STRENGTH OF MATERIALS

CODE MA 201 L T P
CC 201/CE201/ME201/MP201 2 2/2 2/2

RATIONALE

In Engineering every structure or machine element is designed for a particular application. Then it is tested. A Diploma holder should be capable of designing the various elements for particular requirements. For this he must be able to calculate the stresses in an elements and their nature.

CONTENTS

1. Simple Stress and Strain :

1.1 Various mechanical properties

- 1.1.1 Elasticity
- 1.1.2 Plasticity
- 1.1.3 Ductility
- 1.1.4 Brittleness
- 1.1.5 Toughness
- 1.1.6 Hardness

1.2 Concept of stress and strain

- 1.2.1 Type of force - Direct, shear
- 1.2.2 Stress - Tensile, compressive, shear

1.3 Hook's law

- 1.3.1 Statement of Hook's law
- 1.3.2 Young's modulus of elasticity
- 1.3.3 Tensile test diagram
  - 1.3.3.1 Gauge length
  - 1.3.3.2 Limit of proportionality
  - 1.3.3.3 Elastic limit
  - 1.3.3.4 Yield point, Yield strength
  - 1.3.3.5 Ultimate stress
  - 1.3.3.6 Rupture strength
  - 1.3.3.7 Nominal stress
  - 1.3.3.8 Proof stress

1.4 Working stress and factor of safety

1.5 Stress and strain calculations

- 1.5.1 Principle of superposition
- 1.5.2 Bar of homogeneous section
  - 1.5.2.1 Bar of uniform cross-section
  - 1.5.2.2 Bar of steeped cross-section
- 1.5.3 Bar of composite section

1.6 Temperature stresses

- 1.6.1 Homogeneous section
- 1.6.2 Composite section

1.7 Shear stresses

- 1.7.1 Modulus of rigidity
- 1.7.2 Complementary shear stress

1.7.3 Concept of single shear and double shear
1.7.4 Shear strain

1.8 Poisson's ratio and volumetric strain

1.8.1 Lateral strain
1.8.2 Longitudinal strain
1.8.3 Volumetric strain
1.8.4 Bulk modulus

1.9 Relationship between elastic constants (Derivation)

1.9.1 E=3K(1-2/m)
1.9.2 E=2N(1+1/m)
1.9.3 E=9KN/(3K+N)

2. Compound Stress :

2.1 Introduction
2.2 Stress components on an inclined plane

2.2.1 Induced by direct stresses
2.2.2 Induced by simple shear
2.2.3 Induced by direct and simple shear stresses

2.3 Mohr's circle:

2.3.1 For like direct stresses
2.3.2 For unlike direct stresses
2.3.3 For two perpendiculars direct stresses with state of simple shear

2.4 Principal stresses and planes

2.4.1 Major principal stress
2.4.2 Minor principal stress
2.4.3 Mohr's circle method for principal stresses

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

3.4.1 Stress in gradual loading
3.4.2 Stress in sudden loading
3.4.3 Stress in impact loading

4. Bending Moments and Shear Force:

4.1 Basic concept

4.1.1 Types of support

4.1.1.1 Movable hinge support (roller)
4.1.1.2 Immovable hinge support
4.1.1.3 Fixed support

4.1.2 Types of beam

4.1.2.1 Cantilever beam
4.1.2.2 Simply supported beam

4.1.2.3 Fixed beam
4.1.2.4 Continuous beam
4.1.2.5 Overhanging beam

4.1.3 Types of load

4.1.3.1 Point load
4.1.3.2 Distributed load - uniformly and non uniformly

4.2 Shear force and bending moment

4.2.1 Concept and calculation of shear force and bending moment
4.2.2 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)

4.3.1 Cantilever beam
4.3.2 Simply supported beam
4.3.3 Simply supported beam with over hang

5. Moment of Inertia:

5.1 Concept of moment of Inertia
5.2 Radius of gyration

5.2.1 Parallel axis theorem
5.2.2 Perpendicular axis theorem

5.3 Moment of Inertia of various section

5.3.1 Rectangle
5.3.2 Triangle
5.3.3 Circle

5.4 Moment of inertia of unsymmetrical section like: T-section, channel section, L-section etc.

6. Bending Stresses in Beams:

6.1 Concept of bending stress
6.2 Theory of simple bending

6.2.1 Assumptions in theory of simple bending
6.2.2 Use of equation $\frac{M}{I} = \frac{f}{y} = \frac{E}{R}$ (with proof)

