

# **Kalinga University Atal Nagar (C.G.)**



## **SCHEME OF EXAMINATION & SYLLABUS**

**of**

### **Diploma in Civil Engineering**

**UNDER**

**FACULTY OF ENGINEERING & TECHNOLOGY**

**w.e.f. Session 2021-22**

**Kalinga University, Raipur**  
**Diploma in Civil Engineering (3 yrs Programme)**  
**w.e.f 2021-22 Session**

SEMESTER -I (Common for all branches)						
Code No.	Paper	Credits	External Marks	Practical	Internal Marks	Total Marks
DICE101	Communication Skills - I	3	70		30	100
DICE102	Applied Mathematics-I	3	70		30	100
DICE103	Applied Physics -I	3+1	70	50	30	150
DICE104	Applied Chemistry -I	3+1	70	50	30	150
DICE105	Engineering Drawing -I	3+1	70	50	30	150
DICE106	Computer Fundamentals and Applications	2+1	50	50		100
DICE107	Workshop Practice -I	1		50		50
	<b>Total</b>	<b>22</b>	<b>400</b>	<b>250</b>	<b>150</b>	<b>800</b>

SEMESTER -II						
Code No.	Paper	Credits	External Marks	Practical	Internal Marks	Total Marks
DICE201	Communication skills – II	3	70		30	100
DICE202	Applied Maths-II	3	70		30	100
DICE203	Applied Physics -II	3+1	70	50	30	150
DICE204	Applied Chemistry -II	3+1	70	50	30	150
DICE205	Applied Mechanics	3+1	70	50	30	150
DICE206	Engineering Drawing -II	3	70		30	100
DICE207	General Workshop Practice – I	1	30		20	50
	<b>Total</b>	<b>22</b>	<b>450</b>	<b>150</b>	<b>200</b>	<b>800</b>

SEMESTER -III						
Code No.	Paper	Credits	External marks	Practical	Internal Marks	Total Marks
DICE301	Fluid Mechanics	3+1	70	50	30	150
DICE302	Structural Mechanics	3+1	70	50	30	150
DICE303	Surveying – I	3+1	70	50	30	150
DICE304	Construction Materials	3+1	70	50	30	150
DICE305	Building Construction	3	70		30	100
DICE306	Civil Engineering Drawing -I	3	70		30	100
	<b>Total</b>	<b>22</b>	<b>420</b>	<b>200</b>	<b>180</b>	<b>800</b>

SEMESTER -IV						
Code No.	Paper	Credits	External marks	Practical	Internal Marks	Total Marks
DICE401	Concrete Technology	3+1	70	50	30	150
DICE402	Water Supply and Waste Water Engineering	3+1	70	50	30	150
DICE403	Irrigation Engineering	3	70		30	100
DICE404	Surveying – II	3+1	70	50	30	150
DICE405	RCC Design	3	70		30	100
DICE406	Highway Engineering	3+1	70	50	30	150
	<b>Total</b>	<b>22</b>	<b>420</b>	<b>200</b>	<b>180</b>	<b>800</b>

SEMESTER -V						
Code No.	Paper	Credits	External marks	Practical	Internal Marks	Total Marks
DICE501	Steel Structure Design	3+1	70	50	30	150
DICE502	Computer Applications in Civil Engineering	1		50	50*(Project)	100
DICE503	Soil and Foundation Engineering	3+1	70	50	30	150
DICE504	Construction Planning and Management	3+1	70	50	30	150
DICE505	Entrepreneurship Development & Management	3	70		30	100
DICE506	Industrial Training	2				150
	<b>Total</b>	<b>18</b>	<b>280</b>	<b>200</b>	<b>170</b>	<b>800</b>

SEMESTER -VI						
Code No.	Paper	Credits	External marks	Practical	Internal Marks	Total Marks
<b>THEORY PAPERS</b>						
DICE601	Earthquake Resistant Building Construction	3	70		30	100
DICE602	Railway Bridges and Tunnels	3+1	70	50	30	150
DICE603	Quantity Surveying & Valuation	3+1	70	50	30	150
DICE604	Repair & Maintenance	3+1	70	50	30	150
DICE605	Environmental Engineering	3	70		30	100
DICE606	Major Project Work	6	100		50	150
	<b>Total</b>	<b>24</b>	<b>450</b>	<b>150</b>	<b>200</b>	<b>800</b>

# Semester-I

## COMMUNICATION SKILL-I

### UNIT-I

#### Passage for Comprehension:-

- (1) Language of Science
- (2) Robotic Revolution
- (3) Designing a Car
- (4) New Wonders of camera
- (5) Non-conventional sources of Energy
- (6) Our Environment
- (7) Entrepreneurship
- (8) Safety practices

### UNIT-II

#### Short-Stories :-

- (1) Selfish Giant-Oscar Wilde
- (2) A Letter to God-Gregarious Lapex Y-Fuentes An astrologer's Day –R.K. Naragyan

### UNIT-III

#### Applied Grammar :-

- (1) Determiners
- (2) Auxiliaries
- (3) Tenses
- (4) Passive
- (5) Prepositions
- (6) Subject-verb Agreement

### UNIT-IV

#### Letter Writing:-

- (1) Application (For Job/Leave)
- (2) Letter of Enquiry and replies
- (3) Letter for Order Placement
- (4) Letter of Complaints (To Editor/ Appropriate Authorities)

### UNIT-V

#### Report Writing :-

- (1) Writing Progress – Report of a job
- (2) General outline for preparing A Project Report.

#### Reference Books

1. Communication Skill for Teaching Students Book-I. M/s Somalia Publications. Pvt. Ltd., Bhopal.
2. Living English Structure –W.S. Allen
3. Practical English Grammar (Exercises I by Thomson & Martinet)
4. English conversation practice by Grant Taylor.

## APPLIED MATHEMATICS-I

### UNIT-I

#### Algebra-

##### Determinants and Matrices-expansion

Determinants and Matrices-expansion of determinants (upto third order) using sarrus Rank, expansion method and pivotal condensation method. Properties of determinants, solutions of equations (up to 3 unknowns) by Cramers's rule. Definition of matrix, addition, subtraction and multiplication of matrices (up to third order). Inverse of a matrix by Adjoint method and elementary row transformations. Solution of equations (up to 3 unknowns) by Matrix method

### UNIT-II

#### Logarithm

general properties of logarithms

#### Partial fractions

(linear factors, repeated linear factors, non reducible quadratic factors)

To resolve proper fraction into partial fraction with denominator containing non repeated linear factors to resolve improper fraction into partial fraction

### UNIT-III

#### Trigonometry

Trigonometric ratios of any angle relation between degree and radian Fundamental identities examples based on fundamental identities factorization And defactorization formulae inverse trigonometric ratios value of inverse trigonometric ratios

### UNIT-IV

#### Vectors

Definition of vector and scalar quantities. addition and subtraction of vectors. Dot product and cross product of two vectors. Thumb rule, Angle between two vectors, application of dot and cross product in engineering problems

#### Circle

Equation of circle in standard form centre radius form diameter form General equation of circle

### UNIT-V

#### Complex Numbers

Definition, Real and Imaginary parts of a complex number, polar and Cartesian representation of a complex number and conversion from one to the other, conjugate of a complex number, modules and argument of a complex number.

#### Reference Books:-

- Mathematics for Polytechnic Volume I, TTTI Publication
- Applied Mathematics, EEB Publication, Bhopal
- Differential Calculus, By Gorakh Prasad
- Integral Calculus, By Gorakh Prasad
- Coordinate Geometry, By. S.L. Loney

## APPLIED PHYSICS-I

**UNIT-I** Units and Dimensions: Physical quantities, Fundamental and derived units, Systems of units (FPS, CGS, MKS and SI units) , Dimensions and dimensional formulae of physical quantities (area, volume, velocity, acceleration, momentum, force, impulse, work, power, energy, surface tension, coefficient of viscosity and strain) Principle of homogeneity , Dimensional equations and their applications, conversion from one unit to another unit for density, force, pressure, work, power, energy, velocity, acceleration , Limitations of dimensional analysis

### UNIT-II

Force and Motion: Scalar and vector quantities – examples, addition and multiplication (scalar product and vector product) of vectors. Force, resolution and composition of forces – resultant, parallelogram law of forces. Equilibrium of forces, Lami's theorem. Newton's Laws of motion – concept of momentum, Newton's laws of motion and their applications, determination of force equation from Newton's second law of motion; Newton's third law of motion conversion of momentum, impulse and impulsive forces, simple numerical problems based on third law. Projectile, horizontal and oblique projections and equation of trajectory . Derivation of time of flight, maximum height and horizontal range , Circular motion, Relation between linear and angular velocity and linear acceleration and angular acceleration, Centripetal force (derivation) and centrifugal force, Banking of roads

### UNIT-III

Work, Power and Energy: Work: definitions and its SI units, Work done in moving an object on horizontal and inclined plane (incorporating frictional forces). Power: definitions and its SI units, calculation of power in simple cases. Energy: Definitions and its SI units: Types: Kinetic energy and Potential energy, with examples and their derivation, Principle of conservation of mechanical energy (for freely falling boDICEs), transformation of energy from one form to another

Properties of Matter: Elasticity, definition of stress and strain , Different types of modulus of elasticity. Explanation of stress – strain diagram. Pressure – its units, gauge pressure, absolute pressure, atmospheric pressure, Bourdon's pressure, manometers and barometer gauges. Surface tension – its units, measurement of surface tension by capillary tube method, applications of surface tension, effect of temperature and impurity on surface tension . Fluid motion, stream line and turbulent flow, Reynolds number. Viscosity and coefficient of viscosity; derivation of terminal velocity; effect of temperature on viscosity.

### UNIT-IV

Waves and vibrations: Generation of waves by vibrating particles , Wave motion with examples, Types of wave motion, transverse and longitudinal wave motion with examples . Velocity, frequency and wave length of a wave (relationship  $v = \eta\lambda$ ). Sound and Light waves. Simple harmonic motion: definition, expression for displacement, velocity, acceleration, time period, frequency in S.H.M. Vibration of cantilever and beam, determination of time period of a cantilever. Free, forced and resonant vibrations with examples

Rotational Motion: Definitions of torque, moment of inertia, radius of gyration, Derivation of rotational kinetic energy and angular momentum, Conservation of angular momentum (qualitative). Theorems of parallel and perpendicular axes

Gravitation and satellites: Kepler's law of planetary motion, Newton's law of gravitation , Escape velocity (derivation), Satellites, Geo-stationary satellite



## UNIT-V

Temperature and its measurement: Principles of measurement of temperature and different scales of temperature, Difference between heat and temperature on the basis of K.E. of molecules, Bimetallic and Platinum resistance thermometer: their merits and demerits, Pyrometers – Disappearing filament optical pyrometer

Transfer of Heat: Modes of transfer of heat (conduction, convection and radiation with examples) Coefficient of thermal conductivity, determination of thermal conductivity of good conductor (Searle's method) and bad conductor (Lee's disc method) , Properties of heat radiation, Stefan's law, Kirchhoff's law, Wien's law, Planck's black body radiation law, Prevost's theory of heat exchange

## LIST OF PRACTICALS

1. To find the thickness of wire using a screw gauge
2. To find volume of solid cylinder and hollow cylinder using a vernier caliper
3. To determine the thickness of glass strip and radius of curvature of a concave surface using a spherometer
4. To find the surface tension of a liquid by capillary rise method
5. To determine and verify the time period of cantilever by drawing graph between load ( $w$ ) and depression ( $D$ )
6. To determine the atmospheric pressure at a place using Fortin's Barometer
7. To determine the coefficient of linear expansion of a metal rod
8. To find the coefficient of thermal conductivity of copper using Searle's conductivity apparatus

To find the coefficient of thermal conductivity of bakelite sheet (bad conductor) by Lee's Disc Method

## RECOMMENDED BOOKS

1. Applied Physics Vol. I, TTTI Publication Tata McGraw Hill, Delhi
2. Basic Applied Physics by RK Gaur; Dhanpat Rai Publications
3. Comprehensive Practical Physics - Volume I and II by JN Jaiswal; Laxmi Publishers
4. Numerical Problems in Physics - Volume I and II by RS Bharaj; Tata McGraw Hill
5. Simple Course in Electricity and Magnetism by CL Arora; S Chand and Co, New Delhi
6. Fundamental Physics - Volume I and II by Gomber and Gogia; Pardeep Publications, Jalandhar
7. A Text Book of Optics by Subramanian and Brij Lal
8. Physics Laboratory Manual by PK Palanisamy, Scitech Publications
9. Fundamentals of Physics by Resnick and Halliday, Asian Books Pvt. Ltd., New Delhi
10. Concepts in Physics by HC Verma; Bharti Bhawan Ltd., New Delhi
11. Applied Physics Vol. I&II H.C. Saxena & Prabhakar Singh
12. Applied Physics Vol. I&II D.Halliday & R.Rasnick
13. Engineering Physics – BVN Rao
14. Principles of Physics – K.K. Mohindroo
15. Basic Principles of Physics – Brij Lal Subramanyam .

**APPLIED CHEMISTRY-I****UNIT-I**

Language of Chemistry: Definition of symbol, formula, valency and chemical equation. Writing of the chemical formula of a simple chemical compound. Calculation of percentage composition of a chemical compound, Essentials of a chemical equation, balancing of a chemical equation by Hit and Trial method.

**UNIT-II**

Chemical Bonding: Electronic concept of valency, Elementary account of electrovalent, covalent and coordinate bond formation on the basis of the electronic concept of valency with the help of suitable examples to each

**UNIT-III**

Water: Hard and soft water, types of hardness and its causes, disadvantages of hardness of water (i) in industrial use (ii) in boilers for steam generation. Methods to remove hardness of water (i) Clark's Process (ii) Permutit Process (iii) Soda Lime process (iv) Ion-Exchange process. Simple numerical problems related to soda lime process. Definition of degree of hardness of water and the systems to express the degree of hardness of water. Simple numerical problems related to finding the degree of hardness on different scales. Qualities of water used for drinking purposes, treatment of river water to make it fit for town supply

**UNIT-IV**

Solutions: Concept of homogenous solution, brief introduction of the terms (i) Ionization (ii) Acidity (iii) Basicity (iv) equivalent weight and gram equivalent weight with suitable examples Strength of a solution (i) Normality (ii) Molarity (iii) Molarity as applied in relation to a solution. Simple numerical problems related to volumetric analysis, Definition of pH, and different industrial applications of pH

**UNIT-V**

Electrolysis: Definition of the terms: Electrolytes, Non-electrolytes conductors and non-conductors with suitable examples. Faraday's Laws of Electrolysis. Simple numerical problems based upon the laws of electrolysis, Different industrial applications of 'Electrolysis'. Elementary account of (i) lead acid battery and (ii) Ni-Cd battery with special reference to their reaction mechanisms.

**LIST OF PRACTICALS**

1. Volumetric analysis and study of apparatus used therein. Simple problems on volumetric analysis equation
2. Preparation of standard solution of oxalic acid or potassium dichromate
3. Determine the strength of a given solution of sodium hydroxide with the help of a standard solution of oxalic acid
4. Determine the strength of solution of HCl with the help of a solution of NaOH and an intermediate solution of standard oxalic acid
5. Find the amount of chlorides in mg per liter in a sample of H<sub>2</sub>O with the help of a solution of AgNO<sub>3</sub>
6. Determine the degree of temporary hardness of water by O' Hehner's method
7. Estimate the amount of Cu in a sample of CuSO<sub>4</sub> using a standard solution of Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub>
8. Estimation of amount of iron in hematite ore volumetrically
9. Estimation of total alkalinity of water volumetrically
10. Determine conductance, pH of water sample using conductance bridge and pH meter

## RECOMMENDED BOOKS

1. Chemistry in Engineering by J.C. Kuriacose and J. Rajaram; Tata McGraw-Hill Publishing Company Limited, New Delhi
2. Engineering Chemistry by Dr. S. Rabindra and Prof. B.K. Mishra ; Kumar and Kumar Publishers (P) Ltd. Bangalore-40
3. "A Text Book of Applied Chemistry-I" by SS Kumar; Tata McGraw Hill, Delhi
4. "A Text Book of Applied Chemistry-I" by Sharma and Others; Technical Bureau of India, Jalandhar
5. Engineering Chemistry by Jain PC and Jain M
6. Chemistry of Engineering by Aggarwal CV
7. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
8. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar
9. Engineering Chemistry by O. P. Agrawal.
10. Physical Chemistry by Glosstone.
11. Organic Chemistry by Sarkar and Rakshit.
12. Engineering Chemistry by M. M. Uppal Revised by S. C. Bhatia.
13. Modern Text Book of Applied Chemistry by P.C. Jain, Dr. G. C. Saxena and Dr.A. K. Goswami.

## **ENGINEERING DRAWING-I**

### **UNIT-I**

#### **1. Introduction**

- Introduction to drawing equipments, instruments and their uses
- Planning of drawing sheet as per I.S. 696 – 1972
- Indian standard practices of laying out and folding of drawing
- Different types of lines used in engineering drawing
- Standard practice for writing single stroke vertical and inclined capital and lower cases letters (practice to be done on sketch book)
- Standard practice of writing numerals (practice to be done on sketch book)

#### **2. Dimensioning techniques and standard conventions**

- Identification and representation of various symbols used in Mechanical and Electrical Drawing
- Drawing Identification and representation of various symbols of building elements, materials and sanitary fittings
- Principles, system and arrangement of dimensioning
- Practice problems of current method of dimensioning
- 

### **UNIT-II**

#### **1. Form associated with engineering curves**

- Types of engineering curves
- Method of construction of Engineering Curves
- Practice problems of drawing various Engineering Curves.
- Importance of scale in Engineering drawing
- Types of scales- plain, diagonal etc.
- Practical problems for constructing various types of scale.

#### **2. Orthographic projection of points, lines and planes**

- Definitions of various terms associated with orthographic projections.
- Planes of projections
- Concept of Quadrants
- First and third angle method of projection
- Projection of line in different positions with respects to H.P. V.P. and X-Y line
- Projection of planes in different position with respect to reference planes
- Practice problems on projection of points, lines and planes.

### **UNIT-III**

#### **1. Projections of simple machine parts and components**

- Procedure for drawing projections and sectional views of simple machine components
- Practice problems of sketching and drawing the projections and sections of simple machine components.

#### **2. Projections of solids**

- Types of solids and associated terminology
- Position of solid with respect to reference planes
- Drawing projections of solid in different position with respect to reference planes
- Practice problems to draw projections of solid in different positions.

#### **UNIT-IV**

##### **1. Section of solids**

- Concept of sectioning planes
- Auxiliary planes and true shape of section
- Practice problems for drawing projections and section of solids.

##### **2. Development of surfaces**

- Concept and importance of surface development in engineering field
- Development of surfaces for the following
- Cube
- Cylinder
- Prism
- Cone and Frustum cone
- Practice problems.

#### **UNIT-V**

##### **1. Isometric projections 8**

- Limitations of orthographic projections
- Definitions of the terms axonometric, oblique, Isometric and diametric projections
- Procedure for preparing isometric oblique
- Isometric view of geometrical solids and simple machine parts
- Practice problems.

