types of rolling mills ,Roll passes, rolling defects and remedies
1.3 Press forming: Types of presses, working, selection of press dies, die material.Press operations - shearing piercing, trimming, punching, Notching, shaving, guering or rubber forming, embossing, stamping ,Deep Drawing .
1.4 Extrusion: Types of extrusion - Hot and Cold, Direct and Indirect
1.5 Drawing : Pipe drawing, Tube drawing

Unit-2 Conventional Metal Cutting Processes
2.1 Metal Cutting: Elementary theory of metal cutting, chip formation, continuous chip, continuous chips with B.U.E., discontinuous chips,Mechanism of chips formation, geometry of chip formation, forces on chip. Merchant's diagram, Tool life, Economics of tool life, Machinability, Factors affecting Machinability.
2.2 Broaching Machine : Classification and description of broaching machines, Elements of broach, Types of boraches.

2.3 Gear manufacturing processes: Gears hobbing, Gear shaping
2.4 Gear Finishing methods : Gear shaving, gear burnishing
2.5 External threading processes :Die heads, thread milling, Thread grinding, thread rolling

Unit-3 Newer Machining Processes

3.1 Mechanical Processes: Ultrasonic Machining (USM) : Introduction, fundamental principles, process, advantages and Limitation, application, Abrasive jet machining (AJM) - Introduction, principles, process, advantages and Limitation, application.

3.2 Electro Chemical Processes: Electro chemical machining (ECM) - Fundamental principles, process, applications, Electro chemical grinding (ECG) - Fundamental principles, process, applications

3.3 Electrical Discharge Machining (EDM) -Introduction, mechanism of metal removal basic EDM circuit, Principle of operation, material removing rate, dielectric fluid and applications of EDM.

3.4 Laser beam machining (LBM) -   Introduction, machining process and applications

3.5 Electrobeam machining (EBM) - Introduction, principle processes and applications

3.6 Plasma arc machining (PAM) and Welding - Introduction, principle processes and applications.

Unit-4 Metallic Coating Processes

  Metal spraying, galvanising, Electroplating and anodising.

Unit-5 Plastic Process - Working principle, Advantages and limitation of following process

5.1 Injection moulding
5.2 Blow moulding
5.3 Compressive moulding

Unit-6 Jigs and Fixtures

6.1 Importance and use of jigs and fixtures: Principle of location, Locating devices, Clamping devices.

6.2 Types of jigs-Drilling jigs, bushes (fixed, liker, slip). Types of drilling jig - Template jigs, plate jig, channel jig, leaf jig.

6.3 Fixture for milling, Advantages of jigs and fix.

Reference Books:

1. Production Engineering   R.K.Jain
2. Production Technology   Pandey Singh
3. Manufacturing Technology   Gupta & Adithan
4. Manufacturing Scinece   Amitabha Ghosh & A.K.Malik

03DYME103   **THERMAL ENGINEERING AND HEAT TRANSFER**

Unit-1 Steam Nozzles

1.1 Flow of steam through convergent- divergent nozzle
1.2 Velocity of steam leaving nozzles, Mass of steam discharged through nozzles.