6.3 Design criterion and section modulus
6.3.1 Section modulus
6.3.2 Calculation of max bending stress in beams of rectangular, circular, I and T section

7. Shear Stress in Beams:

7.1 Concept

7.2 Use of equation $q = \frac{F}{Ib}(A\bar{y})$ (with proof)

7.3 Shear stress distribution diagram of various sections

7.3.1 Rectangle
7.3.2 I section

7.3.3 T section
7.3.4 Channel section
7.3.5 H section
7.3.6 + section
7.3.7 Circular section

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)

8.2.1 Cantilever beam
8.2.2 Simply supported beam

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)

9.6.1 Both ends hinged
9.6.2 One end fixed and other end free
9.6.3 Both ends fixed
9.6.4 One end fixed and other end hinged
9.6.5 Limitations of Euler's Formula
9.6.6 Equivalent length

9.7 Rankine's formula

10. Torsion of Shaft:

10.1 Concept of torsion

10.1.1 Angle of twist
10.1.2 Polar moment of Inertia
10.1.3 Assumptions in the theory of pure torsion

10.2 Derivation and use of

$$\frac{q}{r} = \frac{T}{J} = \frac{N\theta}{l}$$

10.3 Relation between power and torque
10.4 Combined stress due to bending and torsion in solid and hollow shaft

11. Springs:

11.1 Introduction and classification of springs
11.2 Flat carriage springs

11.2.1 Application of flat carriage springs
11.2.2 Determination of number of leaves and their sections, deflection and radius of curvature
11.2.3 Quarter elliptical spring

11.3 Closely coiled helical springs:

11.3.1 Application of closely coiled helical springs

11.3.2 Determination of deflection, angle of twist, number of coils and stiffness under axial loading in closely coiled helical springs.

12. Thin Cylindrical Shells :

12.1 Use of cylinders
12.2 Stresses due to internal pressure

12.2.1 Circumferential stress or hoop stress
12.2.2 Longitudinal stress

12.3 Design of thin cylinders - calculation of the various dimensions of a thin cylinder

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

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

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

* * * * *

FLUID MECHANICS & MACHINES

CODE MA 202
ME 202

L	T	P
2	2/2	2/2

RATIONALE

Technicians have to deal with pressure measurement, transportation of fluids and the machines converting hydraulic power into mechanical power and vice versa, in the field/industries for that one has to have a basic knowledge of fluid mechanics and machines. Topics such as pressure measurement, laws governing the flow of liquids, measurement of discharge, production of power are included in this subject.

Although the major emphasis in this subject is on the study of liquids like water an incompressible fluid yet all the principles are applicable to all the fluids such as air, gas, steam etc. I includes the knowledge of various machines working on the principles of hydraulics.

CONTENTS

3. Hydrostatics :

3.1 Total pressure
3.2 Centre of pressure
3.3 Total pressure and center of pressure in following cases

3.3.1 Plane surface immersed horizontally
3.3.2 Plane surface immersed vertically
3.3.3 Plane surface immersed at an angle
3.3.4 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

4. Hydrokinematics :

4.1 Description of fluid flow

4.1.1 Eular approach
4.1.2 Lagrangian approach

4.2 Definition of path line, stream line
4.3 Types of flow

4.3.1 Steady - Non steady
4.3.2 Uniform - Non uniform
4.3.3 Laminar - Turbulent
4.3.4 One, Two, Three dimensional flow

4.4 Continuity equation (no proof) :

4.4.1 Assumption
4.4.2 Rate of discharge
4.4.3 For one dimensional flow

5. Hydrodynamics and Measurement of Flow:

5.1 Energy of fluid - pressure, kinetic and potential
5.2 Bernoulli's theorem (no proof)

5.2.1 Assumptions and its limitation
5.2.2 Conversion of pressure into pressure head, velocity into kinetic head
5.3 Applications of Bernoulli's theorem

5.3.1 Pitot-tube
5.3.2 Venturimeter
5.3.3 Orificemeter

6. Orifices:

6.1 Definition and classification
6.2 Discharge through small orifices

6.2.1 Coefficient of contraction
6.2.2 Coefficient of velocity
6.2.3 Coefficient of discharge
6.2.4 Coefficient of resistance
6.3 Time of emptying a vessel of uniform cross section through an orifice at bottom. (Simple Numerical Problem).