##### **2. Basics of CAD**

- Computer hardware and software requirement for CAD
- Co-ordinate systems
- Set up for a CAD drawing
- Drawing objects like- Line, Circle, Arc, Ellipse, Regular Polygons, Polylines, Donuts etc.
- Editing Commands like- Move, Copy, Rotate, Scale, Fillet, Chamfer, Trim, Extend, Array, Mirror etc.
- Basic dimensioning, geometric dimensioning and tolerance
- Use CAD commands for simple orthographic and isometric drawings

##### **Instructional Strategies**

- Lecture Method
- Demonstration and use of instrument used in drawing.
- Classroom practices for different typical exercises.
- Use of computer for developing drawing
- OHP Transparencies for complicated drawing objects

## **List of Practicals**

- Problems on Scales and Letterings (One sheet)
- Problems on Curves (One sheet)
- Simple Orthographic Projections- One for First Angle and One for Third Angle Projection (Two sheets)
- Orthographic projections with sections (One sheet)
- Isometric projection for two objects (One sheet)
- Projection of Points and Lines (One sheet)
- Projection of Planes (One sheet)
- Projection of Solids (Two sheets)
- Section of Solids (Two sheets)
- Development of surface (Two sheets)
- Use CAD for orthographic projection (Five problems)
- Use CAD for isometric projection (Three problems)

## **Reference Books**

1. I.S. 696. (Latest revision), BIS, India
2. Engineering Drawing, N.D. Bhatt, Charoter Publisher, Anand
3. Engineering Drawing & Machine Drawing, R. K. Dhawan, Kumar
4. Engineering Drawing , R.B. Gupta, Satya Prakashan, Delhi
5. Geometrical Drawing , P.S. Gill , ketson & Sons

## Computer Fundamentals and Applications

### UNIT-I

#### 1. INTRODUCTION TO COMPUTERS

##### Generations Of Computer-

-First, Second, Third and Fourth generation.

##### Classification & applications of computers-

- Micro, Mini, Mainframes and Super-Computers.
- Applications of computers.

#### 2. MICROCOMPUTER

##### Structure & Working Of Micro Computers

- Central Processing Unit.
- Memory Unit.
- Input & Output Devices.

##### Evolution Of Micro-Computers

- Comparative study w.r.t. Micro-processor, clock speed, data bus, Register size, storage capacity, peripheral interface of PC to Pentium-IV computer systems.

### UNIT-II

#### 1. DATA REPRESENTATION

##### Data Representation

-Bit, byte, Nibble, Word, Double word Codes: ASCII, Binary Coded Decimal (BCD) EBCDIC, GREY and EXCESS 3 code

##### .Number Systems

-Types of number systems-Binary, Octal, Decimal, Hexadecimal.

##### Conversions Of Number Systems And Its Operations

- Binary addition, subtraction
- .-BCD addition, subtraction.
- 1's complement and 2's complement methods of subtraction Floating point arithmetic.

### UNIT-III

#### 1. COMPUTER LANGUAGES

##### Classification And Characteristics Of Languages

- Machine language.
- Assembly language.
- High level language.
- Hardware, Software And Firmware Computer Hardware Classification Of Software

#### 2. INTRODUCTION TO DOS OPERATING SYSTEMS

- **Micro-Soft Disk Operating System (Ms-Dos)**
  - System files: BIOS, COMMAND.COM, CONFIG.SYS, Autoexec.bat file.
- **MS-DOS Commands**
  - Internal Commands – dir, cd, md, rd, del, ren, date, time, vol.

And copy External commands– attrib, format, edit, find, diskcopy, backup & restore.

## **UNIT-IV**

### **1. INTRODUCTION TO WINDOWS OPERATING SYSTEMS**

#### **Windows Operating System**

- Concept of Windows-Arranging, Moving, Resizing, Opening, and Closing of windows
- .-Folder/File Management-Search, copy, delete and rename files and folders Windows Accessories: Notepad, Word Pad, Pad.

### **2. COMPUTER APPLICATIONS SOFTWARE.**

- **Word Processing Software**  
MS Word
- **Data Analysis Software**  
MS Excel Introduction to Electronic Spreadsheet.
- **Presentation Software**  
MS Power Point

## **UNIT-V**

### **1. INTERNET APPLICATIONS**

#### **Introduction To Internet -Different Services Of Internet**

- www
- Email
- Chat (textual/voice)
- Bulletin Boards
- Video conferencing
- FTP (uploading and downloading files)

#### **WEB-SITE ACCESS AND INFORMATION SEARCH**

- Browsers and search engines.

### **2. INTERNET CONNECTIVITY**

#### **Internet Connectivity**

- Internet Service Provider (ISP)
- Internet accounts : Shell account, TCP/IP ISDN and Leased Line
- Account and its features.

#### **Hardware Required**

- MODEM and Terminal Adapters.
- System software: O.S. Loader, Linker, Interpreter, Compiler and Assembler Application Software.

### **List of Experiments/Demonstrations/Tutorials**

- Study Of Input And Output Devices
- Study Of Storage Devices
- Practice On Internal And External Ms-Dos Commands
- Practice On Windows 95/98/2000

Starting Windows, Exploring the desktop, Arranging windows, My Computer, The start button, Creating Shortcuts, Practice on moving and sizing of windows.

Study of file organization: creating, copying, moving, renaming and deleting. -Practice on Windows Accessories – Notepad, Word Pad and Paint. Editing document & formatting text, Previewing and



printing document/Image file. -Practice on Windows Explorer.  
Recycle bin, Shutting down windows.

### **PRACTICE ON MS-WORD**

Create and format document ,  
Edit and Modify text-changing font size type and style.  
Auto Text, AutoComplete, AutoCorrect, grammar and spellchecker, Find and replace of text.  
Open save and print a document.  
Insert, modify table.

### **PRACTICE ON MICROSOFT EXCEL**

Create, save & format worksheet  
Open and save worksheet file.  
Edit & modify data.  
Use formula and functions.  
Split windows and freeze pans.  
Create, edit, modify, print worksheet/charts.

### **PRACTICE ON POWERPOINT**

Create, edit, insert, move, slides.  
Open and save presentation.  
Insert picture, slide layout, action button.  
Present slide show.

### **PRACTICE ON INTERNET**

Identification of type of Account. Connecting to internet.  
Dial up access  
Web browsing  
Searching websites  
Email services  
Creating email accounts & Receiving and sending mails

### **Reference Books**

1. Introduction to Computers, Iind Edition 1998 , Peter Norton's Tata McGraw Hills Publishing
2. The ABCs of Ms-Office 97 , Ist Edition, Gay Hart Davis
3. Computer Organization and architecture, IVth – Edition 1996 , William Stalling
4. Structured computer Organization , III rd – Edition 1997 , Andrews Tanenbaum Prentice Hall of India Pvt. Ltd, N. Delhi
5. Teach yourself..... windows 95, I st – Edition 1995 , A L Stevens Comer BPB Publication, N. Delhi
6. The Internet Book , II – Edition 200, Douglas E. Prentice Hall of India Pvt. Ltd, N. Delhi

## **WORKSHOP PRACTICE -I**

### **1 Measurement, Identification and use of the various measuring tools & instruments.**

- Linear measurements and measuring devices.
- Angular measurements and measuring devices
- Other measuring tools such as surface plate, Surface gauge, plate Safety in different shop of workshops.

### **2. Wood working (carpentry shop)**

- 2.1 Identification of carpentry tools and their uses.
- 2.2 Perform various wood working operations.

### **3. Fitting shop.**

3. 1 Identification of various tools used and the operations performed in fitting shop.

3.1.1 Perform various fitting operations.

3.1.2 Marking of job as per dimension.

3.1.3 Sawing.

3.1.4 Chipping .

3.1.5 Filling .

3.1.6 Taping .

3.1.7 Reaming.

3.1.8 Drilling.

3.2 Smithy Shop

3.2.1 identification of various tools and equipments used & their use.

3.2.2 Perform Various smithy operations.

3.2.3 Up setting .

3.2.4 Drawing down.

3.2.5 Bending

3.2.6 Setting down.

3.2.7 Welding.

3.2.8 Cutting .

3.2.9 Punching.

3.2.10 Fullering.

### **4. Sheet metal.**

4.3.1 Identification and use of the various tools.

4.3.2 Perform various sheet-metal operations.

4.3.3 Shearing

4.3.4 Bending

4.3.5 Drawing

4.3.6 Squeezing.

4.3.7 Marking on sheet

4.3.8 Snipping.

4.3.9 Grooving

### **5 Welding Shop**

5.1 Identification and use of the various tools and equipments.

5.2 Perform the arc welding and gas welding operations.

5.3 Perform the soldering and Brazing operations.

## **6 Machine shop**

6.1 Identification and use of the various tools and equipments.

6.2 Classification of lathe and operation of lathe.

6.3 Plane turning

6.4 Taper turning

6.5 Treading

6.6 Drilling

6.7 Various attachment used in lathe.

## **Reference Books**

(1) Workshop Technology (Vol-1) Hazra & choudhary .

(2) Workshop Technology – (Vol-1 & 2) Chapnan (3) Manufacturing process (Vol-1) Delela (4) Materials and Manufacturing Lindberg processes.

# Semester-II

## COMMUNICATION SKILLS - II

### Course Objective-

Language is the most commonly used and effective medium of self-expression in all spheres of human life – personal, social and professional. A student must have a fair knowledge of English language and be able to pursue the present course of study and handle the future jobs in industry. The objective of this course is to assist the diploma holders to acquire proficiency, both in spoken (oral) and written language. At the end of the course, the student will be able to develop comprehension, improve vocabulary, develop grammatical ability, enhance writing skills, correspond with others, enhance skills in spoken English.

### DETAILED CONTENTS

#### Unit-I

Prose Text Book

The following six chapters of A Book of English published by Mc million India

Uncle Podger Hangs a Picture

Subash Chandra Bose

A Pair of Mustachios

Guru Gobind Singh

With The Photographer

Sir Jagdish Chandra Bose

There will be one general question from one of these six chapters.

Precise writing (selected from the prescribed 6 chapters of Prose Text Book)

#### Unit-II Grammar

- Antonyms change of words into different parts of speech
- Correspondence

Business letters such as:

Registration as supplier

Floating quotations and tenders

Quarry for product specification, price and other details etc from a firm/Company

Covering letter for quoting prices against a quotation/tender

Placing supply order

- Note-Making
- Interview Skills

### **Unit-III**

Official letters such as:

- Letter to editor for placing an advertisement in the newspaper for purchase/selling of goods
- Letter to General Manager, Telephone Department for restoring a dead telephone/shifting a telephone
- Letter to Municipal Commissioner for improving water supply/ sanitation system in your locality
- Letter to State Electricity Board for repair of street lighting/ correction of bills etc.
- Letter to the supplier for rectifying or replacing a defective machinery/item of purchase
- Letter to Registrar, State Board of Technical Education for allowing to improve grades/marks in diploma examination

### **Unit-IV**

- Report Writing
- Drafting a technical report of a visit to a factory, construction site, modern office, etc.
- Report writing on current general themes/topics related to economy, industry, social issues
- Elements of periodical progress report
- Inspection Note
- Write an inspection note after inspecting technical/industrial goods
- Write an inspection note after visiting a construction site or production shop
- Writing “Preface” and “acknowledgement” of a project report A paragraph on current topics/themes

Technology

Science

Economy

Politics

Social

General

- Drafting
- Press notes
- Memos/circulars
- Notices (lost and found: obituary/auction, etc)
- Telegrams
- Press releases
- Agenda and minutes of the meeting
- Personal resume/curriculum vitae

## Unit-V

### Communication Techniques

- Importance of communication
- Types of communication – verbal and non-verbal
- One way and two-way communication
- Process of communication – horizontal, vertical, upward, downward
- Essentials of good communication
- Level of communication – inter and intra personal, group to person, group to group
- Methods of effective oral, written and non-verbal communication, Horizons – tone, frequency, rate, volume, depth
- Barrier to communication and overcoming barriers
- Listening skill
- Use of audio visual aids for effective communication

### Reference Books

Essentials of Business Communication by Pal and Rorualling; Sultan Chand and Sons

The Essence of Effective Communication, Ludlow and Panthon; Prentice Hall of India

New Design English Grammar, Reading and Writing Skills by AL Kohli (Course A and course B), Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,

New Design English Reading and Advanced Writing Skills for Class XI and XII by MK Kohli and AL Kohli; Kohli Publishers, 34 Industrial Area Phase-II, Chandigarh,

A Practical English Grammar by Thomson and Marlinet

Spoken English by V Sasikumar and PV Dhamija; Tata McGraw Hill

English Conversation Practice by Grount Taylor; Tata McGraw Hill

Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi

Business Correspondence and Report Writing by RC Sharma and Krishna Mohan; Tata McGraw Hill Publishing Company Ltd. New Delhi

Communication Skills by Ms. R Datta Roy and KK Dhir, Vishal Publication, Jalandhar

### Course Outcome –

1. Students will be better equipped in the skills essential for effective communication.
2. This course will instruct students about the in-depth knowledge of career oriented communication.

## APPLIED MATHEMATICS – II

### RATIONALE

Applied Mathematics forms the backbone of engineering discipline. Basic elements of differential calculus, integral calculus, differential equations and coordinate geometry have been included in the curriculum as foundation course and to provide base for continuing education to the students

### DETAILED CONTENTS

#### Unit: I

##### Function and limit

**Function** –definition of variable constant interval such as open closed semi open etc Definition of function value of a function and types of functions **Limit** –definition of limit limits of algebraic trigonometric exponential and logarithmic function

#### Unit: II

##### Differentiation

Definition of differentiation

Differentiation by first principle of  $x^n$ ,  $(ax + b)^n$ ,  $\sin x$ ,  $\cos x$ ,  $\tan x$ ,  $\sec x$ ,  $\operatorname{cosec} x$  and  $\cot x$ ,  $e^x$ ,  $a^x$ ,  $\log x$ . Differentiation of a function of a function and explicit and implicit functions Differentiation of sum, product and quotient of different functions

#### Unit: III

##### Integral Calculus

Integration as inverse operation of differentiation

Simple integration by substitution, by parts and by partial fractions

Evaluation of definite integrals (simple problems) by explaining the general properties of definite integrals

#### Unit: IV

##### Statistics

measures of control tendency. Mean, median, Mode

Measure of Dispersion mean, Standard deviation

Mean deviation variance and coefficient of variation comparison of

Two sets

#### Unit: V

##### Differential Equation

Definition of differential equation

Order of differential equation

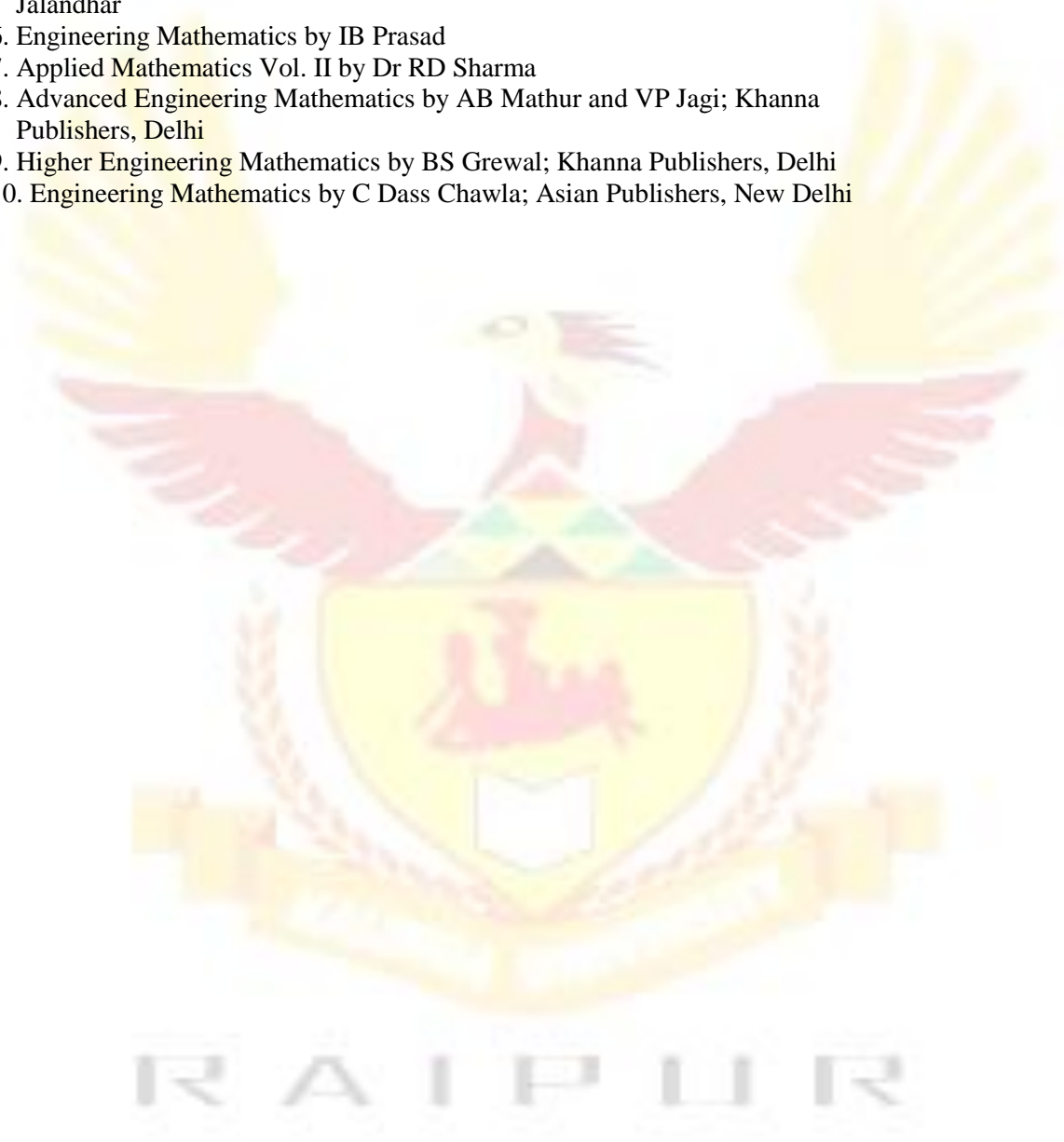
Explanation of order and degree

Solution of differential equation of first order and first degree



### Reference Books:

1. Higher Engineering Mathematics by BS Grewal
2. Engineering Mathematics by BS Grewal
3. Engineering Mathematics vol. II by S Kohli and Others, IPH, Jalandhar
4. Engineering Mathematics by Ishan Publication
5. Applied Mathematics Vol. II by SS Sabharwal and Others; Eagle Parkashan, Jalandhar
6. Engineering Mathematics by IB Prasad
7. Applied Mathematics Vol. II by Dr RD Sharma
8. Advanced Engineering Mathematics by AB Mathur and VP Jagi; Khanna Publishers, Delhi
9. Higher Engineering Mathematics by BS Grewal; Khanna Publishers, Delhi
10. Engineering Mathematics by C Dass Chawla; Asian Publishers, New Delhi



## APPLIED PHYSICS – II

### RATIONALE

Applied physics includes the study of a large number of diverse topics related to things that go in the world around us. It aims to give an understanding of this world both by observation and prediction of the way in which objects behave. Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.