1.3 Critical pressure ratio.

1.4 Area of cross section of throat and exit for maximum discharge. Length of nozzle

1.5bSupersaturatel flow

1.6 Numerical problems.

Unit-2 Steam Turbines

2.1 Classification and industrial application of steam turbines.

2.2 Principle and operation of impulse and reaction turbine

2.3 Compounding of turbines

2.4 Description of simple De-Laval turbine, velocity diagram, work done and efficiency.

2.5 Description of Parson's reaction turbine, velocity diagram, work done and efficiency.

2.6 Reheating of steam, Bleeding of steam'

2.7 Lubrication system for steam turbines

2.8 Blade materials and defects in blades

2.9 Simple numerical problems.

Unit-3 Steam Condenser

3.1 Introduction, main elements of a condensing plant

3.2 Types of condenser

3.3 Low level, high level and ejector type of jet condenser

3.4 Down flow, central flow, inverted flow, regenerative and evaporative type of surface condenser

3.5 Source of air leakage and its effect

3.6 Condenser efficiency and Vacuum efficiency

3.7 Numerical problem.

Unit-4 Air Pumps and Cooling Tower

4.1 Types of air pumps

4.2 Description of wet and dry types air pumps

4.3 Types of cooling towers

4.4 Description of cooling towers

Unit-5 Heat Transfer

5.1 Importance of Heat Transfer

5.2 Mode of Heat transfer: Conduction, Convection ,Radiation

Unit-6 Conduction

6.1 Fourier's law

6.2 Heat transfer by conduction through a plane & composite wall

6.3 Radial Heat transfer by conduction through a cylinder & sphere

6.4 Overall Heat transfer coefficient

6.5 Critical insulation

6.6 Heat transfer through fins

6.7 Numerical problem

Unit-7 Convection

7.1 Natural convection

7.2 Forced convection

7.3 Heat exchangers: Direct contact type, Regenerator & Storage type, Recuperator & Transfer type

7.4 Double pipe heat exchanger- LMTD & NTU

Unit-8 Radiation

8.1 Absorption, Reflection and transmission

8.2 Radiant energy distribution curve

8.3 Emissive power

8.4 Black body & white body

8.5 Grey body

8.6 Kirchoff 's law

8.7 Wien's displacement law

8.8 Planks law & stefan boltzman's law

8.9 Radiosity

8.10 Shape factor

Reference Books:

1. Thermal Engineering vol.I & vol.II	Mathur & Mehta
2. Thermal Engineering	R.K.Rajput
3. Thermal Engineering	R.K.Purohit
4. Thermal Engineering	Raynor Jeol

03DYME104   **CNC MACHINES & AUTOMATION**

Unit-1 Introduction

1.1 NC machines

1.2 CNC machines

1.3 DNC machines

1.4 Advantages of NC machines over conventional machines

1.5 Difference between NC machines and SPM

1.6 Advantage and disadvantages of CNC machines over NC machines

1.7 Application of CNC machines

Unit-2 Component of C Machines

2.1 Basic components of NC system

2.2 Input mediums- punched cards, magnetic tapes, floppy disks and papers tape

2.3 NC coding

2.4 Machine control unit (MCU)

2.5 Sub units of MCU

2.6 Machines tool

2.7 Numerical control procedure

Unit-3 Classification of numerical Control Machines

3.1 Classification based on feedback control system

3.2 Feedback devices – Velocity feedback devices and position feedback devices.

3.3 Classification based on motion control system

3.4 Interpolators

3.5 Classification based on circuit technology

3.6 NC coordinate system

3.7 Axis identification

Unit-4 Constructional Details of CNC Machines

4.1 Introduction

4.2 Machine structure

4.3 Slide ways

4.4 Spindle

4.5 Drive System

4.6 Motion transmission

4.7 Location of transducers

4.8 Swarf removal

4.9 Safety and guarding

Uint-5 Tooling for CNC Machines

5.1 Introduction

5.2 Cutting tools for CNC machines

5.3 Preset tools: Index able inserts, Qualified tools.

5.4 Cutting tools material for CNC machines

5.5 Automatic tool changer (ATC)

5.6 Work holding devices

Unit-6 Fundamentals of Part Programming

6.1 NC Words

6.2 Programming formats

6.3 Part programming for machining- point-to-point , straight line and along curved surface

6.4 Part programming for lathe, milling and drilling operations

Unit-7 Advanced Part Programming

7.1 Standardized fixed cycles

7.2 Non- Standardized fixed cycles: Do-loops, Subroutines.

Unit-8 Computer Aided Part Programming

8.1 Geometry statements

8.2 Motion statements

8.3 Post processor statements

8.4 Auxiliary statements

Unit-9 Robotics

9.1 Introduction

9.2 Advantages of a robot

9.3 Robot terminology

9.4 Major Features of a robot: Manipulator, Controller, Sensors, Power supply unit.
9.5 Types of Robots: According to the structure of Manipulator, According to type of system, According to type of control loops.
9.6 Application of robots.