7. Flow Through Pipes:

7.1 Types of flow in pipes (Reynold's experiment)

- 7.1.1 Laminar flow
- 7.1.2 Turbulent flow
- 7.1.3 Transient flow

7.2 Law of fluid friction

- 7.2.1 Laminar flow
- 7.2.2 Turbulent flow

7.3 Loss of head due to friction (No. proof)

- 7.3.1 Darcy's Weisbach equations
- 7.3.2 Chezy's formula
- 7.3.3 Manning formula

7.4 Other energy losses in pipe (only expressions)
7.5 Total energy line and hydraulic gradient line
7.6 Pipe arrangement

- 7.6.1 Pipes in series
- 7.6.2 Pipes in parallel

7.7 Transmission of power through pipes
7.8 Siphon
7.9 Water hammer

8. Impact of Free Jet :

8.1 Impulse momentum equation (no proof)
8.2 Force exerted by a fluid jet on stationery flat plate

- 8.2.1 Plate normal to the jet
- 8.2.2 Plate inclined to the jet

8.3 Force exerted by fluid jet on moving flat plate

- 8.3.1 Plate normal to the jet
- 8.3.2 Plate inclined to the jet

8.4 Force exerted by fluid jet on stationary curved vane

- 8.4.1 Jet strikes at the centre of symmetrical cured vane
- 8.4.2 Jet strikes tangentially at one

8.5 Force exerted by a fluid jet on moving curved vane.

9. Hydraulic Turbines :

9.1 Classification of water turbines
9.2 Pelton turbine

- 9.2.1 Working principle
- 9.2.2 Constructional features

9.3 Francis turbine and Kaplan turbine

- 9.3.1 Working principle
- 9.3.2 Constructional features

9.4 Draft tube
9.5 Cavitation
9.6 Governing of Turbines

9.6.1 Need for governing
9.6.2 Simple governing mechanism

9.7 Surge tank
9.8 Turbine performance

9.8.1 Heads - gross, net
9.8.2 Efficiency - Hydraulic, Mechanical, Volumetric, Overall
9.8.3 Unit quantities
9.8.4 Specific speed
9.8.5 Introduction to characteristics curve (no numerical problems)

9.9 Numerical problems on turbines

10. Centrifugal Pump :

10.1 Introduction and working principles
10.2 Advantages over reciprocating pump
10.3 Classification
10.4 Constructional features

10.4.1 Mechanical manometric and overall efficiency

10.5 Head of a pump - static, manometric

10.5.1 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

11. Reciprocating Pump :

11.1 Types of pump
11.2 Main components and working
11.3 Slip

11.3.1 Percentage slip
11.3.2 Negative slip

11.4 Work down by a reciprocating pump
11.5 Acceleration of piston
11.5.1 Its effect on velocity and pressure

11.6 Air vessel
11.7 Troubles in Reciprocating pump and their remedies.
11.8 Numerical problems

12. Miscellaneous Hydraulic Machines:

12.1 Description, working principle of following machines
12.1.1 Hydraulic accumulator

12.1.2 Hydraulic intensifier
12.1.3 Hydraulic press
12.1.4 Hydraulic coupling and torque converter

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.

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

* * * * *

ENGINEERING MATERIALS AND PROCESSES

CODE MA 203 L T P
ME 203 2 -- 2/2

RATIONALE

Diploma holders in mechanical automobile engineering are required to make use of different materials for various applications. For this purpose, it is necessary to teach them basics of metal structure, properties, usage and testing of various ferrous and nonferrous materials and various heat treatment processes. This subject aims at developing knowledge about characteristics, testing and usage of various types of materials used in mechanical automobile engineering industry.

CONTENTS

(A) Engineering Materials:

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

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

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

4. Non Ferrous Metals:

4.1 Important ores and properties of aluminium, copper, zinc, tin, lead
4.2 Properties and uses of nonferrous alloys

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

6. Insulating Materials :

6.1 Various heat insulating material like asbestos, glass, wool thermocole, cork, puf, china clay and their use.

7. Testing of Metals and Alloys :

7.1 Identification tests : appearance, sound, spark, weight, magnetic, microstructure, filing

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 :

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.