### DETAILED CONTENTS

#### Unit: I

Applications of sound waves - Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time Ultrasonics – production (magnetostriction and peizoelectric) and their engineering applications

#### Unit: II

Principle of optics - Introduction: reflection of light, image formation in mirrors (convex and concave), refraction and refractive index, image formation in lenses, lens formulae (thin lens only), power of lens, total internal reflection Defects in image formation by lenses and their correction Simple and compound microscope, astronomical and Galileo telescope, magnifying power and its calculation (in each case) Overhead projector and slide projector

#### Unit: III

Electrostatics

- Coulombs law, unit charge
- Gauss's Law
- Electric field intensity and electric potential
- Electric field of point charge, charged sphere (conducting and nonconducting), straight charged conductor, plane charged sheet
- Capacitance, types of capacitors, capacitance of parallel plate capacitor, series and parallel combination of capacitors
- Dielectric and its effect on capacitors, dielectric constant and dielectric break down

#### Unit: IV

Electricity

Ohm's law Resistance of a conductor, specific resistance, series and parallel combination of resistors, effect of temperature on resistance Kirchoff's laws, wheatstone bridge principle and its applications Heating effect of current and concept of electric power Semi conductor physics. Energy bands, intrinsic and extrinsic semi conductors, p-n junction diode and its characteristics Diode as rectifier – half wave and full wave rectifier, semi conductor transistor pnp and npn (concept only)

## Unit: V

### Modern Physics

- Lasers: concept of energy levels, ionizations and excitation potentials; spontaneous and stimulated emission; lasers and its characteristics, population inversion, types of lasers, helium – neon and ruby lasers and applications
- Fibre optics: Introduction, optical fiber materials, types, light propagation and applications
- Super conductivity: Phenomenon of super conductivity, effect of magnetic field, critical field, type I and type II super conductors and their applications)
- Energy sources – conventional and non-conventional (wind, water, solar, bio, nuclear energy), only elementary idea

### List of Practical's

1. To verify Ohm's law
2. To verify law of resistances in series and in parallel
3. To determine the magnifying power of a compound microscope
4. To determine the magnifying power of an astronomical telescope
5. To convert a galvanometer into an ammeter of a given range
6. To convert a galvanometer into a voltmeter of a given range
7. To find the wavelength of a He-Ne laser
8. To find the frequency of a tuning fork by a sonometer
9. To study characteristics of a pn junction diode

### Reference Books

1. Applied Physics Vol. II, TTTI Publication Tata McGraw Hill, Delhi
2. Basic Applied Physics by RK Gaur; Dhanpat Rai Publications
3. Comprehensive Practical Physics - Volume I and II by JN Jaiswal; Laxmi Publishers
4. Numerical Problems in Physics - Volume I and II by S Bharaj; Tata McGraw Hill
5. Simple Course in Electricity and Magnetism by CL Arora; S Chand & Co, New Delhi
6. Fundamental Physics - Volume I and II by Gomber and Gogia; Pardeep Publications, Jalandhar
7. A Text Book of Optics by Subramanian and Brij Lal
8. Physics Laboratory Manual by PK Palanisamy, Scitech Publications
9. Fundamentals of Physics by Resnick and Halliday, Asian Books Pvt. Ltd., New Delhi
10. Concepts in Physics by HC Verma; Bharti Bhawan Ltd., New Delhi

## APPLIED CHEMISTRY-II

### RATIONALE

The role of Chemistry and chemical products in every branch of engineering is expanding greatly. Now a days various products of chemical industries are playing important role in the field of engineering with increasing number of such products each successive years. The strength of materials, the chemical composition of substances, their behaviour when subjected to different treatment and environment, and the laws of heat and dynamic energy have entered in almost every activity of modern life. Chemistry is considered as one of the core subjects for diploma students in engineering and technology for developing in them scientific temper appreciation of chemical properties of materials, which they have to handle in their professional career. Effort should be made to teach this subject through demonstration and with the active involvement of students.

### DETAILED CONTENTS

#### Unit: I

##### Metallurgy

- A brief introduction of the terms: Metallurgy (types), mineral, ore, gangue or matrix, flux, slag, concentration (methods of concentrating the ores), roasting calcination and refining as applied in relation to various metallurgical operations
- Metallurgy of (i) Aluminium (ii) Iron with their physical and chemical properties
- Definition of an alloy, purposes of alloying, composition, properties and uses of alloys-brass, bronze, monel metal, magnalium, duralumin, alnico and invar

#### Unit: II

##### Fuels

- Definition of a 'Fuel', characteristics of a good fuel and classification of fuels with suitable examples
- Definition of Calorific value of a fuel and determination of calorific value of a liquid fuel with the help of Bomb calorimeter. Simple numerical problems based upon Bomb-calorimeter method of finding the Calorific values
- Brief description of 'Proximate' and 'Ultimate' analysis of a fuel. Importance of conducting the proximate and ultimate analysis of a fuel
- Qualities of a good fuel and merits of gaseous fuels over those of other varieties of fuels
- Manufacture, composition, properties and uses of (i) Water gas (ii) Oil gas (iii) Biogas

#### Unit: III

##### Corrosion

- Meaning of the term ‘corrosion’ and its definition
- Theories of corrosion i.e. (i) direct chemical action theory and (ii) electro chemical theory
- Prevention of corrosion by

1. (a) Alloying  
(b) Providing metallic coatings
2. Cathodic protections:  
(a) Sacrificial  
(b) Impressed voltage method

#### **Unit: IV**

##### Lubricants

- Definition of (i) lubricant (ii) lubrication
- Classification of lubricants
- Principles of lubrication
- fluid film lubrication
- boundary lubrication
- extreme pressure lubrication
- Characteristics of a lubricant such as viscosity, viscosity index, volatility oiliness, acidity, emulsification, flash point and fire point and pour point.

#### **Unit: IV**

##### Cement and Glass

- Manufacture of Portland Cement
- Manufacture of ordinary glass and lead glass

#### **Unit: V**

##### Classification and Nomenclature of Organic Compounds

Classification of Organic Compounds, functional group, Homologous Series, Nomenclature, Physical and Chemical properties, and industrial use of Organic Compounds, IUPAC system of nomenclature of Carboxylic acid, Alcohols, Phenols, Aldehydes, Ketones and Amines.

#### **List of Practical's**

1. Gravimetric analysis and study of apparatus used there in
2. To determine the percentage composition of a mixture consisting of a volatile and a non-volatile substances
3. Determine the viscosity of a given oil with the help of “Redwood viscometer”
4. Determine the flash point of the given oil with the help of Abel’s Flash Point Apparatus
5. Estimate the amount of moisture in the given sample of coal
6. Estimate the amount of ash in the given sample of coal
7. Electroplate the given strip of Cu with Ni
8. Confirmation test of alcohol, aldehydes, carboxylic acid, amine

9. Determination of copper in the given brass solution, or sample of blue vitriol volumetrically
10. Detection of metal iron in the rust (solution of rust in concentrated HCL may be given).

**Reference Books:**

1. Chemistry in Engineering by J.C. Kuriacose and J. Rajaram; Tata McGraw-Hill Publishing Company Limited, New Delhi
2. Engineering Chemistry by Dr. S. Rabindra and Prof. B.K. Mishra ; Kumar and Kumar Publishers (P) Ltd. Bangalore-40
3. "A Text Book of Applied Chemistry-I" by SS Kumar; Tata McGraw Hill, Delhi
4. "A Text Book of Applied Chemistry-I" by Sharma and Others; Technical Bureau of India, Jalandhar
5. Engineering Chemistry by Jain PC and Jain M
6. Chemistry of Engineering by Aggarwal CV
7. Chemistry for Environmental Engineers by Swayer and McCarty, McGraw Hill, Delhi
8. Progressive Applied Chemistry –I and II by Dr. G.H. Hugar; Eagle Prakashan, Jalandhar

# APPLIED MECHANICS

## RATIONALE

The subject Applied Mechanics deals with basic concepts of mechanics like laws of forces, moments, friction, centre of gravity, laws of motion and simple machines which are required by the students for further understanding of other allied subjects. The subject enhances the analytical ability of the students.

## DETAILED CONTENTS

### Unit: I

#### Introduction

- Concept of engineering mechanics, definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields
- Concept of rigid body

### Unit: II

#### Laws of forces

- Different force systems (coplanar and non-coplanar), principle of transmissibility of forces
- Parallelogram law of forces, triangle law of forces, polygon law of forces (graphically and analytically) resolution of forces, resolving a force into two rectangular components
- Free body diagram
- Equilibrium force and its determination
- Lami's theorem

### Unit: III

#### Moment

- Concept of moment
- Moment of a force and units of moment
- Varignon's theorem (definition only)
- Principle of moment and its applications
- Parallel forces (like and unlike) and calculating their resultant
- Concept of couple, its properties and effects
- General conditions of equilibrium of bodies under co-planar forces
- Position of resultant force by moment
- 4.1 Definition and concept of friction, types of friction
- Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction Equilibrium of a body lying on a horizontal plane, equilibrium of a body

### Unit: IV

#### Friction

- lying on a rough inclined plane, friction in simple screw jack

Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force:

- a) acting along the inclined plane
- b) horizontally
- c) at some angle with the inclined plane

#### Centre of Gravity

- Concept, definition of center of gravity and centroid of plain figure and symmetrical solid body
- Determination of centroid of plain and composite lamina using moment method, centroid of bodies with removed portion
- Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed

#### Unit: V

Application of the laws of motion

Simple problems on second law of motion, piles, lift, bodies tied with strings

#### 1. Simple machines

- Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machine
- Simple and compound machine
- Definition of ideal machine, reversible and self locking machine
- Effort lost in friction, determination of maximum mechanical advantage and maximum efficiency
- System of pulley (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency
- Working principle and application of wheel and axle, different pulley blocks, simple screw jack, worm and worm wheel, single and double purchase winch crab, expression for their velocity ratio and field of their application

**Note: Simple problem/numericals may be included in all the above topics wherever feasible**

#### List of Practical's

1. Verification of the following laws:
  - a) Parallelogram law of forces
  - b) Triangle law of forces
  - c) Polygon law of forces
2. To verify the forces in different members of a jib crane
3. To verify the reaction at the supports of a simply supported beam
4. To find the mechanical advantage, velocity ratio and efficiency in case of an



inclined plane

5. To find the mechanical advantage, velocity ratio and efficiency of a screw jack
6. To find the mechanical advantage, velocity ratio and efficiency of worm and worm wheel
7. To find mechanical advantage, velocity ratio and efficiency of single purchase winch crab
8. To find center of gravity of regular lamina
9. To find center of gravity of irregular lamina
10. To determine coefficient of friction between different surfaces on horizontal plane

**Reference Books:**

1. A Text Book of Engineering Mechanics (Applied Mechanics) by RK Khurmi; S Chand and Co. Ltd., New Delhi
2. Text Book in Applied Mechanics by MM Malhotra, R Subramanian, PS Gahlot and BS Rathore; Wiley Eastern Ltd., New Delhi
3. Engineering Mechanics by SS Bhavikatti, KG Rajashekarappa; Wiley Eastern Ltd., New Delhi
4. Engineering Mechanics and Strength of Materials by S Ramamurtham; Dhanpat Rai Publishing Co.(P) Ltd.
5. Engineering Mechanics by AB Basu; Tata McGraw Hill Publishing Co. Ltd.
6. Engineering Mechanics – Volume I and II by VS Mokashi; Tata McGraw Hill Publishing Co. Ltd.
7. Elements of Strength of Materials by SP Timoshenko, DH Young; East West Press Pvt Ltd.
8. Schaum's Outline Series - Theory and Problems of Strength of Materials by William A Nash, McGraw Hill Book Company
9. A Text Book of Applied Mechanics by NL Arora and RK Dhawan; India Publishing House, Delhi
10. A Text Book of Applied Mechanics by RK Rajput; Laxmi Publications, New Delhi
11. Text Book of Applied Mechanics by Birinder Singh, Kaption Publishing House, New Delhi

R A I P U R

## ENGINEERING DRAWING – II

### RATIONALE

Drawing is said to be the language of engineers and technicians. Reading and interpreting engineering drawing is their day-to-day responsibility. The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation

- Note:
1. First angle projection is to be followed
  2. Minimum of 15 sheets to be prepared by each student
  3. SP 46 – 1988 should be followed
  4. Instructions relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students

### DETAILED CONTENTS

#### Unit: I

##### Detail and Assembly Drawing

- Principle and utility of detail and assembly drawings
- Wooden joints i.e. corner mortice and tenon joint, Tee halving joint, Mitre faced corner joint, Tee bridle joint, Crossed wooden joint, Cogged joint, Dovetail joint, Through Mortice and Tenon joint, Corner and Through halving joint, Closed Mortise and Tenon joint

##### Threads

- Nomenclature of threads, types of threads (metric), single and multiple start threads
- Forms of various external thread sections such as V, square and acme threads, BA, BSW and Knuckle, Metric, Seller Thread, Buttress Threads
- Simplified conventions of left hand and right hand threads, both external and internal threads
- Locking Devices (1 sheet)  
Lock nuts, castle nuts, split pin nuts, sawn nuts, slotted nut
- Nuts and Bolts Different views of hexagonal and square nuts; Different views of hexagonal and square nuts; Assembly of hexagonal headed, square headed, square headed with square neck bolts with hexagonal and square nuts and washers. Foundations bolts – Rag bolt and Lewis bolt

## **Unit: II**

### Screws, Studs and Washers

- Drawing various types of machine screws
- 5.2 Drawing various types of studs and set screws

### Keys and Cotters

- Various types of keys and cotters and their practical application and preparation of drawing of various keys and cotters showing keys and cotters in position
- Cotter joints (i) sleeve and cotter joint (ii) gib and cotter joint (iii) knuckle joint (iv) Spigot and socket joint

## **Unit: III**

### Rivets and Riveted Joints

- Types of structural and general purpose rivet heads
- Caulking and fullering of riveted joints
- Types of riveted joints – lap, butt (single riveted, double riveted lap joint, single cover plate and double cover plate), chain and zig – zag riveting

### Welded Joints

- Various conventions and symbols of welded joints (IS 696)
- Practical applications of welded joints say joints on steel frames, windows, doors and furniture

## **Unit: IV**

### Couplings

- Muff or Box coupling, half lap muff coupling
- Flange coupling (Protected and non-protected)
- Flexible coupling

### Symbols and Conventions

- Civil engineering sanitary fitting symbols
- Electrical fitting symbols for domestic interior installations
- Building plan drawing with electrical and civil engineering symbols

## **Unit: V**

### Development of Surfaces

- Construction of geometrical figures such as square, pentagon, hexagon
- Development of surfaces of cylinder, square, pentagonal and hexagonal, Prism, Cone and Pyramid, Sequence pentagonal and hexagonal pyramid

Interpenetration of

- Cylinder to cylinder
- Cylinder to cone

AUTO CAD

- Concept of AutoCAD, Tool bars in AutoCAD, coordinate system, snap, grid, and ortho mode
- Drawing commands – point, line, arc, circle, ellipse
- Editing commands – scale, erase, copy, stretch, lengthen and explode
- Dimensioning and placing text in drawing area
- Sectioning and hatching
- Inquiry for different parameters of drawing entity

**Note: A minimum of 15 sheets should be prepared by each student**

**Reference Books:**

1. Elementary Engineering Drawing (in first angle projection) by ND Bhatt, Charotar Publishing House
2. A Text Book of Engineering Drawing by Surjit Singh Published by Dhanpat Rai and Co. Delhi
3. Engineering Drawing by PS Gill; published by SK kataria and Sons, New Delhi

RAIPUR

## General Workshop Practice - I

### RATIONALE

In order to have a balanced overall development of diploma engineers, it is necessary to integrate theory with practice. General workshop practices are included in the curriculum in order to provide hand on experience about use of different tools and basic manufacturing practices. This course aims at developing general manual and machining skills in the students. Besides above, the development of dignity of labour, precision, safety at work place, team working and development of right attitude are the other objectives.

### DETAILED CONTENTS (PRACTICALS)

Note: The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced.

The students should prepare sketches of various tools/jobs in their practical

The following shops are included in the syllabus:

1. Carpentry and Painting Shop-1
2. Fitting Shop
3. Welding Shop-I
4. Electric Shop –I
5. Smithy Shop or Electronic Shop-I
6. Sheet Metal Shop

#### Note:

1. The branches e.g. Civil Engineering, Electrical Engineering and Automobile Engineering, will do Smithy Shop instead of Electronic Shop- I
2. The branches e.g. Electronics and Communication Engineering, Computer Engineering and Information Technology will do Electronic Shop-I instead of Smithy Shop. 26

#### 1. Carpentry and Painting Shop -I

- 1.1 Introduction to various types of wood such as Deodar, Kail, Partal, Teak,

Mango, Sheesham, etc. (Demonstration and their identification).

1.2 Demonstration, function and use of commonly used hand tools. Care, maintenance of tools and safety measures to be observed.

**Job I** Marking, sawing, planing and chiseling & their practice (size should be mentioned)

1.3 Introduction to various types of wooden joints, their relative advantages and uses.

**Job II** Preparation of half lap joint

**Job III** Preparation of Mortise and Tenon Joint

1.4 Demonstration of various methods of painting wooden items.

**Job IV** Preparation of wooden surface before painting including primer coating

**Job V** Painting Practice by brush/spray

**Job VI** Preparation of surface, before Painting such as cleaning, sanding, putty. Procedure and application of primer coat and painting steel items.

1.5 Safety precautions in carpentry shop

## 2. Fitting Shop

2.1 Introduction to fitting shop tools, common materials used in fitting shop, Identification of materials. Such as Steel, Brass, Copper, Aluminium etc. Identification of various sections of steel such as Flat, Angle, Tee, Channel, Bar Girder, Square, Z-Section, etc.

2.2 Description and demonstration of various types of work benches, holding devices and files. Precautions while filing.

2.3 Description and demonstration of simple operation of hack-sawing, demonstration and description of various types of blades and their specifications, uses and method of fitting the blade.

**Job I** Marking of job, use of marking tools and measuring instruments.

**Job II** Filing a dimensioned rectangular or square piece of an accuracy of  $\pm 0.5\text{mm}$

**Job III** Filing practice (production of flat surfaces). Checking by straight edge.

**Job IV** Making a cutout from a square piece of MS Flat using hand hacksaw.

2.4 Care and maintenance of measuring tools like calipers, steel rule, try square, vernier calipers, micrometer, height gauge, combination set. Handling of measuring instruments, checking of zero error, finding of least count (all gauges including dial gauge).<sup>27</sup>

### 3. Welding Shop – I

3.1 (a) Introduction to welding and its importance in engineering practice; types of welding; common materials that can be welded, introduction to welding equipment e.g. a.c. welding set, d.c. rectifier, electrode holder, electrodes and their specifications, welding screens and other welding related equipment, accessories and gloves.