Unit-10 Automation in Manufacturing
10.1 Introduction to machining centre
10.2 Introduction to computer Integrated manufacturing (CIM)
10.3 Introduction to flexible manufacturing system (FMS)
10.4 Introduction to group technology (GT)
10.5 Introduction to computer process planning (CAPP)

REFERANCE BOOKS:

1. CNC Machines   Dhanpat Rai & Sons
2. CAD/CAM   Groover(TMH)
3. CNC Machine: Programming & Application   Adithan & Pabla new age International

03DYME105   ADVANCE WORKSHOP TECHNIQUES

Unit-1 Metal Cutting Saws
1.1 Specifications, description, working and uses of sawing machine
1.2 Description, specification of cutters/ blade for sawing machines, blade setting.

Unit-2 Boring
2.1 Principle of boring
2.2 Classification of boring machines and their description
2.3 Specification of boring machine
2.4 Boring tools
2.5 Boring bars and boring heads
2.6 Description of Jig boring machine

Unit-3 Milling Machine
3.1 Specifications and working principle of milling machine
3.2 Classification of milling machines and their brief description and their applications.
3.3 Details of column and knee type milling machine
3.4 Milling machine accessories and attachment -Arbors, adaptors, collets, vices, circular table, indexing head and tail stock, vertical milling attachment, spiral milling attachment, slotting attachment and rack milling attachment.
3.5 Work holding devices.
3.6 Milling methods-up milling and down milling
3.7 Various types of milling cutters and mandrels for milling machines
3.8 Milling operations-face milling, angular milling, form milling, straddle milling and gang milling.
3.9 Cutting speed and feed. Simple numerical problems
3.10 Indexing on dividing heads, plain and universal dividing heads

3.11 Indexing methods: direct, plain or simple, compound, differential and angular indexing. Numerical problems on indexing

3.12 Helical and spiral milling

3.13 Introduction to machining centre

Unit-4 Grinding and Grinding Machines

4.1 Purpose of grinding

4.2 Various elements of grinding wheel – Abrasive, Grade, Structure, Bond

4.3 Common wheel shapes and types of wheels - built up wheels, mounted wheels and diamond wheels. Specifications of grinding wheels as per BIS

4.4 Truing and dressing, balancing and mounting of wheel

4.5 Grinding methods: surface grinding, cylindrical grinding and centreless grinding.

4.6 Grinding Machines- cylindrical grinders, surface grinders, internal grinders, centreless grinders and tools and cutter grinders.

4.7 Selection of grinding wheel

Unit-5 Capstan and Turret Lathes

5.1 Concept of ram or capstan type and turret or saddle type machine

5.2 Principal parts of capstan and turret lathes

5.3 Capstan and Turret lathe mechanism: Turret indexing mechanism, Bar feeding mechanism

5.4 Work holding devices: Jaw and collets chucks

5.5 Tool holding devices : slide tool holder, knee tool holder, knurling tool holder, recessing tool holder, form tool holder, Tap and Die holder, V-steady box tool holder, roller steady box tool holder

5.6 Introduction to turret tooling layout

5.7 Difference among capstan, turret and conventional lathe.

Unit-6 Automatic Machines

6.1 Brief description of single spindle and multi-spindle automatic machines viz. Swiss type automatic screw machine and Turret type screw machines