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

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

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

13. Modern Welding Methods :

13.1 Principle of operation, advantage, disadvantages, application
- 13.1.1 Tungsten inert gas welding (TIG)
- 13.1.2 Metal inert gas welding (MIG)

13.2 Brief concept of following
- 13.2.1 Thermit welding
- 13.2.2 Electroslag welding, Electron beam welding
- 13.2.3 Ultrasonic welding, Laser beam welding

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 :
- 14.3.1 Types of molds
- 14.3.2 Steps involved in making a molds,
- 14.3.3 Elementary idea of gating & risering

14.4 Core :
- 14.4.1 Function of core
- 14.4.2 Type of core according to shape & position of core.

14.5 Molding Furnaces
- 14.5.1 Construction & Cupola
- 14.5.2 Introduction of tilting type Crucible Furness

14.6 Elementary Idea, Advantages, Disadvantages and Application of following special Casting Techniques :
- 14.6.1 Die casting - Hot chamber, cold chamber process
- 14.6.2 Investment or lost wax process
- 14.6.3 Centrifugal casting - True, Semi centrifugal, centrifugal
- 14.6.4 Shell moudling

14.7 Types of Casting defects

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)

Note : Industrial visit may be arranged for study experiments.

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

6.	A Text Book of Welding Technology	O.P. Khanna
7.	Welding Technology	Tahil Maghnani
8.	A Text Book on Foundry Technology	M.Lal & O.P.Khanna.
9.	Foundry Engineering	Tahil Meghnani
10.	Foundry Technology	O.P. Khanna & M. Lal
11.	Manufacturing Process - I	R.K. Yadav

*****

THEORY OF MACHINES

CODE MA 204 L T P
ME 204 2 2/2 --

RATIONALE

An engineer should be well acquainted with the motion of mechanism of different machine element. With this view the study of Theory of machine is very much important.

The contents of this subject include simple mechanism, kinematics of machine, dynamics of reciprocating parts, friction involved in the machine elements, power transmission, governors, balancing and vibrations in machine.

CONTENTS

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

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

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.

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

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.

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

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.

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.

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

10. Gyroscope – Introduction and principle, Gyroscopic couple

REFERENCE BOOKS :

1.	मशीन का सिद्धांत	कपूर एवं कुमार
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

* * * * *

MACHINE DRAWING AND COMPUTER AIDED DRAFTING

CODE MA 205
ME 205

L	T	P
-	--	--	4

RATIONALE

For better communication and effective working in Mechanical and automobile industries, motor garages, service stations, and other fields, the knowledge of MACHINE drawing is very essential.

In the present time, computer is becoming more and more importance in every field, so the engineering drawing is also not untouched with it. Computer aided drawing makes the work of drawing, easier, faster, accurate and clear.

CONTENTS

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 6
MOVE command – COPY command – OFFSET command – ROTATE command – SCALE command – STRETCH command – LENGTHEN command –TRIM command – EXTEND command – BREAK command – 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

REFERENCE BOOK :

1. AutoCAD for Windows Bible (with Applications) / Sham Tickoo / Galgotia Publications Pvt. Ltd.
2. Advanced AutoCAD Robert M. Thomas / Sybex BPD
3. AutoCAD Part – 1 & 2 Banglay Prokashito Tutorial / CD Media / Sonolite, 55, Elliot Road, Kolkata
4. Auto CAD George omura
5. Machine drawing P. S. Gill
6. Machine drawing Laxmi narayan
7. Machine drawing R. B. Gupta
8. Machine Drawing N.D. Bhatt

* * * * *

BASIC AUTOMOBILE ENGINEERING

CODE MA 206
ME 206

L	T	P
2	--	2/2

RATIONALE

Knowledge of chassis layout, suspension system, braking system, wheel and tyres, frame and body, transmission and steering is imparted in this subject.

CONTENTS

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, minimum ground clearance, minimum turning radius.

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.