(b) Safety precautions during welding

(c) Hazards of welding and its remedies

3.2 Electric arc welding, (a.c. and d.c.) precautions while using electric arc welding, Practice in setting current and voltage for striking proper arc. Earthing of welding machine.

**Job I** Practice of striking arc bending and tacking while using electric arc welding set.

**Job II** Welding practice on electric arc welding for making uniform and straight weld beads

3.3 Various types of joints and end preparation.

**Job III** Preparation of butt joint by electric arc welding.

**Job IV** Preparation of lap joint by electric arc welding.

**Job V** Preparation of corner joint by using electric arc welding.

**Job VI** Preparation of Tee joint by electric arc welding.

### 4. Electric Shop – I

4.1 Study, demonstration and identification of common electrical materials such as wires, cables, switches, fuses, ceiling roses, PVC Conduits, PVC Channels and allied items, tools along with electrical instruments such as voltmeter, ammeter and multimeter.

4.2 Study of electrical safety measures and demonstration about use of protective devices such as fuses, MCBs, ELCBs and relays including earthing.

**Job I** Identification of phase, neutral and earth of domestic appliances and their connection to two pin/three pin plugs.

**Job II** Preparation of a house wiring circuit on wooden board using fuse, switches, socket, holder, ceiling rose etc. in PVC conduit and PVC casing and capping wiring system.

4.3 Study of common electrical appliances such as electric iron, electric kettle, ceiling fan, table fan, electric mixer, electric Geyser, gas geyser, desert cooler, refrigerator, water purifier

4.4 Introduction to lead-acid battery, identification of parts and its working.

**Job III** Installation of inverter with battery and to connect two or more batteries in series and in parallel (knowledge of a.c. and d.c.)

**Job IV** Charging of a battery and testing it with the help of hydrometer and cell tester<sup>28</sup>

## 5. Smithy Shop

5.1 Demonstration and detailed explanation of tools and equipment used. Forging operations in smithy shop. Safety measures to be observed in the smithy shop.

5.2 Demonstration and description of bending operation, upsetting operation, description and specification of anvils, swage blocks, hammers etc.

5.3 Demonstration and description of tongs, fullers, swages etc.

**Job I** To forge a L-hook.

**Job II** To prepare a job involving upsetting process

**Job III** To forge a chisel

**Job IV** To prepare a cube from a M.S. round by forging method.

## 6. Sheet Metal Shop

Introduction to sheet metal shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material and specifications.

6.1 Introduction and demonstration of hand tools used in sheet metal shop.

6.2 Introduction and demonstration of various machines and equipment used in sheet metal shop e.g. shearing machine, bar folder, burring machine, power press, sheet bending machine.

6.3 Introduction and demonstration of various raw materials used in sheet metal shop e.g. M.S. sheet, galvanized-iron plain sheet, galvanised corrugated sheet, aluminium sheets etc.

6.4 Study of various types of rivets, steel screw etc.

**Job I** Shearing practice on a sheet using hand shears.

a) Practice on making single riveted lap joint/double riveted lap

Joint.

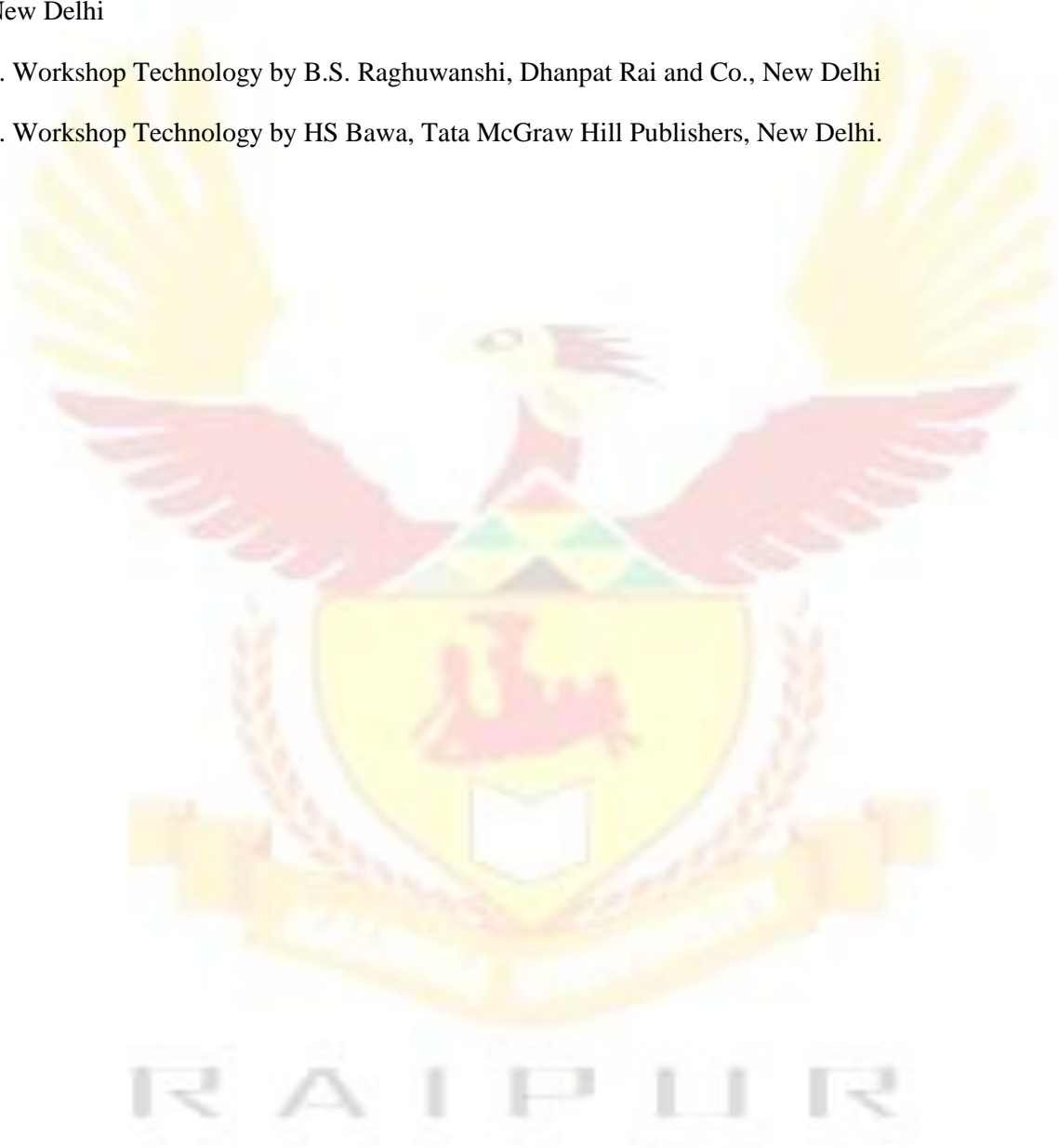
b) Practice on making single cover plate chain type, seam joint and riveted butt joint

### Reference Books:

1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Chaoudhary. Media Promoters and Publishers Pvt. Ltd., Bombay



2. Workshop Technology by Manchanda Vol. I,II,III India Publishing House, Jalandhar.
3. Manual on Workshop Practice by K Venkata Reddy, KL Narayana et al; MacMillan India Ltd. New Delhi
4. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
5. Workshop Technology by B.S. Raghuwanshi, Dhanpat Rai and Co., New Delhi
6. Workshop Technology by HS Bawa, Tata McGraw Hill Publishers, New Delhi.





# Semester- III

RAIPUR

## FLUID MECHANICS

### RATIONALE

Subject of Hydraulics is a basic engineering subject and helps in solving fluid flow problems in the field of Civil Engineering. The subject deals with basic concepts and principles in hydrostatics, hydro kinematics and hydrodynamics and their application in solving fluid -mechanics problems.

### DETAILED CONTENTS

#### Unit: I

##### Introduction:

- Fluids: Real and ideal fluids
- Fluid Mechanics, Hydrostatics, Hydrodynamics, Hydraulics

##### Properties of Fluids (definition only)

- Mass density, specific weight, specific gravity, viscosity, surface tension - cohesion, adhesion and, capillarity, vapour pressure and compressibility.
- Units of measurement and their conversion

#### Unit: II

##### Hydrostatic Pressure:

- Pressure, intensity of pressure, pressure head, Pascal's law and its applications.
- Total pressure, resultant pressure, and centre of pressure.
- Total pressure and centre of pressure on horizontal, vertical and inclined plane surfaces of rectangular, triangular, trapezoidal shapes and circular. (No derivation)

##### Measurement of Pressure:

- Atmospheric pressure, gauge pressure, vacuum pressure and absolute Pressure.
- Piezometer, simple manometer and differential manometer, Bourden gauge and dead weight pressure gauge

#### Unit: III

##### Fundamentals of Fluid Flow:

- Types of Flow: Steady and unsteady flow, laminar and turbulent flow, uniform and non-uniform flow
- Discharge and continuity equation (flow equation) {No derivation}
- Types of hydraulic energy: Potential energy, kinetic energy, pressure energy
- Bernoulli's theorem; statement and description (without proof of theorem) and simple numerical problems.

##### Flow Measurements (brief description with simple numerical problems)

- Venturimeter and mouthpiece
- Pitot tube
- Orifice and Orifice meter
- Current meters
- Notches and weirs (simple numerical problems)

## **Unit: IV**

### **Flow through Pipes:**

- Definition of pipe flow; Reynolds number, laminar and turbulent flow - explained through Reynold's experiment
- Critical velocity and velocity distributions in a pipe for laminar flow
- Head loss in pipe lines due to friction, sudden expansion and sudden contraction, entrance, exit, obstruction and change of direction (No derivation of formula)
- Hydraulic gradient line and total energy line
- Flow from one reservoir to another through a long pipe of uniform cross section (simple problems)
- Pipes in series and parallel
- Water hammer phenomenon and its effects (only definition and description)

## **Unit: V**

### **Flow through open channels:**

- Definition of an open channel, uniform flow and non-uniform flow
  - Discharge through channels using
- i) Chezy's formula (no derivation)
  - ii) Manning's formula (no derivation)
  - iii) Simple Numerical Problems
    - Most economical channel sections (no derivation)
  - i) Rectangular
  - ii) Trapezoidal
  - iii) Simple Numerical Problems
    - Head loss in open channel due to friction

### **Hydraulic Pumps:**

Hydraulic pump, reciprocating pump, centrifugal pumps (No numericals and derivations) (may be demonstrated with the help of working models)

Note: Visit to Hydraulic research station is must to explain the various concepts.

### **Practical Exercises**

- i) To verify Bernoulli's Theorem
- ii) To find out venturimeter coefficient
- iii) To determine coefficient of velocity ( $C_v$ ), Coefficient of discharge ( $C_d$ )  
Coefficient of contraction ( $C_c$ ) of an orifice and verify the relation between them
- iv) To perform Reynold's experiment
- v) To verify loss of head in pipe flow due to
  - a) Sudden enlargement
  - b) Sudden contraction
  - c) Sudden bend
- vi) Demonstration of use of current meter and pitot tube
- vii) To determine coefficient of discharge of a rectangular notch/triangular notch.

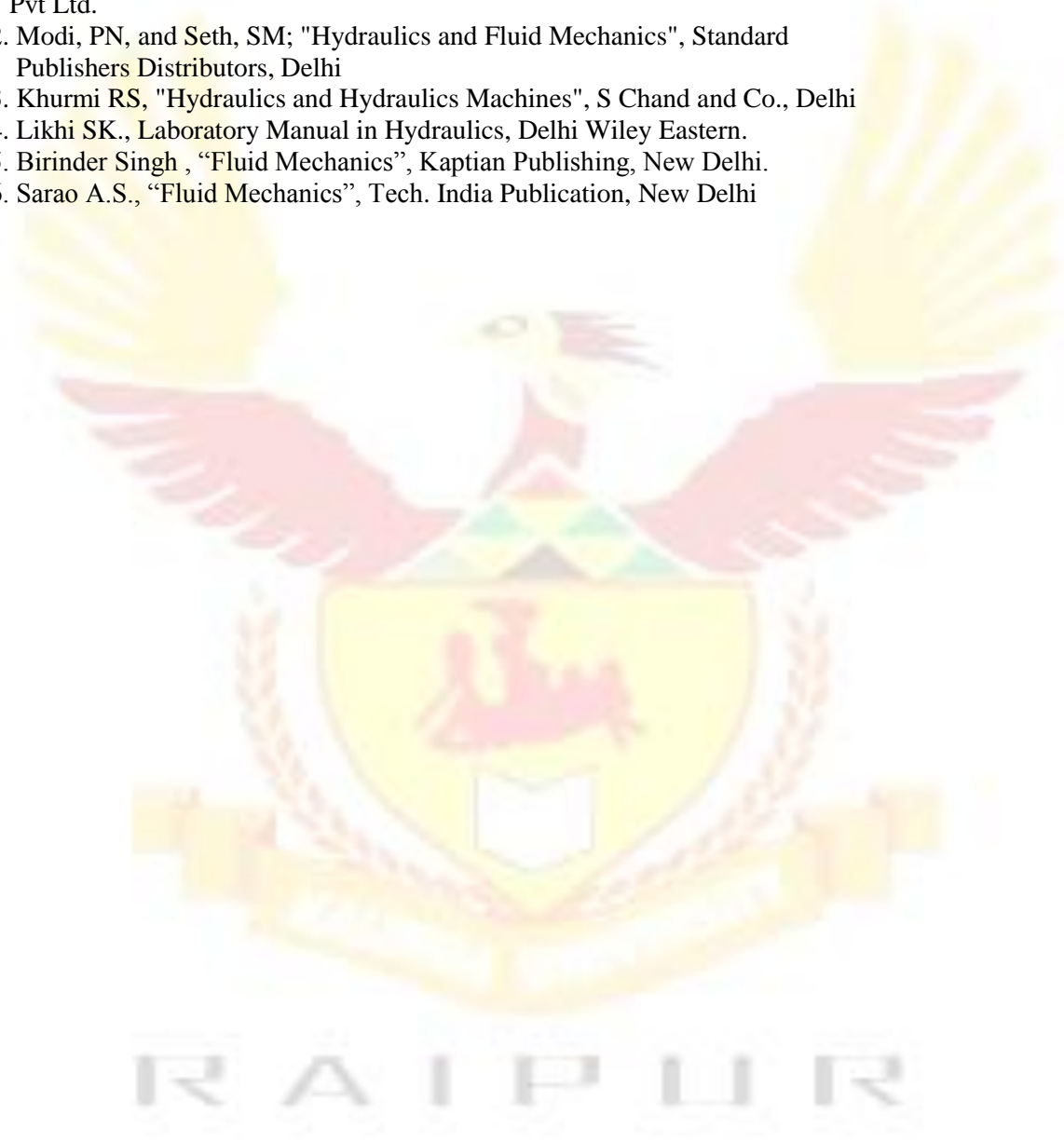
### **INSTRUCTIONAL STRATEGY**

Hydraulics being a fundamental subject, teachers are expected to lay considerable stress on understanding the basic concepts, principles and their applications. For this purpose, teachers are expected to give simple problems in the class room and provide tutorial exercises so as to develop necessary knowledge for

comprehending the basic concepts and principles. As far as possible, the teaching of the subject be supplemented by demonstrations and practical work in the laboratory. Visit to hydraulic research stations must be carried out.

**Reference Books:**

1. Jagdish Lal, "Fluid Mechanics and Hydraulics" Delhi Metropolitan Book Co. Pvt Ltd.
2. Modi, PN, and Seth, SM; "Hydraulics and Fluid Mechanics", Standard Publishers Distributors, Delhi
3. Khurmi RS, "Hydraulics and Hydraulics Machines", S Chand and Co., Delhi
4. Likhi SK., Laboratory Manual in Hydraulics, Delhi Wiley Eastern.
5. Birinder Singh , "Fluid Mechanics", Kaptian Publishing, New Delhi.
6. Sarao A.S., "Fluid Mechanics", Tech. India Publication, New Delhi



## STRUCTURAL MECHANICS

### RATIONALE

This is a basic engineering subject. The purpose of the subject is to impart basic knowledge and skill regarding properties of materials, concept of stresses and strains, bending moment and shear force diagrams, second moment of area, bending and shear stresses, slope and deflection and analysis of trusses. The above knowledge will be useful for designing simple structural components. This subject is very important to develop basic concepts and principles related to strength of materials. This subject will also enable the students to continue their further education.

### DETAILED CONTENTS

#### THEORY:

##### Unit: I

##### Properties of Materials

- Classification of materials, elastic materials, plastic materials, ductile materials, brittle materials.
- Introduction to tensile test, compressive test, impact test, fatigue test, torsion test on metals

##### Simple Stresses and Strains:

- Concept of stress, normal and shear stresses,
- Concept of strain and deformation, longitudinal and transverse strain, poisson's ratio, volumetric strain
- Hooke's law, moduli of elasticity and rigidity, Bulk modulus of elasticity, relationship between the elastic constants.
- Stresses and strains in bars subjected to tension and compression. Extension of uniform bar under its own weight, stress produced in compound bars (two or three) due to axial load.
- Stress-strain diagram for mild steel and HYSD steel, mechanical properties, factor of safety.
- Temperature stresses and strains

##### Shear Force and Bending Moment:

- Concept of a beam and supports (Hinges, Roller and Fixed), types of beams: simply supported, cantilever, propped, over hang, cantilever and continuous beams (only concept).
- Types of loads (dead load, live load, snow load, wind load seismic load as per IS Codes etc) and types of loading (point, uniformly distributed and uniformly varying loads)
- Concept of bending moment and shear force, sign conventions
- Bending Moment and shear force diagrams for cantilever, simply supported and overhanging beams subjected to concentrated, uniformly distributed
- Relationship between load, shear force and bending moment, point of maximum bending moment, and point of contraflexure.

##### Unit: II

##### Moment of Inertia:

Concept of moment of inertia and second moment of area and radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical sections: rectangle, triangle, circle (*without derivations*). Second moment of area for L, T and I sections, section modulus.