6.2 Transfer Machines- Inline , Rotary Indexing Table , Drum Machines

Uint-7 Metal Finishing Processes

7.1 Purpose of finishing surfaces

7.2 Description of lapping, super finishing, polishing and buffing processes

7.3 Description of honing machine and honing tools

Unit-8 Maintenance of Machine Tools

8.1 Importance of maintenance

8.2 Different type of maintenance

8.3 Sequence of maintenance operation : Disassembly, washing, fault finding, assembly

Unit-9 Installation and Testing of Machine Tools

9.1 Different types of machine foundation

9.2 Foundation plan

9.3 Machine tool testing

REFERANCE BOOKS:
1. Workshop Technology II   Hazra Chaudhary
2. Workshop Technology II   Raghuvanshi
3. Production Technology   R.K.Jain & S.C.Gupta

03DYME106   **MACHINE DESIGN**

Unit-1 Introduction
1.1 General consideration in machine design
1.2 General procedure in machine design
1.3 Selection of material
1.4 Working stress and factor of safety, selection of factor of safety
1.5 Stress concentration, stress concentration factor and methods of reducing stress concentration
1.6 Fatigue and endurance limit
1.7 Effect of load, surface finish and size on endurance limit
1.8 Preferred number

Unit-2 Design of Welding Joints
2.1 Types of welded joint and Design of lap joint and butt joint
2.2 Strength of transverse and parallel fillet welded joints in axial loading
2.3 Basic welding symbols
2.4 Welded joint subjected to twisting moment and bending moment
2.5 Eccentrically loaded welded joints

Unit-3 Design of Screw and Bolts
3.1 Initial stresses due to screwing up
3.2 Stress due to external forces
3.3 Stress due to combined forces
3.4 Bolt of uniform strength
3.5 Screw thread, designations and its dimensions.
3.6 Design of Power screw
3.7 Design of screw jack

Unit-4 Design of Joints
4.1 Design of simple cotter joints
4.2 Design of knuckle joints
4.3 Design of turnbuckle

Unit-5 Design of Keys and Couplings
5.1 Design of sunk key
5.2 Design of rigid flange coupling
5.3 Design of pin type flexible couplings

Unit-6 Design of Shaft
6.1 Shaft subjected to twisting moment
6.2 Shaft subjected to bending moment
6.3 Shaft subjected to combined twisting and bending moment

Unit-7 Design of Components
7.1 Cast Iron pulley
7.2 Flywheel
7.3 Helical spring
7.4 Leaf spring.

Unit-8 Bearings (no numerical problems)
8.1 Introduction and Classification
8.2 Material used for bearings and their properties
8.3 Types and uses of rolling contact bearings
8.4 Standard dimension and designations of ball bearings
8.5 Selection of rolling elements bearings

Unit-9 Lever
9.1 Introduction
9.2 Design of a hand lever
9.3 Design of a foot lever
9.4 Design of Lever for safety valve

REFERANCE BOOKS:

1. Machine Design	pandya & shah
2. Machine Design	R.S.Khurmi
3. Machine Design	Sharma & Aggrawal
4. Machine Design	V.B.Bhandari

03DYME107   **POWER GENERATION**

Unit-1 Introduction
1.1 Different types of conventional sources of energy
1.2 Base load and peak load plants
1.3 Scope of conventional energy sources in India
1.4 Status of conventional power plants in India

Unit-2Thermal Power Plants
2.1 General layout and working
2.2 Factors of site selection
2.3 Methods of coal handling
2.4 Unloading devices
2.5 Ash handling system
2.6 Concept of super thermal power plants
2.7 Combustion equipment: Basic requirements, Methods of coal burning : Hand firing, Stroker fired systems, Pulverised fuel fired system, Coal Burners : Stream line, Turbulent types, Combustion control, fluidised bed combustion.