3. Braking Systems :

3.1 Purpose, principle, classification of brakes.
3.2 Layout and description of mechanical brakes.
3.3 Hydraulic brakes
- 3.3.1 Principle, layout
- 3.3.2 Construction & working of single and tandem master cylinder, wheel cylinder
- 3.3.3 Bleeding of hydraulic brakes
- 3.3.4 Brake fluids and characteristics

3.4 Maintenance of brakes, brake troubles and remedies.
3.5 Hand brakes

4. Wheels and Tyres :

4.1 Wheels
- 4.1.1 Requirements of wheel
- 4.1.2 Types- pressed steel disc, wire, light alloy cast wheels

4.2 Tyres
- 4.2.1 Types (Tubed, Tubless, Cross ply, Radial ply
- 4.2.2 Cross section of a pneumatic tyre
- 4.2.3 Specification of tyres
- 4.2.4 Tyre maintenances, tyre trouble and repair

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

6. Power Transmission System :

6.1 Clutch :

6.1.1 Purpose and requirements of clutch

6.2.2 Construction of working detail of single plate, coil spring, clutch, multi plate clutch,

6.2.3 Dry and wet clutch

6.2.4 Construction of clutch plate

6.2 Gear Box :

6.2.1 Functions and types of gear boxes

6.2.2 Constructional and working of sliding mesh, constant mesh and synchronous mesh gear boxes

6.2.3 Construction and working of selector and inter locking mechanism

6.3 Final Drive:

6.3.1 Function and constructional details of - Propeller shafts, Universal joints, Sliding joint

6.3.2 Differential - Principles, function, construction and working of conventional differential

6.3.3 Different types of rear axles according to methods of supporting.

7. Frame and Body:

7.1 Frame

7.1.1 Function of frame, loads or frame

7.1.2 Frame construction, sub-frame

7.1.3 Defects in frame chassis repair and alignment

7.1.4 Frame less construction

7.2 Body

7.2.1 Types and construction (parts of body)

7.2.2 Main features – strength, stiffness, space air drag, stream lining , weight, vibration, protection against weather, corrosion, safety and economy considerations.

7.2.3 Body alignment

7.2.4 Bumpers – types and functions

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 near by auto workshop and service station.

REFERENCE BOOKS :

1.	Automotive Chassis & Body.	P.L.Kohli.
2.	Vehicle & Engine Technology (Vol. I & II)	Heinz Heisler.
3.	Basic Automobile Engineering	C.P.Nakra.
4.	Automobile Engineering.	T.R.Banga & Nathu Singh.
5.	Automobile Engineering	H.S. Reyat
6.	Automobile Engineering (Hindi & English)	Kirpal Singh
6.	ऑटोमोबाइल अभियांत्रिकी	एस.एम. पाण्डेय (दीपक प्रकाशन, म.प्र.)

*****

ELECTRICAL AND ELECTRONICS ENGINEERING

CODE MA 207
ME 207

L	T	P
2	--	2/2

RATIONALE

This subject is designed to give basic knowledge of electrical m/c such as transformer, A.C./D.C. machine. Diode, transistor, digital and power electronics, relays, timers and photo electric devises.

CONTENTS

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

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

- 2.5.1 Polarity test
- 2.5.2 Open circuit test
- 2.5.3 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

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

4. Industrial Drives:

4.1 Elementary idea for industrial drives
4.2 Application of industrial drives in following fields -

- 4.2.1 Rolling mill
- 4.2.2 Textile mills

4.2.3 Paper mill
4.2.4 Crane
4.2.5 Mines
4.2.6 Lathe machine
4.2.7 Pumps
4.2.8 Food processor, refrigerators punches

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 -

5.2.1 Resistance heating
5.2.2 Induction heating
5.2.3 Arc heating

5.3 Brief idea of high frequency heating, dielectric heating and its application.

6. Illumination:

6.1 Nature of light
6.2 Standard terms and definitions
6.3 Laws of illumination
6.4 Types of lamps

6.4.1 Tungston
6.4.2 Halogen
6.4.3 Sodium
6.4.4 Neon
6.4.5 Mercury vapour lamp
6.4.6 Fluorescent tubes.

7. Instrumentation and Measurement:

7.1 Principle, construction and working of the following measuring instruments -

7.1.1 Ammeter and voltmeter (moving coil and moving iron type)
7.1.2 Dynamometer types wattmeter
7.1.3 Single phase AC energy meter
7.1.4 Multimeter and megger

7.2 Transducers
7.3 Measurements of mechanical quantities like pressure, strain, temperature

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

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.

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

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.

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.