### **Bending Stresses in Beams:**

- Concept of pure/simple bending
- Assumptions made in the theory of simple bending, derivation and application of bending equation to circular cross-section, I section, T&L sections only
- Moment of resistance
- Calculations of bending stresses in simply supported beam

### **Combined Direct and Bending Stresses:**

- Concentric and eccentric loads single axis eccentricity only
- Effect of eccentric load on the section stresses due to eccentric loads, Numerical in the case of short columns.
- Simple problems on stability of masonry dams and retaining walls

### **Unit: III**

#### **Shear Stresses in Beams**

- Concept of shear stresses in beams, shear stress distribution in rectangular, circular I, T, L sections (Formula to be stated, no derivation)

#### **Slope and Deflection:**

Necessity for determination of slope and deflection

Moment area theorem ( no derivation, numerical problems)

#### **Columns:**

- Theory of columns
- Eulers and Rankine Formula (No derivation)

#### **Analysis of Trusses:**

- Concept of a perfect, redundant and deficient frames
- Assumptions and analysis of trusses by:
  - a) Method of joints
  - b) Method of sections
  - c) Graphical method

### **Unit: IV**

#### **PRACTICAL EXERCISES**

- i) Determination of yield stress, ultimate stress, percentage elongation and plot the stress strain diagram and compute the value of young's modulus on mild steel
- ii) Testing of HYSD Steel
- iii) Determination of Young's modulus of elasticity for steel wire with searl's apparatus
- iv) Determination of modulus of rupture of a concrete beam
- v) Determination of maximum deflection and young's modulus of elasticity in simply supported beam with load at middle third point
- vi) Verification of forces in a framed structure

### **Unit: V**

#### **INSTRUCTIONAL STRATEGY**

Teachers are expected to give simple exercises involving the applications of various concepts and principles being taught in the subject. Efforts should be made to prepare tutorial sheets on various topics

and students should be encouraged/guided to solve tutorial sheets independently. In the practical works, individual students should be given opportunities to do practical work, make observations and draw conclusions. Teachers should also conduct viva examination in which stress should be given on the understanding of basic concepts and principles.

### **Reference Books:**

- i) Ramamrutham, S., "Strength of Materials", Dhanpat Rai and Sons., New Delhi
- ii) Ram Chandra, "Applied Mechanics and Strength of Materials", Standard Publishers. Delhi:
- iii) Punmia, BC., "Strength of Materials", Standard Publishers, Delhi,
- iv) Prasad VS " Structural mechanics Galgotia publications Pvt Ltd, Delhi
- v) Sadhu Singh "Strengths of Materials" Standard Publishers, New Delhi
- vi) Singh Birinder "Structural Mechanics" Kaption Publishers, Ludhiana
- vii) Singh Harbhajan, " Structural Mechanics" ., Abhishek Publishers, Chandigarh
- viii) Singh Harbhajan, "Design of Masonry and Timber Structures" Abhishek Publishers, Chandigarh.

DICE303

**SURVEYING - I**

**RATIONALE**



The important functions of a diploma civil engineer includes the jobs of detailed surveying, plotting of survey data, preparation of survey maps and setting out works While framing the curriculum for the subject of surveying, stress has been given to the development of the skill in each type of survey like chain surveying, compass surveying leveling, that the Civil Engineering diploma holder will normally be called upon to perform and plane table surveying, Field work should be a selected one so that student can check his work and have an idea of the results the extent of error in the work done by him. As far as possible, the surveys done should be got plotted, as this will also reveal errors in the work and develop skill in plotting.

## **DETAILED CONTENTS**

### **Unit: I**

#### **Introduction:**

- Basic principles of surveying
- Concept and purpose of surveying, measurements-linear and angular, units of measurements
- Instruments used for taking these measurements, classification based on surveying instruments

#### **Chain surveying:**

- Purpose of chain surveying, principles of chain surveying and its advantages and disadvantages
- Obstacles in chain surveying
- Direct and indirect ranging offsets and recording of field notes
- Errors in chain surveying and their corrections

#### **Compass surveying:**

- Purpose of compass surveying. Use of prismatic compass: Setting and taking observations
- Concept of following with simple numerical problems:
  - a) Meridian - Magnetic and true
  - b) Bearing - Magnetic, True and Arbitrary
  - c) Whole circle bearing and reduced bearing
  - d) Fore and back bearing
  - e) Magnetic dip and declination
- Local attraction - causes, detection, errors and corrections, problems on local attraction, magnetic declination and calculation of included angles in a compass traverse

### **Unit: II**

#### **Levelling:**

- Purpose of levelling, concept of a level surface, horizontal surface, vertical surface, datum, reduced level and bench marks
- Identification of various parts of Dumpy level and use of Dumpy level, Engineer' level, Auto level: advantages and disadvantages, use of auto level.
- Concepts of line of collimation, axis of the bubble tube, axis of the telescope and vertical axis
- Levelling staff: single piece, folding, invar precision staff, telescopic

- Temporary adjustment and permanent adjustment of dumpy level by two peg method.
- Concept of back sight, foresight, intermediate sight, change point, to determine reduce levels

### **Unit: III**

- Level book and reduction of levels by
- Height of collimation method and
- Rise and fall method
- Arithmetic checks, problem on reduction of levels, fly levelling, check leveling and profile levelling (L-section and X-section), errors in levelling, permissible limits, reciprocal leveling. Numerical problems.
- Computations of Areas of regular figures and irregular figures. Simpson's rule: prismatic formula and graphical method use of planimeter for computation of areas, numerical problems

### **Unit: IV**

#### **Plane Table Surveying**

- Purpose of plane table surveying, equipment used in plane table survey:
- Setting of a plane table:
  - (a) Centering
  - (b) Levelling
  - (c) Orientation
- Methods of plane table surveying
  - (a) Radiation,
  - (b) Intersection
  - (c) Traversing
  - (d) Resection
    - Concept of Two point and Three point problems (Concept only)
    - Errors in plane table survey and precautions to control them. Testing and adjustment of plane table and alidad

### **Unit: V**

#### **INSTRUCTIONAL STRATEGY**

This is highly practice-oriented course. While imparting theoretical instructions, teachers are expected to demonstrate the use of various instruments in surveying, stress should be laid on correct use of various instruments so as to avoid/minimize errors during surveying. It is further recommended that more emphasis should be laid in conducting practical work by individual students. Technical visit to Survey of India, Northern Region and Great Trigonometrical Survey(GTS), Dehradun.

#### **PRACTICAL EXERCISES**

I. Chain surveying:

- i) a) Ranging a line
- b) Chaining a line and recording in the field book
- c) Taking offsets - perpendicular and oblique (with a tape only)
- d) Setting out right angle with a tape
- ii) Chaining of a line involving reciprocal ranging
- iii) Chaining a line involving obstacles to ranging
- iv) Chain Survey of a small area.

II. Compass Surveying:

- i) a) Study of prismatic compass
- b) Setting the compass and taking observations
- c) Measuring angles between the lines meeting at a point

III. Levelling:

- i) a) Study of dumpy level and levelling staff
- b) Temporary adjustments of various levels
- c) Taking staff readings on different stations from the single setting and finding differences of level between them
- ii) To find out difference of level between two distant points by shifting the instrument
- iii) Longitudinal and cross sectioning of a road/railway/canal
- iv) Setting a gradient by dumpy and auto-level

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IV. Plane Table Surveying:

- i) a) Study of the plane table survey equipment
  - b) Setting the plane table
  - c) Marking the North direction
  - d) Plotting a few points by radiation method
  - ii) a) Orientation by
    - Trough compass
    - Back sighting
  - b) Plotting few points by intersection, radiation and resection method
  - iii) Traversing an area with a plane table (at least five lines)
- V. Layout of Buildings (from given drawing of two room residential building) by use of surveying instruments.

**Reference Books:**

1. Hussain, SK and Nagraj, MS; "Text Book of Surveying"; New Delhi, S Chand and Co Ltd.
2. Deshpande, RS; "A Text Book Surveying and Levelling"; Poona, United Book Corporation
3. Kocher, CL; "A Text Book of Surveying"; Ludhiana, Katson Publishing House
4. Kanetkar, TP and Kulkarni, SV., "Surveying and Leveling", Poona, AVG Parkashan
5. Kanetkar, TP; and Kulkarni, SV; "Surveying and Leveling" Poona, AVG Prakashan
6. Mahajan, Sanjay "Surveying -I", Tech. Publication, Delhi
7. Punmia, BC; "Surveying and Leveling", Delhi Standard Publishers Distributors.
8. Shahai, PB; "A Text Book of Surveying", Oxford and IBH Publishing Co.



RAIPUR

DICE304

## **CONSTRUCTION MATERIALS**

**RATIONALE**

Civil Engineering diploma holders have to supervise construction of various types of civil works involving use of various materials like stones, bricks and tiles, cement and cement based products, lime, timber and wood based products, paints and varnishes, metals and other miscellaneous materials. The students should have requisite knowledge regarding characteristics, uses and availability of various building materials and skills in conducting tests to determine suitability of materials for various construction purposes. In addition, specifications of various materials should also be known (PWD/BIS) for effective quality control.

## **DETAILED CONTENTS**

### **Unit: I**

#### **Building Stones:**

- Classification of Rocks: (General Review)
- Geological classification: Igneous, sedimentary and metamorphic rocks
- Chemical classification; Calcareous, argillaceous and siliceous rocks
- Physical classification: Unstratified, stratified and foliated rocks
- General characteristics of stones – Marble, Kota stone, Granite, Sand, Trap, Basalt stone, Lime stone and Slate
- Requirements of good building stones
- Identification of common building stones
- Various uses of stones in construction
- Quarrying of stones by blasting and its effect on environment

### **Unit: II**

#### **Bricks and Tiles:**

- Introduction to bricks
- Raw materials for brick manufacturing and properties of good brick making earth
- Manufacturing of bricks
- Preparation of clay (manual/mechanically)
- Moulding: hand moulding and machine moulding brick table; drying of bricks, burning of bricks, types of kilns (Bull's Trench Kiln and Hoffman's Kiln), process of burning, size and weight of standard brick; traditional brick, refractory brick, clay-flyash bricks, sun dried bricks, only line diagram of kilns
- Classification and specifications of bricks as per BIS: 1077
- Testing of common building bricks as per BIS: 3495  
Compressive strength, water absorption – hot and cold water test, efflorescence, Dimensional tolerance, soundness
- Tiles
- Building tiles; Types of tiles-wall, ceiling, roofing and flooring tiles
- Ceramic, terrazo and PVC tiles, : their properties and uses,
- Vitrified tiles, Paver blocks.
- Stacking of bricks and tiles at site

### **Unit: III**

**Cement: (10 hrs)**

- Introduction, raw materials, flow diagram of manufacturing of cement
- Various types of Cements, their uses and testing: Ordinary portland cement, rapid hardening cement, low heat cement, high alumina cement, blast furnace slag cement, white and coloured cement, portland pozzolana cement, super sulphate cement, Tests of cement – fineness, soundness, initial and final setting time etc.as per B.I.S. Code.
- Properties of cement

**Lime:**

- Introduction: Lime as one of the cementing materials
- Classification and types of lime as per BIS Code
- Calcination and slaking of lime

**Unit: IV****Timber and Wood Based Products:**

- Identification and uses of different types of timber: Teak, Deodar, Shisham, Sal, Mango, Kail, Chir, Fir, Hollock, Champ
- Market forms of converted timber as per BIS Code
- Seasoning of timber: Purpose, methods of seasoning as per BIS Code
- Properties of timber and specifications of structural timber
- Defects in timber, decay in timber
- Preservation of timber and methods of treatment as per BIS
- Other wood based products, their brief description of manufacture and uses: laminated board, block board, fibre board, hard board, sunmica, plywood, veneers, nu-wood and study of the brand name and cost of the wood based products available in the market, Cement Panel Board, Moulded Door.

**Paints and Varnishes:**

- Introduction, purpose and use of paints
- Types, ingredients, properties and uses of oil paints, water paints and cement paints
- Covering capacity of various paints
- Types, properties and uses of varnishes
- Trade name of different products.

**Metals:**

- Ferrous metals: Composition, properties and uses of cast iron, mild steel, HYSD steel, high tension steel as per BIS.
- Commercial forms of ferrous, metals.
- Aluminium & Stainless Steel.

**Unit: V****8. Miscellaneous Materials:**

- Plastics – Introduction and uses of various plastic products in buildings such as doors, water tanks and PVC pipes
- Fibre Sheets and their manufacture process.
- Types and uses of insulating materials for sound and thermal insulation

- Construction chemicals like water proofing compound, epoxies, polymers
- Water proofing, termite proofing and fire resistance materials – types and uses
- Materials used in interior decoration works like POP, methods of doing POP

**NOTE:** \*\*A field visit may be planned to explain and show the relevant things

**Practical Exercises:**

- To identify the stones used in building works by visual examination
- To determine the crushing strength of bricks
- To determine the water absorption of bricks and efflorescence of bricks
- To identify various types of timbers such as: Teak, Sal, Chir, Sissoo, Deodar, Kail & Hollock by visual examination only
- To determine fineness (by sieve analysis) of cement
- To conduct field test of cement.
- To determine normal consistency of cement
- To determine initial and final setting times of cement
- To determine soundness of cement
- To determine compressive strength of cement
- The students should submit a report work on the construction materials, covering water proofing material, cements, steel, paints and timber products available in the local market. They will also show the competitive study based upon the cost, brand name, sizes available in the local market.

**Reference Books:**

- Sharma, SK; and Mathur, GC; "Engineering Materials;" Delhi-Jalandhar, S. Chand and Co.
- Surendra Singh; "Engineering Materials;" New Delhi, Vikas Publishing House Pvt. Ltd.
- Chowdhuri, N; "Engineering Materials;" Calcutta, Technical Publishers of India.
- Bahl, SK; "Engineering Materials;" Delhi, Rainbow Book Co.
- TTTI, Chandigarh "Civil Engineering Materials:” New Delhi Tata McGraw Hill Publication
- Kulkarni, GJ; "Engineering Materials;" Ahmedabad, Ahmedabad Book Depot.
- Shahane; “Engineering Materials”; Poona, Allied Book Stall.
- Gurcharan Singh; “Engineering materials”, Delhi Standard Publishers Distributors
- SC Rangawala, ”Construction Materials”, Charotar Publishers
- Alam Singh, “Construction Materials”
- Dr. Hemant Sood “Lab Manual in Testing of Engineering Materials”, New Age International (P) Ltd., New Delhi
- Handbook of Civil Engineering by PN Khanna.

DICE305

**BUILDING CONSTRUCTION**

**RATIONALE**

Diploma holders in Civil Engineering are supposed to effectively supervise construction of buildings. Effective supervision is essential to obtain/provide a fault free service from contractors to users. To perform above task, it is essential that students should have knowledge of various sub components of buildings like foundations, walls, roofs, staircases, floors etc., and their constructional details as well as preventive, remedial and corrective methods of common construction faults. Therefore, the subject of Building Construction is very important for Civil Engineering diploma holders.

## **DETAILED CONTENTS**

### **THEORY:**

#### **Unit: I**

##### **Introduction:**

- Definition of a building, classification of buildings based on occupancy
- Different parts of a building

##### **Foundations:**

- Concept of foundation and its purpose
- Types of foundation-shallow and deep
- Shallow foundation - constructional details of: Spread foundations for walls, thumb rules for depth and width of foundation and thickness of concrete block, stepped foundation, masonry pillars and concrete columns
- Earthwork
- Layout/setting out for surface excavation, cutting and filling
- Excavation of foundation, trenches, shoring, timbering and dewatering

##### **Walls:**

- Purpose of walls
- Classification of walls - load bearing, non-load bearing, dwarf wall, retaining, breast walls and partition walls
- Classification of walls as per materials of construction: brick, stone, reinforced brick, reinforced concrete, precast, hollow and solid concrete block and composite masonry walls
- Partition walls: Constructional details, suitability and uses of brick and wooden partition walls
- Mortars: types, selection of mortar and its preparation
- Scaffolding, construction details and suitability of mason's brick layers and tubular scaffolding, shoring, underpinning

#### **Unit: II**

##### **Masonry**

- Brick Masonry: Definition of terms like header, stretcher, queen closer, king closer, frog and quoin, course, bond, facing, backing, hearting, jambs, reveals, soffit, plinth, pillars and pilasters
- Bond – meaning and necessity; English, flemish bond and other



- types of bonds
- Construction of brick walls –methods of laying bricks in walls, precautions observed in the construction of walls, methods of bonding new brick work with old (toothing, raking, back and block bonding), Expansion and contraction joints
- Importance towards special care during execution on: soaking of bricks, maintenance of bonds and plumb, filling of horizontal and vertical joints, masonry work, restriction height of construction on a given day, every fourth course, earthquake resistance measure, making of joints to receive finishes
- Stone Masonry
- Glossary of terms – natural bed, bedding planes, string course, corbel, cornice, block in course grouting, moulding, templates, corner stone, bond stone, throating, through stone, parapet, coping, pilasters and buttress
- Types of stone masonry: rubble masonry - random and coursed; Ashlar masonry, principles to be observed in construction of stone masonry walls
- Importance towards special care during execution of stone masonry work on dressing of stone, size and placing of bond and corner stones, filling joints, proper packing of internal cavities of rubble masonry wall, raking of joints to receive finishes

### **Unit: III**

#### **Arches and Lintels:**

- Meaning and use of arches and lintels:
- Glossary of terms used in arches and lintels - abutment, pier, arch ring, intrados, soffit, extrados, voussoiers, springer, springing line, crown, key stone, skew back, span, rise, depth of an arch, haunch, spandril, jambs, bearing, thickness of lintel, effective span
- Arches:
- Types of Arches - Semi circular, segmental, elliptical and parabolic, flat, inverted and relieving
- Stone arches and their construction
- Brick arches and their construction
- Lintels
- Purpose of lintel
- Materials used for lintels
- Cast-in-situ and pre-cast lintels
- Lintel along with sun-shade or chhajja

#### **6. Doors, Windows and Ventilators:**

- Glossary of terms with neat sketches
- Classification based on materials i.e. wood, metal and plastic and their suitability for different situations. Different type of doors- panel door, flush door, flazed door, rolling shutter, steel door, sliding door, plastic and aluminium doors

- Window – Panel window, glazed windows (fixed and openable) ventilators, sky light window, Louvres shutters, plastic and aluminium windows.
- Door and window frames – materials and sections, door closures, hold fasts

#### **Unit: IV**

##### **Damp Proofing and Water Proofing**

- Dampness and its ill effects on bricks, plaster, wooden fixtures, metal fixtures and reinforcement, damage to aesthetic appearance, damage to heat insulating materials, damage to stored articles and health, sources and causes of dampness
- Sources of dampness - moisture penetrating the building from outside e.g. rainwater, surface water, ground moisture. Moisture entrapped during construction i.e. moisture in concrete, masonry construction and plastering work etc. Moisture which originates in the building itself i.e. water in kitchen and bathrooms etc.
- Damp proofing materials and their specifications: rich concrete and mortar, bitumen, bitumen mastic, polymer coating, use of chemicals
- Damp proofing of : basement, ground floors, plinth and walls, special damp proofing arrangements in bathrooms, WC and kitchen, damp proofing for roofs and window sills

##### **Floors**

- Glossary of terms-floor finish, topping, under layer, base course, rubble filling and their purpose
- Types of floor finishes - cast-in-situ, concrete flooring (monolithic, bonded) Terrazzo tile flooring, stone (marble and kota) flooring, PVC flooring, Terrazzo flooring, glazed tiles flooring, Timber flooring, description with sketches. The methods of construction of concrete, terrazzo and timber floors and their BIS specifications
- Special emphasis on level/slope/reverse slope in bathrooms, toilets, kitchen, balcony and staircase

##### **Roofs**

- Types of roofs, concept of flat, pitched and arched roofs
- Glossary of terms for pitched roofs - batten, eaves, fascia board, gable, hip, lap, purlin, rafter, rag bolt, valley, ridge, rain water gutter, anchoring bolts
- False ceilings using gypsum, plaster boards, cellotex, fibre boards
- Special emphasis on maintenance of slopes, overlaps of roofing materials, applicability and problems of wind ties, size of anchoring bolts

##### **Stairs**

- Glossary of terms: Staircase, winders, landing, stringer, newel, baluster, riser, tread, width of staircase, hand-rail, nosing
- Classification of staircase on the basis of material – RCC, timber, steel, Aluminium
- Planning and layout of staircase: Relations between rise and tread, determination of width of stair, landing etc
- Various types of layout - straight flight, dog legged, open well, quarter

turn, half turn (newel and geometrical stairs), bifurcated stair, spiral stair

## **Unit: V**

### **Surface Finishes**

- Plastering - classification according to use and finishes like plain plaster, grit finish, rough cast, pebble dashed, concrete and stone cladding etc., dubbing, proportion of mortars used for different plasters, techniques of plastering and curing
- Pointing - different types of pointing and their methods
- Painting - preparation of surface, primer coat and application of paints on wooden, steel and plastered wall surfaces
- Application of white washing, colour washing and distempering, polishing, application of cement and plastic paints
- Selection of appropriate paints/finishes for interior and exterior surfaces
- Importance of preparation of surfaces such as hacking, grooving etc before application of surface finishes

### **Anti Termite Measures (As per IS 6313 –I – III)**

- Introduction, site preparation and chemicals used in anti-termite treatment
- Treatment of masonry foundation
- Treatment of RCC foundation
- Treatment of top surface of earth filling
- Treatment of junction of walls and floors
- Treatment along external perimeter of building
- Treatment and selection of timber
- Treatment in existing buildings

### **Building Planning**

- Site selection: Factors to be considered for selection of site for residential, commercial, industrial and public building
- Basic principles of building planning, arrangement of doors, windows, cupboards etc for residential building
- Orientation of building as per IS: 7662 in relation to sun and wind direction, rains, internal circulation and placement of rooms within the available area, concept of Vastu-Shastra
- Introduction to National Building code.