Unit-3 Hydro-Electric Power Plant
3.1 Advantages and application of hydroelectric power plants
3.2 Elements of hydroelectric power plant
3.3 Plant layout of low head and high head intake

3.4 Combination of Hydel – Thermal power plants
3.5 Hydro electric power plants in India.

Unit-4 Nuclear Power Plant

4.1 Introduction to nuclear reactions and nuclear fuels
4.2 Site selection of nuclear power plants
4.3 Nuclear reactors : various elements of nuclear reactors.
4.4 Comparison of nuclear power plant with thermal and hydel power plants
4.5 Common types of nuclear reactors: Pressurised water reactor, Boiling water reactor, Gas cooled reactors, Liquid metal cooled reactor, Fast breeder reactor
4.6 Nuclear power plants in India
4.7 Hazards in nuclear power plants and safety measures
4.8 Nuclear waste disposal

Unit-5 Diesel Power Plants

5.1 Elements of a diesel power plant
5.2 Building and general layout
5.3 Use of diesel engine with steam power plants
5.4 Applications of diesel power plants
5.5 Limitation of diesel power plants

Unit-6 Gas Turbine Plants

6.1 Classification and application
6.2 Elementary description of gas turbines
6.3 Details of elements of a gas turbine plant and plant layout
6.4 Advantages over thermal and diesel power plants

Unit-7 Power Plant Economics

7.1 Elements of cost of power
7.2 Factors affecting economics of generation and distribution of power
7.3 Factors affecting choice and type of power plants on economics of power generation
7.4 Simple numerical problems on cost of power generation.

Unit-8 Renewal Energy Sources

8.1 Present position of conventional energy sources in India
8.2 Need for non-conventional energy sources
8.3 Various alternate energy sources – solar, biogas, wind, geothermal, tidal, Magneto hydro dynamic, thermo electric power etc.

Unit-9 Solar Energy

9.1 Introduction to solar power
9.2 Solar energy collectors
9.3 Application of solar energy: Solar water healing, Solar heating of Buildings, Solar thermal electric conversion , Solar photo voltaic, Solar distillation, Solar green house, Space cooling,
9.4 Solar energy storage: Thermal storage, Chemical storage, Mechanical energy storage,Solar pond.

Unit-10 Wind Energy

10.1 Scope of wind energy
10.2 Merits and demerits of wind energy

10.3 Measurement of wind velocity by Anemometer: Indicating and recording type
10.4 Wind Machines: Horizontal axis wind machine, vertical axis wind machine
10.5 Wind power and energy pattern factor
10.6 Efficiency of wind machine
10.7 Site selection of wind machine

REFERANCE BOOKS:
1. Power Plant Engineering	Dr. Mahesh Verma
2. Power Plant Engineering	Keshwani
3. Power Plant Engineering	Domkumdwar
4. Power Plant Engineering(Hindi)	Prakash & Kumar

03DYME108   MECHANICAL ESTIMATING AND COSTING

Unit-1 Introduction
1.1 Estimating: Definition, Importance of estimating , Aims and functions, Estimating procedure
1.2 Costing: Definition, Aims of costing, Procedure of costing
1.3Difference between estimating and costing

Unit-2 Elements of Costs
2.1 Material cost
2.2 Labour cost
2.3 Expenses: Direct expenses, Indirect expenses
2.4 Component of cost
2.5 Overhead cost
2.6 Allocation of on cost

Unit-6 Break Even Analysis and Equipment Replacement Analysis
3**.1**Break even analysis (cost, volume, profit analysts), determination of Break even point, break even point theory
3.2 Equipment Replacement Analysts: Regions, Policy,Guide line, Various methods
3.3 Hire Purchasing

Unit-7 Estimation of Material Cost
4.1 Estimation of volumes, weights and cost of materials for: Pulley , Spindle ,Lathe centre, Fly wheel, Crank shaft

Unit-5 Labour Costing
5.1 Type of Wage and Incentive
5.2 Wage Differentials
5.3 Methods of wage Payments
5.4 Job Evaluation

Unit-6 Estimation in Machining
6.1 Cutting speed, feed and depth of cut
6.2 Setup time, operation time, machining, time tear down time, handling time
6.3 Allowances