13. Photo Electric Devices :

13.1 Photo cells
13.2 Photo transistors
13.3 LDR's
13.4 Solar cells – working principle and applications

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

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
7.	Industrial Electronics & control (Hindi)	Kumar & Tyagi (Nav Bharat)
8.	Electrical Engineering (Hindi & English)	K.D. Sharma
9.	Electrical Technology	B.L.Theraja
10.	Utilization of Electrical Power	H.Pratap
11.	Electrical and Electronic Instrumentation& Measurement	H.Cotton

* * * * *

THERMODYNAMICS AND I. C. ENGINES

CODE MA 208
ME 208

L	T	P
2	--	2/2

RATIONALE

For technical education in Mechanical & Auto mobile engineering field the subject of Thermodynamics and ICE is very important for understanding the basic principles and concept of thermodynamics and knowledge of thermal engineering is essential in order to understand the working of the Petrol engines. Diesel engines, Gas turbines and air compressors.

CONTENTS

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

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 and free expansion, work done during these processes.
2.5 Simple numerical problems

3. Availability :

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

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.

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.

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

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

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 centres, crank throw, compression ratio, clearance volume, piston displacement and piston speed
8.5 Valve timing diagrams (Theoritical & Actual), firing order
8.6 Super charging of I.C. engines

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

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

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.

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

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.

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

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 compressor.

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
5.	Elements of Heat Engines -Vol.1	Patel & Karam Chandani
6.	Internal Combustion Engine	Mathur & Sharma

* * * * *

WORKSHOP TECHNOLOGY AND METROLOGY

CODE MA 209
ME 209

L	T	P
2	--	3

RATIONALE

Subject covers the study of various components used in various machines. This also deals with various types of cutting fluids and their property. Technicians have to carry out the job of measurement and inspection in the factories for controlling the quality of products. Therefore they must have the knowledge of science of measurements or metrology. They must be familiar with the concept and technique of inspection and quality control methods.

The subject has been designed to impart all the related and concerned knowledge to the student to fulfill the need.

CONTENTS

(A) Workshop Technology.

1. Cutting Tools and Materials:

1.1 Cutting tools

1.1.1 Standard shape of single point tool
1.1.2 Cutting angles, effect of rake angle, importance of clearance angle

1.1.3 Heat produced by cutting and its effect
1.1.4 Cutting speed, feed and depth of cut

1.2 Materials

1.2.1 Materials of cutting tools and their properties
1.2.2 High-speed steel, cobalt steel, tungsten carbide, cemented carbide, stellite, diamond, ceramics.

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.

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

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, Feed 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

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

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

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

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.

9. Comparators:

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

10. Light Wave Interference:

10.1 Principle of interference
10.2 Interferometry applied to flatness testing
10.3 N.P.L. flatness interferometer

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.

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

13. Machine Tool Metrology:

13.1 Alignment tests
13.2 Performance tests
13.3 Alignment test on lathe and drilling machine

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 ± 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.

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
6.	All About M/C Tools	Gerling
7.	Engineering Metrology	R.K. Jain
8.	Engineering Precision Metrology	R.C. Gupta
9.	Engineering Metrology (Hindi)	Mittal
10.	Engineering Metrology (Hindi)	Bhatnagar.
11.	Engineering Metrology	R.K. Rajput
12.	Metrology Lab Manual	Adithen, Bahl
13.	Metrology	M. Mahajan

* * * * *

'C' PROGRAMMING

CODE MA 210 L T P

Same in all branches except AR/CC/CE/CS/ EE /IT 2 -- 2

RATIONALE

'C' is computer programming language and also structured programming language. In 'C' programming language we consider various syntax used in programming. By having good knowledge of 'C', students can write modular application and system programs. 'C' can be used in the engineering applications. By acquiring a sound knowledge of 'C' students will be able to understand the concept of all the application areas. This course is specially designed for engineering students of all diploma streams.

CONTENTS

1. Introduction:

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

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

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()

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

5. Arrays :

5.1 Basic concepts
5.2 Memory representation
5.3 One dimensional array
5.4 Two dimensional array

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

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

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

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.

REFERENCE BOOKS :

1. 'C' Programming — Stephen Kochan
2. Programming with 'C' — Schaum's Series
3. 'C' Programming — V. Balguru Swami
4. 'C' Programming — Kernighan & Ritchie
5. Let us 'C' — Yashwant Kanetkar

* * * * *