### **Building Services**

Introduction to fire fighting systems, Ducting for Air-conditioning, service lines for cable telephone, and electrical wiring , garbage disposal systems. Water supply system (internal and external).

### **Elementary idea of interior decoration, wall paneling, false ceiling,**

flooring etc.

**Note** \* An expert may be invited from field/industry for extension lecture

\*\* A field visit may be planned to explain and show the relevant things

**Reference Books:**

1. Gupta, Sushil Kumar, Singla, DR, and Juneja BM; "A Text Book of Building Construction"; Ludhiana, Katson Publishing House.
2. Deshpande, RS and Vartak, GV; "A Text Book of Building Construction"; Poona, United Book Corporation.
3. Rangwala, SC; "Building Construction"; Anand, Charotar Book Stall
4. Kulkarni, GJ; "A Text Book of Building Construction"; Ahmedabad Book Depot
5. Arora, SP and Bindra, SP; "A Text Book of Building Construction"; New Delhi Dhanpt Rai and Sons.
6. Sharma,SK and Kaul, BK; "A Text Book of Building Construction"; Delhi, S Chand and Co.
7. Sushil Kumar; "Building Construction"; Standard Publishers Distributors, Delhi
8. Moorthy, NKR; "A Text Book of Building Construction"; Poona, Engineering Book Publishing Co.
9. SP – 62 Hand Book of BIS
10. B.I.S. – 6313 Part 1, 2, 3
11. National Building Code
12. Handbook of Civil Engineering by PN Khanna
13. Video films on Damp proofing, water proofing, surface finishes

DICE306

**CIVIL ENGINEERING DRAWING – I**

**RATIONALE**

Drawing is the language of engineers. Engineering is incomplete without a thorough knowledge of drawing. A Civil Engineering diploma holder must be capable of sketching detailed constructional drawing of various components of building for the purpose of communication with the craftsman. Planning of small buildings, developing a line plan, dimensioning, key plan, drainage plan should be a part of curriculum. The diploma engineer must be conversant with reading and interpretation of drawing for execution of work.

## **DETAILED CONTENTS**

### **Unit: I**

#### **Drawing No. 1:**

Details of spread footing foundations, load bearing and non-load bearing wall for given thickness of walls with the help of given data or rule of the thumb, showing offsets, position of DPC. The details of the concrete and brick plinth protection have to be shown in the drawing.

#### **Drawing No. 2**

Plans of 'T' and Corner junction of walls of 1 Brick, 1-1/2 Brick and 2 brick thick in English bond

#### **Drawing No. 3:**

Detailed drawing of basement, single wooden floor, double wooden floor.

### **Unit: II**

#### **Drawing No.4**

Elevation, sectional plan and sectional side elevation of flush door, glazed door, panelled door and window, Aluminium door and window with wire gauge shutter. Sketches of various joints of different members.

#### **Drawing No.5**

Draw atleast one sheet using CAD software

### **Unit: III**

#### **Drawing No. 6:**

Drawing plan, elevation of a small building by measurement and foundation detail and sectional elevation.

**Drawing No.7 (a)** Drawing detailed plan, elevation and section of a two room residential building from a given line plan, showing details of foundations, roof and parapet

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#### **Drawing No. 7 (b)**

Draw detailed plan, elevation and section of:

- (i) Single flight R.C.C. stair case
- (ii) Dog legged wooden stair case

### **Unit: IV**

#### **Drawing No. 8 (one sheet)**

Drawings of following floors

Cement concrete floors on ground and at first floor

- i) Conglomerate (Concrete Flooring)

- ii) Bonded cement concrete flooring
- iii) Terrazo flooring
- iv) Ceramic/vitrified tile flooring

**Drawing No. 9:** (one sheet)

Drawing of flat roof, showing the heat/thermal insulation provisions.

**Unit: V**

**Drawing No.10**

Draw atleast one sheet using CAD software

**Drawing No. 11**

Drawing details of damp proofing arrangement of roofs and walls as per BIS Code. Show the rain water drainage arrangement also.

**NOTE:**

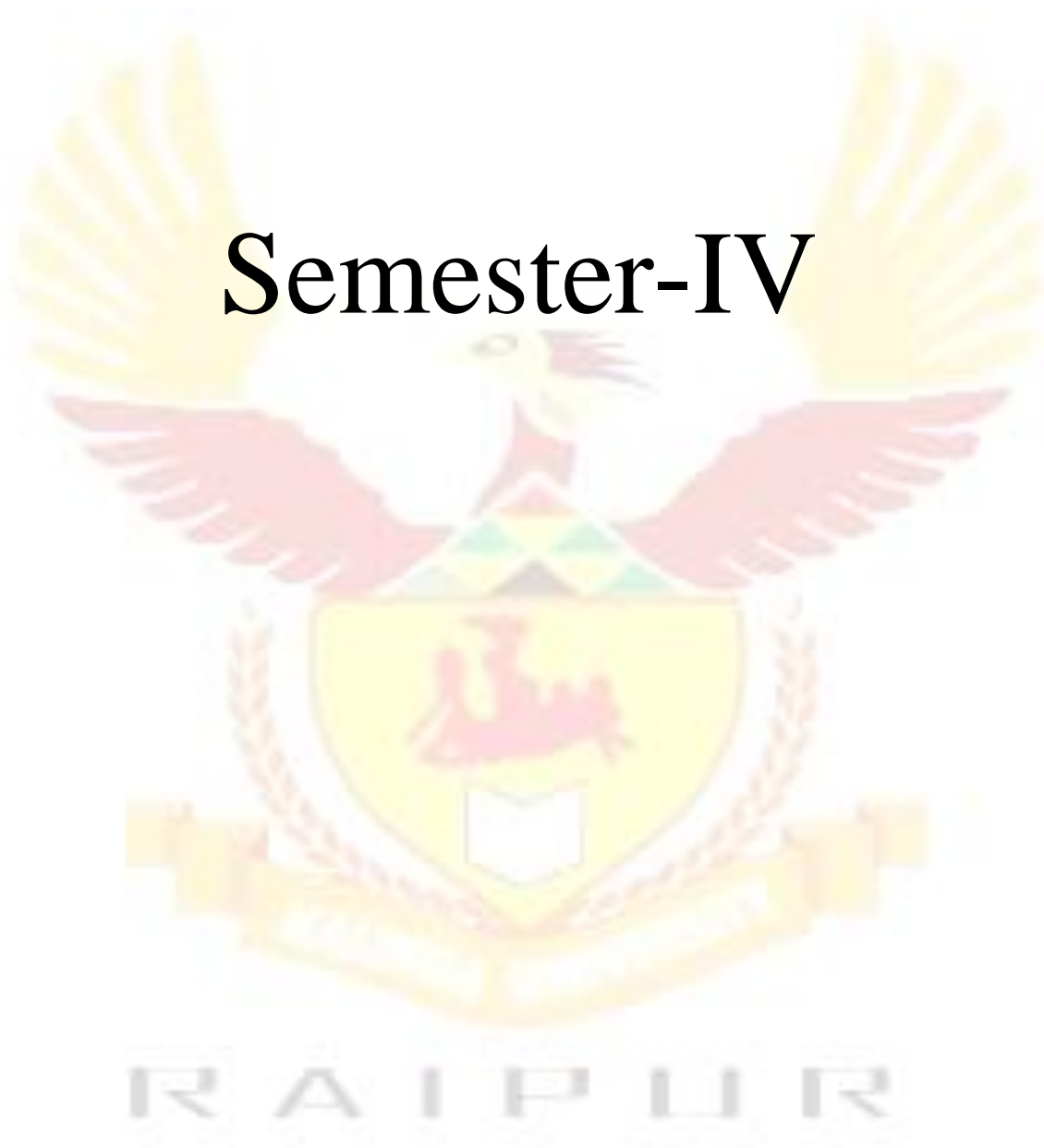
- a) All drawings should be as per BIS code and specifications in SI Units
- b) Intensive practice of reading and interpreting building drawings should be given
- c) Some practice should be done to prepare drawings on AutoCAD

**Reference Books**

1. Civil Engineering Drawing by RS Malik, Asia Publishing House
2. Civil Engineering Drawing by V.B.Sikka. Katson Publishing, Ludhiana
3. Civil Engineering Drawing by NS Kumar; IPH, New Delhi
4. Principles of Building Drawing by MG Shah and CM Kale, MacMillan, Delhi
5. Building Construction by Moorthy NRK
6. Civil Engg Drawing by Layal
7. Zaidi, SKA and Siddiqui, Suhail; Drawing and Design of Residential and Commercial Buildings, Standard Publishers and Distributors, Delhi.
8. SP : 20
9. National Building Code

RAIPUR

# Semester-IV



DICE401

**CONCRETE TECHNOLOGY**

**RATIONALE**

Diploma holders in Civil Engineering are supposed to supervise concreting operations involving proportioning, mixing, transporting, placing, compacting, finishing and curing of concrete. To perform above functions, it is essential to impart knowledge and skills regarding ingredients of concrete and their properties; properties of concrete in plastic and hardened stage, water cement ratio and workability; proportioning for ordinary concrete; concreting operations and joints in concrete.

## **DETAILED CONTENTS**

### **THEORY**

#### **Unit: I**

**Introduction: Definition of concrete, uses of concrete in comparison to other building materials.**

#### **Ingredients of Concrete:**

- Cement: physical properties of cement; different types of cement as per IS Codes
- Aggregates:
  - Classification of aggregates according to size and shape
  - Characteristics of aggregates: Particle size and shape, surface texture, specific gravity of aggregate; bulk density, water absorption, surface moisture, bulking of sand, deleterious materials, soundness
  - Grading of aggregates: coarse aggregate, fine aggregate; All-in-aggregate;
  - fineness modulus; interpretation of grading charts
- Water: Quality requirements as per IS:456-2000

#### **Water Cement Ratio:**

- Hydration of cement, principle of water-cement ratio, Duff Abram's Water-cement ratio law: Limitations of water-cement ratio law and its effects on strength of concrete

#### **Unit: II**

#### **Workability:**

- Workability factors affecting workability, Measurement of workability: slump test, compacting factor and Vee Bee consistometer; Recommended slumps for placement in various conditions as per IS:456-2000/SP-23

#### **Properties of Concrete:**

- Properties in plastic state: Workability, Segregation, Bleeding and Harshness
- Properties in hardened state: Strength, Durability, Impermeability, Dimensional changes;

#### **Proportioning for Normal Concrete:**

- Objectives of mix design, introduction to various grades as per IS:456-2000; proportioning for nominal mix design as prescribed by IS 456-2000
- Adjustment on site for: Bulking of fine aggregate, water absorption of aggregate, workability
- Difference between nominal and controlled concrete
- Introduction to IS-10262-2009-Code for controlled mix design

#### **Unit: III**

**Introduction to Admixtures (chemicals and minerals) for improving performance**



## of concrete

### Special Concretes (only features)

- Concreting under special conditions, difficulties and precautions before, during and after concreting
- Cold weather concreting
- Under water concreting
- Hot weather concreting
- Ready mix concrete
- Fibre reinforced concrete
- Polymer Concrete
- Fly ash concrete
- Silica fume concrete

### Concreting Operations:

- Storing of Cement:
- Storing of cement in a warehouse
- Storing of cement at site
- Effect of storage on strength of cement
- Determination of warehouse capacity for storage of Cement
- Storing of Aggregate: Storing of aggregate at site
- Batching (to be shown during site visit )
- Batching of Cement
- Batching of aggregate by:
- Volume, using gauge box (farma) selection of proper gauge box
- Weight spring balances and batching machines
- Measurement of water
- Mixing:
- Hand mixing
- Machine mixing - types of mixers, capacities of mixers, choosing appropriate size of mixers, operation of mixers
- Maintenance and care of machines
- Transportation of concrete: Transportation of concrete using: wheel barrows, transit mixers, chutes, belt conveyors, pumps, tower crane and hoists etc.
- Placement of concrete:  
Checking of form work, shuttering and precautions to be taken during placement
- Compaction:

### Unit: IV

#### Hand compaction

- Machine compaction - types of vibrators, internal screed vibrators and form vibrators
- Selection of suitable vibrators for different situations
- Finishing concrete slabs - screeding, floating and trowelling
- Curing:

## Unit: V

- Objectives of curing, methods of curing like ponding, membrane curing, steam curing, chemical curing
- Duration for curing and removal of form work
- Jointing: Location of construction joints, treatment of construction joints, expansion joints in buildings - their importance and location
- Defects in concrete: Identification of and methods of repair
- Importance and methods of non-destructive tests (introduction only) (01 hr)

NOTE: \*\* A field visit may be planned to explain and show the relevant things

### Practical Exercises:

- To determine the physical properties of cement as per IS Codes
- To determine flakiness and elongation index of coarse aggregates
- To determine silt in fine aggregate
- Determination of specific gravity and water absorption of aggregates
- Determination of bulk density and voids of aggregates
- To determine surface moisture in fine aggregate by displacement method
- Determination of particle size distribution of fine, coarse and all in aggregate by sieve analysis (grading of aggregate)
- To determine necessary adjustment for bulking of fine aggregate
- To determine workability by slump test:
- To verify the effect of water, fine aggregate/coarse aggregate ratio and aggregate/Cement ratio on slump
- Compaction factor test for workability
- Non destructive test on concrete by:
  - Rebound Hammer Test
  - Ultrasonic Pulse Velocity Test
- Tests for compressive strength of concrete cubes for different grades of concrete

### Reference Books:

- Kulkarni, PD; Ghosh, RK and Phull, YR; "Text Book of Concrete Technology"; Oxford and IBH Publishing Co. New Delhi
- Krishnamurthy, KT; Rao, A Kasundra and Khandekar, AA; "Concrete Technology"; Dhanpat Rai and Sons, Delhi,
- Gupta BL and Gupta Amit; "Text Book of Concrete Technology"; Standard Publishers Distributors, Delhi.
- Varshney, RS;"Concrete Technology";, Oxford and IBH Publishing, New Delhi
- Neville, AM; "Properties of Concrete", Pitman (ELBS Edition available), London
- Orchard; "Concrete Technology"; Vol I, II, and III
- Handoo, BL; Puri, LD and Mahajan Sanjay "Concrete Technology"; Satya Prakashan, New Delhi,
- Sood, Hemant, Mittal LN and Kulkarni PD; "Laboratory Manual on Concrete Technology", CBS Publishers, New Delhi, 2002
- Vazirani, VN; and Chandola, SP; "Concrete Technology"; Khanna Publishers, Delhi,
- Gambhir, ML; "Concrete Technology";, MacMillan India Ltd., New Delhi
- Siddique, R., "Special Structural Concretes", , Galgotia Publishers Pvt. Ltd. Delhi

- xii) Birinder Singh, “Concrete Technology”, Kaption Publications, Ludhiana,
- (xiii) Module on ‘Special Concretes by Dr Hemant Sood , NITTTR Chandigarh
- (xiv) Concrete Technology by P Dayaratman
- (xv) Video programme on different experiments in ‘Concrete Technology’ developed by NITTTR, Chandigarh.



DICE402

## **WATER SUPPLY AND WASTE WATER ENGINEERING**

**RATIONALE**

One of the basic necessities of life is water which is not easily available to a lot of people. Providing potable water at the first place then collection and disposal of waste solids and liquids are important activities of civil engineering field. This subject provides basic knowledge and skills in the field of water supply system and waste disposal system. Classroom instructions should be supplemented by field visits to show functional details of water supply and waste disposal systems. It will also be advantageous to invite professionals from field to deliver extension lectures on specialised operations.

## **DETAILED CONTENTS**

### **Unit: I**

#### **WATER SUPPLY**

##### **Introduction**

- Necessity and brief description of water supply system.

##### **Quantity of Water**

- Water requirement
- Rate of demand and variation in rate of demand
- Per capita consumption for domestic, industrial, public and fire fighting uses as per BIS standards (no numerical problems)
- Population Forecasting

##### **Quality of Water**

- Meaning of pure water and methods of analysis of water
- Physical, Chemical and bacteriological tests and their significance
- Standard of potable water as per Indian Standard
- Maintenance of purity of water (small scale and large scale quantity)

##### **Water Treatment (brief introduction)**

- Sedimentation - purpose, types of sedimentation tanks
- Coagulation flocculation - usual coagulation and their feeding
- Filtration - significance, types of filters, their suitability
- Necessity of disinfection of water, forms of chlorination, break point chlorine, residual chlorine, application of chlorine.
- Flow diagram of different treatment units, functions of (i) Aeration fountain (ii) mixer (iii) flocculator, (iv) classifier, (v) slow and rapid sand filters (vi) chlorination chamber.