6.4 Estimation of machining time for various lathe operations : Turning , Facing, Threading , Drilling, Chamfering

6.5 Estimation of machining time for Milling operation

6.6 Estimation of machining time for Shaping operation

6.7 Estimation of machining time for Grinding operation

6.8 Metal removal rates

Unit-7 Estimation in Welding Shop

7.1 Estimation of electric are welding cost

7.2 Estimation of gas welding

7.3 Estimation of gas cutting

7.4 Factors affecting welding cost

Unit-8 Estimation in Forging Shop

8.1 Hand forging

8.2 Machine forging

8.3 Estimation of losses in forging operation , net weight, Time

8.4 Estimation of cost of forging operation

Unit-9 Estimation in Pattern Making and Foundry Shop

9.1 Pattern allowances

9.2 Estimation of pattern cost

9.3 Estimation of foundry shop

Unit-10 Estimation in Sheet Metal Shop

10.1 Sheet metal operations

10.2 Sheet metal joints

10.3 Estimation of time and cost in sheet metal operations

10.4 Blank layout

10.5 Capacity for power press.

REFERANCE BOOKS:

1. Estimating & Costing   Banga & Sharma
2. Mechanical estimating & costing   O.P.Khanna
3. Mechanical estimating & costing   T.T.T.I.Madras

03DYME109   INDUSTRIAL ENGINEERING

Unit-1 Production, Planning and Control

1.1 Definition and importance, types of production -job, batch and mass forecasting, routing, scheduling, dispatching and follow up.

1.2 Break even analysis and Gantt chart

1.3 Project scheduling, application of CPM and PERT techniques

1.4 Analysis and control of project cost in CPM and PERT, simple numerical problems.

Unit-2 Inventory Control

2.1 Definition, types of inventory - Codification and standardization

2.2 ABC analysis. Economic ordering quantity

2.3 Procurement cost, carrying charges, lead-time, re-order point, simple problems.

Unit-3 Inspection and Quality Control

3.1 Definitions, types of inspection and procedure

3.2 Statistical quality control - Basic theory of quality control, Process capability

3.3 Control charts for variables – X and R, relationship between control limits and specification limits, Control chart for fraction defective (p), control chart for number of defect (c)

3.4 Acceptance sampling - Selection of samples, sample size, method of taking samples. Samplings plan - single, double, sequential. Acceptance quality level (AQL), lot tolerance percentage defective (LTPD), producer's risk, consumer's risk. Operating characteristic curve, simple problems.

Unit-4 Work Study

4.1 Definition, advantages and procedure of work-study. Difference between production and productivity, Factors to improve productivity

4.2 Method Study :- Definition, objectives and procedure of method study.

4.3 Symbols, flow process chart (man-machine-material), flow diagram, machine chart, two hand chart

4.4 Critical examination. Developing a new method

4.5 Principles of motion economy. Therblig symbols, SIMO chart, simple problems.

4.6 work measurement-time study, definition, principal & methods of time study.

4.7 stop watch study- number of reading, calculation of basic allowances, standard time.

4.8 Simple numerical problems.

4.9 Work Sampling - Definition, method, advantages and disadvantage of work sampling Applications.

Unit-5 Plant Location and Layout

5.1 Definition, factors affecting the site selection of plant

5.2 Factor affecting plant layout

5.3 Types of layout - process, product, combination and fixed position layout

5.4 Techniques in making layout-Flow diagram, templates, distance volume matrix, travel chart

5.5 Line balancing, workstation, Numerical problem.

Unit-6 Material Handling

6.1 Principles of economic material handling

6.2 Hoisting equipment - forklift truck, Cranes- mobile motor cranes, overhead cranes, travelling bridges crane. Derrick crane. Whiler crane.

6.3 Conveying equipment - Package conveyors, gravity roller conveyors, screw conveyors, flight or scraper conveyors, bucket conveyors, bucket elevators, belt conveyors, pneumatic conveyors.

Unit-7 Linear Programming

7.1 Formulation L.P. problems

7.2 Graphical method for optimal solution

7.3 Simplex method for optimal solution

Unit-8 Depreciation
8.1 Definition
8.2 Obsolescence and amortization
8.3 Different methods of calculating depreciation
8.4 Numerical problems.