### **Unit: II**

#### **Conveyance of Water**

- Different types of pipes - cast iron, PVC, steel, asbestos cement, concrete and lead pipes. Their suitability and uses, types of joints in different types of pipes.
- Appurtenances: Sluice, air, reflux valves, relief valves, scour valves, bib cocks, stop cocks, fire hydrants, water meters their working and uses
- Distribution site: Requirement of distribution, minimum head and rate, methods of layout of distribution pipes
- Systems of water supply - Intermittent and continuous service reservoirs - types, necessity and accessories.
- Wastage of water - preventive measures

- Maintenance of distribution system
- Leakage detection

### **Laying out Pipes**

- Setting out alignment of pipes
- Excavation for laying of pipes and precautions to be taken in laying pipes in black cotton soil.
- Handling, lowering beginning and jointing of pipes
- Testing of pipe lines
- Back filling
- Use of boring rods

### **Building Water Supply**

- Connections to water main (practical aspect only)
- Water supply fixtures and installations and terminology related to plumbing

## **Unit: III**

### **WASTE WATER ENGINEERING**

#### **Introduction**

- Purpose of sanitation
- Necessity of systematic collection and disposal of waste
- Definition of terms in sanitary engineering
- Collection and conveyance of sewage
- Conservancy and water carriage systems, their advantages and Disadvantages
- Surface drains (only sketches) : various types, suitability
- Types of sewage: Domestic, industrial, storm water and its seasonal variation

#### **Sewerage System**

- Types of sewerage systems, materials for sewers, their sizes and joints
- Appurtenance: Location, function and construction features. Manholes, drop manholes, tank hole, catch basin, inverted siphon, flushing tanks grease and oil traps, storm regulators, ventilating shafts

#### **Laying and Construction of Sewers:**

- Setting out/alignment of sewers
- Excavations, checking the gradient with boning rods preparation of bedding, handling and jointing testing and back filling of sewers/pipes.
- Construction of surface mains and different sections required

## **Unit: IV**

### **Sewage characteristics:**

- Properties of sewage and IS standards for analysis of sewage
- Physical, chemical and bacteriological parameters
- Natural Methods of Sewerage Disposal (5 hrs)

- General composition of sewage and disposal methods
- Disposal by dilution
- Self purification of stream
- Disposal by land treatment
- Nuisance due to disposal
- Sewage Treatment (9 hrs)
- Meaning and principle of primary and secondary treatment and activated sludge process their flow diagrams
- Introduction and uses of screens, grit chambers, detritus tanks, skimming tanks, plain sedimentation tanks, primary clarifiers, secondary clarifiers, filters, control beds, intermittent sand filters, trickling filters, sludge treatment and disposal, oxidation ponds (Visit to a sewage treatment plant)

### **Building Drainage**

- Aims of building drainage and its requirements
  - Different sanitary fittings and installations
  - Traps, seals, causes of breaking seals
- A field visit may be planned to explain and show the relevant things.

### **List of Practical's**

- 1) To determine turbidity of water sample
- 2) To determine dissolved oxygen of given sample
- 3) To determine pH value of water
- 4) To perform jar test for coagulation
- 5) To determine BOD of given sample
- 6) To determine residual chlorine in water
- 7) To determine conductivity of water and total dissolved solids
- 8) To study the installation of following:
  - a) Water meter
  - b) Connection of water supply of building with main
  - c) Pipe valves and bends
  - d) Water supply and sanitary fittings

### **Unit: V**

**To study and demonstrate the joining/threading of GI Pipes, CI Pipes, SW pipes, D.I. pipes and PVC pipes.**

**To demonstrate the laying of SW pipes for sewers**

**Study of water purifying process by visiting a field lab.**

**To test house drainage**

### **Reference Books:**

1. Duggal, KN; "Elements of Public Health Engineering"; S. Chand and Co. New

Delhi

2. Rangwala, SC; “Water Supply and Sanitary Engineering”; Anand Charotar Book Stall
3. Kshirsagar, SR; “Water Supply Engineering”; Roorkee Publishing House, Roorkee
4. Kshirsagar, SR; “Sewage and Sewage Treatment”; Roorkee, Roorkee Publishing House
5. Hussain, SK; “Text Book of Water Supply and Sanitary Engineering”; Oxford and IBH Publishing Co, New Delhi,
6. Birdie, GS; “Water Supply and Sanitary Engineering”; Dhanpat Rai and Sons, Delhi
7. Garg, Santosh Kumar; “Water Supply Engineering”; Khanna Publishers, Delhi
8. Garg, Santosh Kumar; “Sewage and Waste Water Disposal Engineering”; Khanna Publishers, Delhi
9. Steel, EW; “Water Supply and Sewerage”; McGraw Hill.
- 10 Duggal, Ajay K and Sharma, Sanjay, “A Laboratory Manual in Public Health Engineering” , Galgotra Publications, 2006, New Delhi
- 11 Gurjar,B.R. “ Sludge Treatment & Disposal” Oxford and IBH Co Pvt Ltd New Delhi.
12. Mahajan Sanjay, Water Supply and Waste Water Engineering, Satya Prakashan Ltd., Delhi.

DICE403

## **IRRIGATION ENGINEERING**

**RATIONALE**

Diploma holders in civil engineering have to supervise the construction, repair and maintenance of canals, head works, river training works, cross drainage works, regulatory and other works. Some of diploma holders are also engaged for preventing water logging and irrigation by tubewells. This subject imparts knowledge regarding hydrology, flow irrigation – storage and distribution system, constructional features of head works, river training works, cross drainage works, causes and prevention of water logging and construction of tube wells.

## **DETAILED CONTENTS**

### **Unit: I**

#### **Introduction:**

- Definition of irrigation
- Necessity of irrigation
- History of development of irrigation in India
- Major, medium and minor irrigation projects

#### **Water Requirement of Crops**

- Principal crops in India and their water requirements
- Crop seasons – Kharif and Rabi
- Soil water, soil crop and water relationships, duty, delta and base period, their relationship
- Gross commanded area (GCA), culturable commanded area (CCA), intensity of irrigation, irrigable area

#### **Hydrological Cycle Catchment Area and Run-off (06 hrs)**

Rainfall, definition rain-gauges – automatic and non-automatic, methods of estimating average rainfall (Arithmetic system); catchment area runoff, factors affecting runoff, hydrograph, basic concept of unit hydrograph.

### **Unit: II**

#### **Methods of Irrigation**

- Flow irrigation - its advantages and limitations
- Lift Irrigation – Tube well and open well irrigation, their advantages and disadvantages
- Sprinkler irrigation conditions favourable and essential requirements for sprinkler irrigation, sprinkler system – classification and component parts
- Drip irrigation, suitability of drip irrigation, layout, component parts, advantages

#### **Canals**

- Classification, apurtenances of a canal and their functions, sketches of different canal cross-sections (unlined)
- Various types of canal lining - their related advantages and disadvantages, sketches of different lined canal x-sections
- Breaches and their control
- Maintenance of lined and unlined canals

### **Unit: III**



### **Tube Well Irrigation**

- Introduction, occurrence of ground water, location and command, advantages and disadvantages, comparison with canal irrigation
- Tube wells, explanation of terms: water table, radius of influence, depression head, cone of depression, confined and unconfined aquifers. Yield of a well and methods of determining yield of well
- Types of tube wells, cavity, strainer and slotted type;
- Method of boring, installation of well assembly, development of well, pump selection and installation and maintenance
- Water Harvesting Techniques: Need and requirement of various methods, Run-off from roof top and ground surface, construction of recharge pits and recharge wells and their maintenance.

### **Dams**

- Classification of dams; earthen dams - types, causes of failure; crosssection of zoned earthen dams, method of construction, gravity dams – types, cross-sections of a dam, method of construction
- Concept of small and micro dams
- Concept of spillways and energy dissipators

### **Unit: IV**

#### **Canal Head Works and Regulatory Works**

Definition, object, general layout, functions of different parts of head works.  
Difference between weir and barrage

#### **Cross Drainage Works**

- Functions and necessity of the following types: aqueduct, super passage, level crossing, inlet and outlet, pipe crossing
- Sketches of the above cross drainage works

#### **Definitions of following Hydraulic Structures with Sketches**

- Falls
- Cross and head regulators
- Outlets
- Canal Escapes

### **Unit: V**

#### **River Training Works**

Methods of river training, guide banks, retired (levees) embankments, groynes and spurs, pitched island, cut-off

#### **Water Logging and Drainage and Ground Water Re-charge**

- Definition of water logging – its causes and effects, detection, prevention and remedies
- Reclamation of soil
- Surface and sub-surface drains and their layout
- Concept and various techniques used for ground water re-charge

**Reference Books:**

1. Bharat Singh, 'Fundamentals of Irrigation Engineering', , Nem Chand and Bros, Roorkee
2. Garg, Santosh Kumar, 'Irrigation Engineering and Hydraulics Structures', Khanna Publishers, Delhi,
3. Punmia, BC; and Pande Brij Bansi Lal, 'Irrigation and Water Power Engineering', Delhi, Standard Publishers Distributors, Delhi,
4. Sharma, RK; 'Text Book of Irrigation Engineering and Hydraulics Structures', , Oxford and IBH Publishing Company, New Delhi
5. Sharma, SK; 'Principles and Practice of Irrigation Engineering', Prentice Hall of India Pvt. Ltd., New Delhi,
6. Varshney RS, Gupta SC, Gupta RL at all. "Theory and Design of Irrigation Structures", Vol. I and II,
7. Saharsabudhe SR, "Irrigation Engineering and Hydraulic Structures"
8. Priyani BB, 'The Fundamental Principles of Irrigation and Water Power
9. BIS Codes
10. Wan. E. Houk, "Irrigation Engineering" Vol. I and II
11. Central Ground Water Board and Central Water Commission Guidelines and Reference Books.

DICE404

**SURVEYING – II**

**RATIONALE**

The important functions of a civil engineer includes the jobs of detailed surveying, plotting of survey data, preparation of survey maps and setting out works  
While framing the curriculum for the subject of surveying, stress has been given to the development of knowledge and skill in theodolite surveying, tachometry surveying, curves and use of minor and modern instruments have been included in this subject. Field work should be a selected one so that student can check his work and have an idea of the results the extent of error in the work done by him. As far as possible, the surveys done should be got plotted, as this will also reveal errors in the work and develop skill in plotting.

## **DETAILED CONTENTS**

### **Unit: I**

#### **Contouring:**

Concept of contours, purpose of contouring, contour interval and horizontal equivalent, factors effecting contour interval, characteristics of contours, methods of contouring: Direct and indirect, use of stadia measurements in contour survey, interpolation of contours; use of contour map, Drawing cross section from a contour map; marking alignment of a road, railway and a canal on a contour map, computation of earth work and reservoir capacity from a contour map

### **Unit: II**

#### **Theodolite Surveying:**

Working of a transit vernier theodolite, axes of a theodolite and their relation; temporary adjustments of a transit theodolite; concept of transiting, swinging, face left, face right and changing face; measurement of horizontal and vertical angles. Prolonging a line (forward and backward) measurement of bearing of a line; traversing by included angles and deflection angle method; traversing by stadia measurement, theodolite triangulation, plotting a traverse; concept of coordinate and solution of omitted measurements (one side affected), errors in theodolite survey and precautions taken to minimize them; limits of precision in theodolite traversing. Height of objects – accessible and non-accessible bases

### **Unit: III**

#### **Tacho-metric surveying**

Tachometry, Instruments to be used in tachometry, methods of tachometry, stadia system of tachometry, general principles of stadia tachometry, examples of stadia tachometry and Numerical problems.

### **Unit: IV**

#### **Curves:**

- Simple Circular Curve:  
Need and definition of a simple circular curve; Elements of simple circular curve - Degree of the curve, radius of the curve, tangent length, point of

intersection (Apex point), tangent point, length of curve, long chord deflection angle, Apex distance and Mid-ordinate. Setting out of simple circular curve:

a) By linear measurements only:

Offsets from the tangent

Successive bisection of arcs

Offsets from the chord produced

b) By tangential angles using a theodolite

- Transition Curve:

Need (centrifugal force and super elevation) and definition of transition curve; requirements of transition curve; length of transition curve for roads; by cubic parabola; calculation of offsets for a transition curve; setting out of a transition curve by tangential offsets only

- Vertical curve

Setting out of a vertical curve

### **Unit: V**

#### **Introduction to the use of Modern Surveying equipment and techniques such as:**

a) EDM or Distomat

b) Planimeter

c) Total station

d) Introduction to remote sensing, GIS and GPS

#### **Minor Instruments:-**

- Introduction and use of minor instruments like Ceylon Ghat Tracer, Clinometer, Pantagraph, Abney Level etc.
- Use of planimeter for computing areas

**NOTE:** No sketch of the instruments may be asked in the examination

### **PRACTICAL EXERCISES**

#### **I. Contouring:**

i) Preparing a contour plan by radial line method by the use of a Tangent Clinometer/Tachometer

ii) Preparing a contour plan by method of squares

iii) Preparing a contour plan of a Road/Railway track/Canal by taking cross sections.

#### **II. Theodolite:**

i) Taking out the Theodolite, mounting on the tripod and placing it back in the box

ii) Study of a transit vernier theodolite; temporary adjustments of theodolite

iii) Reading the vernier and working out the least count, measurement of horizontal angles by repetition and reiteration methods

iv) Measurement of vertical angles and use of tachometric tables

v) Measurement of magnetic bearing of a line

vi) Running a closed traverse with a theodolite (at least five sides) and its plotting

vii) Height of objects with and without accessible bases

#### **III. Curves**

i) Setting out of a simple circular curve with given data by the following methods

- a) Offsets from the chords produced
  - b) One theodolite method
- IV Minor instruments:
- i) Demonstration and use of minor instruments like Ceylon Ghat Tracer, Tangent Clinometer, Pantagraph, Abney level etc.
  - ii) Use of planimeter for computing areas
- V Demonstration of digital instruments through field visits to Survey of India and other government agencies.
- VI Total Station (only demonstrations).

**Reference Books:**

1. Hussain, SK and Nagraj, MS "Text Book of Surveying";, S Chand and Co Ltd., New Delhi
2. Deshpande, RS "A Text Book Surveying and Levelling"; United Book Corporation, Pune,
3. Kocher, CL; "A Text Book of Surveying"; Katson Publishing House Ludhiana,
4. Kanetkar, TP and Kulkarni, SV., "Surveying and Leveling", Poona, AVG Parkashan, Pune
5. Kanetkar, TP; and Kulkarni, SV; "Surveying and Leveling-Vol.2" AVG Prakashan, Pune
6. Punima, BC; "Surveying and Leveling ", Standard Publishers Distributors, Delhi
7. Shahai, PB; "A Text Book of Surveying ", Oxford and IBH Publishing Co.
8. Lilly Sant "Remote Sensing and Image Interpretation"
9. Mahajan, Sanjay, "Surveying-II", Satya Prakashan, Delhi

R A I P U R

DICE405

**RCC DESIGN**

**RATIONALE**

This subject is an applied engineering subject. Diploma holders in Civil Engineering will

be required to supervise RC Construction and fabrication. He may also be required to design simple structural elements, make changes in design depending upon availability of materials (bars of different diameters). This subject thus deals with elementary design principles as per IS:456-2000

## **DETAILED CONTENTS**

### **Unit: I**

#### **Introduction**

- Concept of Reinforced Cement Concrete (RCC)
- Reinforcement Materials:  
Suitability of steel as reinforcing material  
Properties of mild steel and HYSD steel
- Loading on structures as per IS: 875

#### **Introduction to following methods of RCC design**

- Working stress method
- Limit state method

### **Unit: II**

#### **Shear and Development Length**

- Shear as per IS:456-2000 by working stress method

- i) Shear strength of concrete without shear reinforcement
- ii) Maximum shear stress
- iii) Shear reinforcement

#### **Singly Reinforced Beam (Working stress method)**

- Basic assumptions and stress strain curve, neutral axis, balanced, underreinforcement and over reinforced beams, Moment of resistance for singly reinforced beam.
- Design of singly reinforced beam including sketches showing reinforcement details.

### **Unit: III**

#### **Concept of Limit State Method**

- Definitions and assumptions made in limit state of collapse (flexure)
- Partial factor of safety for materials
- Partial factor of safety for loads
- Design loads
- Stress block, parameters

#### **Singly Reinforced beam**

- Theory and design of singly reinforced beam by Limit State Method

#### **Doubly Reinforced Beams**

Theory and design of simply supported doubly reinforced rectangular beam by Limit State Method

#### **8. Behaviour of T beam, inverted T beam, isolated T beam and 'L' beams (No Numericals)**

## **Unit: IV**

### **One Way Slab**

Theory and design of simply supported one way slab including sketches showing reinforcement details (plan and section) by Limit State Method..

### **Two Way Slab**

Theory and design of two-way simply supported slab with corners free to lift, no provisions for torsional reinforcement by Limit State Method including sketches showing reinforcement details (plan and two sections)

### **11. Axially Loaded Column**

- Definition and classification of columns
- . Effective length of column,
- . Specifications for longitudinal and lateral reinforcement
- Design of axially loaded square, rectangular and circular short columns by Limit State Method including sketching of reinforcement(sectional elevation and plan)

## **Unit: V**

### **Prestressed Concrete**

- Concept of pre-stressed concrete
- . Methods of pre-stressing : pre-tensioning and post tensioning
- Advantages and disadvantages of prestressing
- Losses in pre-stress

### **Important Note:**

**Use of BIS:456-2000 is permitted in the examination.**

### **Reference Books:**

1. Punmia, BC; "Reinforced Concrete Structure Vol I", Standard Publishers, Delhi
2. Ramamurtham, S; "Design and Testing of Reinforced Structures", Dhanpat Rai and Sons, Delhi
3. Gambhir, M.L., "Reinforced Concrete Design", Macmillan India Limited
4. Singh, Birinder "RCC Design and Drawing", Kaption Publishing House, New Delhi
5. Singh Harbhajan "Design of Reinforced Concrete Structure Design" Abhishek Publishers Ltd., Chandigarh
6. Mallick, SK; and Gupta, AP; "Reinforced Concrete", Oxford and IBH Publishing Co, New Delhi.
7. Singh Harbhajan, Limit Stat of RCC Design"; Abhishek Publishers Ltd.