REFERANCE BOOKS:

1. Industrial Engineering(hindi)   V.K.Sharma
2. Industrial Engineering   S.C.Sharma
3. Industrial Engineering & management   T.R.Banga

03DYME110   MANAGEMENT & ENTREPRENEURSHIP

Unit-1 Principles of Management
1.1 Management, administration and organisation, difference between them.
1.2 Scientific management : Meaning, characteristics, object and advantage : Taylor's scientific management – Fayol's principles of management, functions of management
1.3 Types of ownership, sole trading, partnership, joint stock, co-operative and public enterprise
1.4 Types of organisation, different types and their charts.
1.5 Importance of human relation professional ethics
1.6 Need for leadership, leadership qualities
1.7 Motivation

Unit-2 Human Resources Development
2.1 Introduction, object and functions of human resource development department
2.2 Recruitment, sources and methods of selection, need for effective training, method of training, duties of supervisor / Formen, Role of HRD in industries.

Unit-3 Wages and Incentives
3.1 Definition and requirements of a good wage system methods of wage payment
3.2 Wage incentives - type of incentive, difference in wage incentive and bonus. incentive to supervisor.

Unit-4 Material Management
4.1 Purchasing Functions and duties of purchase department organisation of purchase department, methods of purchasing, purchase order contracts, legality of contracts types of contracts i.e. piece work contract, lumpsum contract, item rate contract, percentage contract, merits and limitation of each contract system, departmental execution of works, rate contract - D.G.S & D and C.S.P.O. tender, necessity, types of tenders, tendering procedure, earnest money and security money
4.2 Store and store keeping : Functions and duties of store department, location and layout of store, bin cards, store ledger, receipt and issue procedure of materials, physical verification of stores, disposal method of unserviceable articles and protection of stores.
4.3 Sales : function and duties of sales department sales promotion advertisement service after sales.

Unit-5 Financial Management
5.1 Function and duties of finance department
5.2 Brief idea of journal, ledger, trial balance, trading account, profit and loss account, balance sheet.
5.3 Cheques (crossed and bearer), draft, promissory note, letter of credit, brief idea of cost accounting.

5.4 Numerical problems.

Unit-6 Marketing Management
6.1 Concept of Marketing
6.2 Problems of Marketing
6.3 Pricing policy
6.4 Distribution channels and methods of marketing

Unit-7 Entrepreneurship
7.1 Entrepreneurship and Entrepreneur
7.2 Need of Employment and Opportunities.
7.3 Essential Characteristics of a good Entrepreneur
7.4 Industrial Policy.
7.5 Classification of industries- Tiny, small scale , Medium scale, Large scale, Handicraft, Ancillary
7.6 Type of industries- Production, Job based & Service

Unit-8 Entrepreneurial Development
8.1 Product identification/ selection
8.2 Site selection
8.3 Plant layout
8.4 Institutional support needed
8.5 Pre-market survey

Unit-9 Entrepreneurship Support System
9.1 Role of District Industries Centre in setting up industry
9.2 Function of NSIC, SISI, NISIET, NRDC, SSIC, SIDO, NMTC, KVIC, RSMML.
9.3 Role of state finance corporation, state electricity corporations, pollution control board, BIS, I.S.O. etc.

Unit-10 Setting up SSI
10.1 Registration of SSI
10.2 Allotment of land by RIICO
10.3 Preparation of project report
10.4 Structure of organisation
10.5 Building construction
10.6 Establishment of machines

Unit-11 Tax System and Insurance
11.1 Idea of income tax, sales tax, excise duty and custom duty
11.2 Industrial and fire insurance, procedure for industrial insurance.

Unit-12 Financial Sources for SSI
12.1 Various institutions providing loans for industries
12.2 Various types of loans
12.3 Subsidies

Unit-13 Labour Legislation and Pollution Control Acts

13.1 Industrial acts : factory act 1948

13.2 Workmen's compensation act 1923

13.3 Apprentices act 1961

13.4 Water pollution contract act 1974 and 1981

13.5 Air pollution contract act 1981

13.6 Environmental protection act 1986

13.7 Forest (animal conservation act 1972)

13.8 Pollution control provisions in motor vehicle act.

Unit-14Project Report

14.1 Procedure of preparing a project report

14.2 Format of project report

14.3 Preparation of project report for some SSI items

Unit-15 ISO : 9000 Series of Quality System

15.1Definition of few important terms related to ISO quality system

15.2 Various models for quality assurance in ISO : 9000 series

15.3 Various elements of ISO : 9001 model (20 points)

15.4 Benefits by becoming an ISO : 9000 company

15.5 Introduction to total quality management (TQM)

REFERANCE BOOKS:

1. Industrial Engg. & Management	O.P.Kanana
2. Industrial Engg. & Management	T.R.Banga
3. Entrepreneurial Development	S.S.Khanka

03DYME201   REFRIGERATION AND AIR CONDITIONING PRACTICALS

1. To aquatint with the use of refrigeration tools, charging board, special refrigeration tube fittings.

2. Copper tube jointing practice, flaring and brazing.

3. Study of domestic refrigerator & water cooler with electrical system and equipment arrangement.

4. Study of Window and Split Air-conditioner.

5. Study of following components-

5.1 Compressor open and hermetic sealed type

5.2 Expansion valves

5.3 Starting and over load relay

5.4 Thermostates

5.5 Strainer and drier

6. Charging practice on refrigerating machine including making vacuum, pressure testing, charging and final testing for performance

7. Determination of psychrometric properties of air at different places with the help of sling-psychrometer and hygrometer.

8. Using refrigeration trainer test rig to find out its refrigerating capacity, power input and C.O.P.

9. Use of Air-conditioning trainer to find out C.O.P

10. To determine the Ice-making capacity and C.O.P. of an Ice plant.

11. Study of following plants by industrial visits.

11.1 Ice plant

11.2 Cold storage plant

11.3 Central air conditioning plant.

12. A seminar on study of various models of refrigerator and A C. available in the market.

03DYME202   PROCESSES IN MANUFACTURING PRACTICALS

1. Exercise on forging operation by power hammers

2. Study of USM.

3. Exercise on buffing.

4. Exercise on lapping.

5. Exercise on super finishing.

6. Exercises on Electro plating.

7. Demonstration of Engine cylinder honing with the help of honing machine through industrial visit.

8. Design and manufacture of one drilling jig.

9. Design and manufacture of one milling fixture.

10. Demonstration of newer machining processes / metal cutting process/ plastic process through industrial visits.

03DYME203   THERMAL ENGINEERING & HEAT TRANSFER PRACTICALS

1. Study of steam turbine

2. Study of steam condensers, Jet condenser and surface condenser

3. Study of air pump

4. Study of cooling towers

5. Study of heat transfer equipments available in the laboratory.

03DYME204   CNC MACHINES & AUTOMATION

1. To prepare jobs on CNC machine by using various operations like turning, facing, taper turning, step turning, profile cutting, threading, chamfering etc on available machine.

2. To develop various types of CNC machine programmes.

3. Industrial Visit

03DYME205   ADVANCE WORKSHOP TECHNIQUES PRCTICALS

1. Face milling.
2. Gear cutting on a milling machine. (Spur and Bevel)
3. Key way cutting on shaft
4. Exercise on gang milling
5. Job on Capstan lathe and Turret lathe.
6. Job on grinding machine:
6.1 Surface grinding
6.2 Cylindrical grinding (internal and external)
6.3 Centre less grinding (internal and external)
7. Milling cutter grinding on tool and cutter grinder
8. Job using copying attachment on lathe
9. Exercises on honing and lapping machine
10. Super finishing practice on lathe
11. Maintenance of milling, Grinding and Lathe machines

****