DICE406

## **HIGHWAY ENGINEERING**

### **RATIONALE**

Construction of roads is one of the area in which diploma holders in Civil Engineering get employment. These diploma holders are responsible for construction and maintenance of highways. Basic concepts of road geo-metrics, surveys and plans, elements of traffic engineering, road materials, construction of rigid and flexible pavements, special features of hill roads, road drainage system and various aspects of maintenance find place in above course

## **DETAILED CONTENTS**

### **THEORY**

#### **Unit: I**

##### 1. Introduction

- Importance of Highway transportation;
- Functions of IRC, CRRI, MOST&H
- IRC classification of roads
- Organization of a state highway department

##### 2. Road Geometrics

- Glossary of terms used in geo-metrics and their importance: Right of way, formation width, road margin, road shoulder, carriage way, side slopes, kerbs, formation levels, camber and gradient
- Design and average running speed, stopping and passing sight distance
- Curve necessity, horizontal and vertical curves including transition curves and super elevation. Methods of providing super elevation
- Sketch of typical cross-sections in cutting and filling on straight alignment and at a curve

**(Note: No design/numerical problem to be taken)**

##### 3. Highway Surveys and Plan

- Designation of a topographic map, reading the data given on a topographic map
  - Basic considerations governing alignment for a road in plain and hilly area
  - Highway location; marking of alignment; importance of various stages viz
- a) Reconnaissance survey: Conduct reconnaissance and prepare reconnaissance report
  - b) Preliminary survey: Object, organizing, conducting and information to be collected
  - c) Location survey
  - d) Standards for preparing the highway plans as per Ministry of Surface Transport (MOST)

#### **Unit: II**

##### 4. Road Materials

- Different types of road materials in use; soil, aggregate, binders
- Function of soil as highway subgrade



- California Bearing Ratio; method of finding CBR value and its significance
- Testing aggregates: Los Angeles Abrasion test, impact test, crushing strength test, water absorption test and soundness test
- Aggregates: Availability of road aggregates in India, requirements of road aggregates as per IRC specifications
- Binders: Common binders; cement, bitumen and tar, properties as per IS specifications, penetration and viscosity test of bitumen, procedures and significance, cut back and emulsion and their uses, Bitumen modifiers

## 5. Road Pavements

- Road pavement: Flexible and rigid pavement, their merits and demerits, typical cross-sections, functions of various components
- Sub-grade preparation: Setting out alignment of road, setting out bench marks, control pegs for embankment and cutting, borrow pits, making profiles of embankment, construction of embankment, compaction, stabilization, preparation of subgrade, methods of checking camber, gradient and alignment as per recommendations of IRC, equipment used for subgrade preparation
- Flexible pavements: sub base necessity and purpose, stabilized sub base; purpose of stabilization. Types of stabilization:
  - a) Mechanical stabilization
  - b) Lime stabilization
  - c) Cement stabilization
  - d) Fly ash stabilization
    - Base Course:

### Unit: III

Preparation of base course: Prime coat, Tack coat

- (a) Water bound macadam
- (b) Wet mix macadam
- (c) Bituminous macadam
 

Methods of construction as per Ministry of Surface Transport (MOST)

  - Surfacing:
    - a) surface dressing
    - b) open graded premix carpet
    - c) semi dense bituminous concrete
    - d) mix seal surfacing
    - e) seal coat
  - f) bituminous Penetration Macadam
 

Methods of constructions as per Ministry of Surface, Transport, specifications and quality control; equipment used for above.

    - Rigid Pavements:
 

Construction of concrete roads as per IRC specifications: Form laying, mixing and placing the concrete, compacting and finishing, curing, joints in concrete pavement, equipment used

## 6. Hill Roads:

- Introduction: Typical cross-sections showing all details of a typical hill road in cut, partly in cutting and partly in filling
- Special problems of hill areas
- Landslides: Causes, prevention and control measures
- Drainage
- Soil erosion
- Snow: Snow clearance, snow avalanches, frost
- Maintenance of plant and machinery

#### **Unit: IV**

##### **7. Road Drainage:**

- Necessity of road drainage work, cross drainage works
- Surface and subsurface drains and storm water drains. Location, spacing and typical details of side drains, side ditches for surface drainage. Intercepting drains, pipe drains in hill roads, details of drains in cutting embankment, typical cross sections

##### **8. Road Maintenance:**

- Common types of road failures of flexible pavements: Pot hole, cracks, rutting, corrugation, fatty surface upheaval - their causes and remedies
- Maintenance of bituminous road such as seal-coat, patch-work and resurfacing.
- Maintenance of concrete roads-filling cracks, repairing joints, maintenance of shoulders (berms), maintenance of traffic control devices

#### **Unit: V**

##### **9. Construction Equipment:**

Output and use of the following plant and equipment

- Hot mix plant
- Tipper, tractors (wheel and crawler) scraper, bulldozer, dumpers, shovels, grader, roller, dragline
- Asphalt mixer and tar boilers
- Road pavers

#### **Practical Exercises**

- Determination of the california bearing ratio (CBR) for the sub-grade soil (demonstration only)
- Determination of penetration value of bitumen
- Determination of softening point of bitumen
- Determination of impact value and crushing value of the road aggregate
- Determination of abrasion value (Los Angeles') of road aggregate
- Determination of ductility of bitumen
- Determination of viscosity of tar/bitumen

#### **Reference Books:**

- i) Khanna, SK and Justo, CEG, "Highway Engineering" Roorkee Nem Chand and Bros.
- ii) Vaswani, NK, "Highway Engineering" Roorkee, Roorkee Publishing House.
- iii) Priyani, VB, "Highway and Airport Engineering" Anand, Charotar Book Stall
- iv) Sehgal, SB; and Bhanot, KL; "A Text Book on Highway Engineering and Airport" Delhi, S Chand and Co
- v) Bindra, SP; "A Course on Highway Engineering" New Delhi, Dhanpat Rai and Sons
- vi) Sharma, RC; and Sharma, SK; "Principles and Practice of Highway Engineering", New Delhi, Asia Publishing House
- viii) Duggal AK, Puri VP., "Laboratory Manual in Highway Engineering", Delhi, New Age Publishers (P) Ltd
- ix) Rao, GV' Transportation Engineering
- x) Duggal AK, "Maintenance of Highway – a Reader", TTTI, Sector 26, Chandigarh

#### **IRC Publications**

- i) MOST Specifications for Road and Bridge Works Latest Edition
- ii) MOST Pocket book for Highway Engineers, 2001
- iii) MOST Manual for Maintenance of Roads, 1983





# Semester- V

RAIPUR

DICE501

**STEEL STRUCTURES DESIGN**

**RATIONALE**

This subject is an applied engineering subject. Diploma holders in Civil Engineering will be required to supervise steel construction and fabrication. He may also be required to design simple structural elements, make changes in design depending upon availability of materials. This subject thus deals with elementary design principles as per BIS code of practice IS: 800 – 2007

## **DETAILED CONTENTS**

### **THEORY**

#### **Unit: I**

##### **Structural Steel and Sections: (02 hrs)**

- Properties of structural steel as per IS Code
- Designation of structural steel sections as per IS handbook and IS:800 - 2007

##### **Riveted Connections:**

Types of rivets, permissible stresses in rivets, types of riveted joints, specifications for riveted joints as per IS 800. Failure of a riveted joint. Assumptions in the theory of riveted joints. Strength and efficiency of a riveted joint. Design of riveted joints for axially loaded members ( No Staggered riveting).

##### **Bolted and Welded connections:**

- Types of bolts and bolted joints, specifications for bolted joints as per IS: 800 - 2007
- Types of welds and welded joints, advantages and disadvantages of welded joints and bolted joints design of fillet and butt weld. Plug and slot welds (Descriptive No numerical on plug and slot welds)

#### **Unit: II**

##### **Tension Members**

Analysis and design of single and double angle section tension members and their rivetted and welded connections with gusset plate as per IS:800

##### **Compression Members**

Analysis and design of single and double angle sections compression members (struts) and their welded connections with gusset plate as per IS:800

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#### **Unit: III**

##### **Roof Trusses**

Form of trusses, pitch of roof truss, spacing of trusses, spacing of purlins, connection between purlin and roof covering. Connection between purlin and principal rafter (no design, only concept)

##### **Columns:**

- Concept of buckling of columns, effective length and slenderness ratio, permissible stresses in compression as per IS:800 for different end conditions. Analysis and Design of axially loaded single section steel column

- Types of column bases (Descriptive only)
- Beam and column, frame and seated connections (descriptive only, no design)

#### **Unit: IV**

##### **Beams**

Analysis and design of single section simply supported laterally restrained steel beams. Introduction to plate girder and functions of various elements of a plate girder

#### **Fabrication and Erection of Steel Structures like trusses, columns and girders**

#### **Masonry structures – Design of brick column and wall foundations**

##### **Important Note:**

Use of IS: 800 – 2007 and Steel Tables are permitted in examination.

#### **Unit: V**

##### **INSTRUCTIONAL STRATEGY**

Teachers are expected to give simple problems for designing various steel structural members. For creating comprehension of the subject, teachers may prepare tutorial sheets, which may be given to the students for solving. It would be advantageous if students are taken at construction site to show fabrication and erection of steel structures. IS:800 may be referred along with code for relevant clauses

##### **List of Practicals**

1. Preparation of a working drawing (elevation, plan, details of joints as ridge, eaves and other connections) for a riveted steel roof truss resting on a masonry wall with the given span, shape of the truss and the design data regarding the size of the members and the connections. Also calculate the quantity of steel for the truss.
2. Steel connections (a,b,c,d) rivetted and (e) welded all unstiffened
  - Beam to beam connections (Seated and framed)
  - Beam to column (Seated and framed)
  - Column base connections (Slab base, grillage base and gusseted base)
  - Details of column splices
  - Connections of a steel bracket with flange of a column
3. Detailed drawing showing plan and elevation for a riveted plate girder with the given design data regarding the sizes of its parts, with details at the supports and connections of stiffeners, flange angles and cover plates with the web

##### **Reference Books:**

1. Duggal SK, "Design of Steel Structures" by Standard Publishers, Delhi
2. Birinder Singh, "Steel Structures Design and Drawing", Kaption Publishing House, Ludhiana
3. Ram Chandra, "Design of Steel Structures", Standard Publishers, Delhi
4. LS Negi, "Design of Steel Structure" Tata McGraw Hill, New Delhi

5. S Ramamurthan, “Design of Steel Structures”;
6. Harbhajan Singh, “Design of Steel Structures”, Abhishek Publishing, Chandigarh
7. IS Code : 800-2007
8. Design of Steel Structures by N. Subramanian; Oxford University Press.
9. Design of Steel Structures by Limit State Method by S S Bharikatti; I K International Publishing House Pvt.
10. Design of Steel Structures by K S Sai Ram, Pearson Education
11. Limit State Design of Steel Structures by Karuna Roy Ghosh, PHI, New Delhi.



DICE502

## **COMPUTER APPLICATIONS IN CIVIL ENGINEERING**

**RATIONALE**

Computer applications plays a very vital role in present day life and more so, in the professional life of diploma engineer. In order to enable the students use the computers effectively in problem solving, this course offers applications of various computer softwares in civil engineering.

## **DETAILED CONTENTS**

### **Practical Exercises**

**Introduction and use of AutoCAD for making 2D Drawings and develop plan, section and elevation of 2 rooms building..**

**Demonstration of various civil engineering softwares like STAAD-Pro, MS Project or Primavera Project Planner, Auto Civil, MX Road or any other equivalent software for above mentioned softwares**

#### **Note:**

- i) The polytechnic may use any other software available with them for performing these exercises
- ii) If the above softwares are not available in the institution, the demonstration of the above said software should be arranged outside the institute.

DICE503

## **SOIL AND FOUNDATION ENGINEERING**

### **RATIONALE**



Civil Engineering diploma engineers are required to supervise the construction of structural buildings, roads, pavements, dams, embankments, and other Civil Engineering structures. As such the knowledge of basic soil engineering is the pre-requisite for these engineers for effective discharge of their duties. This necessitates the introduction of Soil and Foundation Engineering subject in the curriculum for Diploma Course in Civil Engineering. The subject covers only such topics which will enable the diploma engineers to identify and classify the different types of soils, their selection and proper use in the field for various types of engineering structures. The emphasis will be more on teaching practical aspect rather than theory.

## **DETAILED CONTENTS**

### **THEORY**

#### **Unit: I**

##### **Introduction:**

- Importance of soil studies in Civil Engineering
- Geological origin of soils with special reference to soil profiles in India: residual and transported soil, alluvial deposits, lake deposits, local soil found in J&K, dunes and loess, glacial deposits, black cotton soils, conditions in which above deposits are formed and their engineering characteristics.
- Names of organizations dealing with soil engineering work in India, soil map of India

##### **Physical Properties of Soils:**

- Constituents of soil and representation by a phase diagram
- Definitions of void ratio, porosity, water content, degree of saturation, specific gravity, unit weight, bulk density/bulk unit weight, dry unit weight, saturated unit weight and submerged unit weight of soil grains and correlation between them
- Simple numerical problems with the help of phase diagrams

##### **Classification and Identification of Soils**

- Particle size, shape and their effect on engineering properties of soil, particle size classification of soils
- Gradation and its influence on engineering properties
- Relative density and its use in describing cohesionless soils
- Behaviour of cohesive soils with change in water content, Atterberg's limit - definitions, use and practical significance
- Field identification tests for soils
- Soil classification system as per BIS 1498; basis, symbols, major divisions and sub divisions, groups, plasticity chart; procedure for classification of a given soil

#### **Unit: II**

##### **Flow of Water Through Soils:**

- Concept of permeability and its importance
- Darcy's law, coefficient of permeability, seepage velocity and factors

- affecting permeability
- Comparison of permeability of different soils as per BIS
- Measurement of permeability in the laboratory

#### **Effective Stress: (Concept only)**

- Stresses in subsoil
- Definition and meaning of total stress, effective stress and neutral stress
- Principle of effective stress
- Importance of effective stress in engineering problems

#### **Deformation of Soils**

- Meaning, conditions/situations of occurrence with emphasis on practical significance of:
  - a) Consolidation and settlement
  - b) Creep
  - c) Plastic flow
  - d) Heaving
  - e) Lateral movement
  - f) Freeze and thaw of soil
- Definition and practical significance of compression index, coefficient of consolidation, degree of consolidation.
- Meaning of total settlement, uniform settlement and differential settlement; rate of settlement and their effects
- Settlement due to construction operations and lowering of water table
- Tolerable settlement for different structures as per BIS

#### **Unit: III**

##### **Shear Strength Characteristics of Soils:**

- Concept and Significance of shear strength
- Factors contributing to shear strength of cohesive and cohesion less soils, Coulomb's law
- Examples of shear failure in soils

#### **8. Compaction:**

- Definition and necessity of compaction
- Laboratory compaction test (standard and modified proctor test as per BIS) definition and importance of optimum water content, maximum dry density; moisture dry density relationship for typical soils with different compactive efforts
- Compaction control; Density control, measurement of field density by core cutter method and sand replacement method, moisture control, Proctor's needle and its use, thickness control, jobs of an embankment supervisor in relation to compaction

#### **Unit: IV**

##### **Soil Exploration:**

- Purpose and necessity of soil exploration
- Reconnaissance, methods of soil exploration, Trial pits, borings (auger,

- wash, rotary, percussion to be briefly dealt)
- Sampling; undisturbed, disturbed and representative samples; selection of type of sample; thin wall and piston samples; area ratio, recovery ratio of samples and their significance, number and quantity of samples, resetting, sealing and preservation of samples.
  - Presentation of soil investigation results

## **Unit: V**

### **Bearing Capacity of soil**

- Concept of bearing capacity
- Definition and significance of ultimate bearing capacity, net safe bearing capacity and allowable bearing pressure
- Guidelines of BIS (IS 6403) for estimation of bearing capacity of soil
- Factors affecting bearing capacity
- Concept of vertical stress distribution in soils due to foundation loads, pressure bulb
- Applications of SPT, unconfined compression test and direct shear test in estimation of bearing capacity
- Plate load test (no procedure details) and its limitations
- Improvement of bearing capacity by sand drain method, compaction, use of geo-synthetics.

### **Foundation Engineering:**

Concept of shallow and deep foundation; types of shallow foundations: isolated, combined, strip, mat, and their suitability. Factors affecting the depth of shallow foundations, deep foundations, type of piles and their suitability; pile classification on the basis of material, pile group and pile cap.

### **Practical Exercises:**

1. To determine the moisture content of a given sample of soil
2. Auger Boring and Standard Penetration Test
  - a) Identifying the equipment and accessories
  - b) Conducting boring and SPT at a given location
  - c) Collecting soil samples and their identification
  - d) Preparation of boring log and SPT graphs
  - e) Interpretation of test results
3. Extraction of Disturbed and Undisturbed Samples
  - a) Extracting a block sample
  - b) Extracting a tube sample
  - c) Extracting a disturbed samples for mechanical analysis.
  - d) Field identification of samples
4. Field Density Measurement (Sand Replacement and Core Cutter Method)
  - a) Calibration of sand
  - b) Conducting field density test at a given location
  - c) Determination of water content
  - d) Computation and interpretation of results
5. Liquid Limit and Plastic Limit Determination:

- a) Identifying various grooving tools
- b) Preparation of sample
- c) Conducting the test
- d) Observing soil behaviour during tests
- e) Computation, plotting and interpretation of results
- 6. Mechanical Analysis
  - a) Preparation of sample
  - b) Conducting sieve analysis
  - c) Computation of results
  - d) Plotting the grain size distribution curve
  - e) Interpretation of the curve
- 7. Laboratory Compaction Tests (Standard Proctor Test)
  - a) Preparation of sample
  - b) Conducting the test
  - c) Observing soil behaviour during test
  - d) Computation of results and plotting
  - e) Determination of optimum moisture content and maximum dry density
- 8. Demonstration of Unconfined Compression Test
  - a) Specimen preparation
  - b) Conducting the test
  - c) Plotting the graph
  - d) Interpretation of results and finding/bearing capacity
- 9. Demonstration of:
  - a) Direct Shear and Vane Shear Test on sandy soil samples
  - b) Permeability test apparatus

**Reference Books:**

- i) Punmia, BC, "Soil Mechanics
- ii) Bharat Singh and Shamsher Prakash; "Soil Mechanics and Foundations Engineering", Nem Chand and Bros, Roorkee,
- iii) Sehgal, SB, "A Text Book of Soil Mechanics"; CBS Publishers and Distributors, Delhi,
- iv) Gulati, SK and Manoj Dutta, "Geotechnical Engineering ", Tata McGraw Hill, Delhi,
- v) Ranjan Gopal and Rao ASR "Basic and Applied Soil Mechanics", New Age Publication (P) Ltd., New Delhi
- vi) Singh Harbhajan "Soil and Foundation Engineering", Abhishek Publishers, Chandigarh
- vii) S Mittal and JP Shukla, "Soil Testing for Engineers", Khanna Publishers Ltd., Delhi
- viii) BIS Codes IS 6403 (latest edition) and IS 1498 (latest edition)
- ix) Jagroop Singh, "Soil and Foundation Engineering", Eagle Parkashan, Jalandhar
- x) Rabinder Singh, "Soil and Foundation Engg." SK Kataria and Sons, Ludhiana
- xi) NITTTR, Chandigarh, "Shallow Foundations"
- xii) Video films on Geo-technical Laboratory Practices by NITTTR, Chandigarh

DICE504

## Construction Planning and Management

### Unit 1

### **Scope of CPM**

Objectives and functions of project management, project feasibility reports, Planning for construction projects, Cost control in construction-importance, objectives of cost control. Types of Constructions

### **Unit 2**

#### **Scheduling**

Scheduling Job layout and Line of balance, project management through networking PERT, CPM

### **Unit 3**

#### **Safety and Quality Control**

Importance, causes of Accidents safety measures, safety benefits to various parties. Quality control in construction: Importance, Quality Assurance Techniques. Total Quality Management in construction, Introduction, Approaches to total quality, difference between traditional management and TQM, Applications of TQM in construction process, rescue plan in construction.

### **Unit 4**

#### **Economics of Project management**

Economic analysis of engineering projects, economic studies, sensitivity analysis, Introduction to Management Information System (MIS)- definition, outline of MIS.

### **Unit 5**

#### **Construction Equipments and Management**

Classification of construction equipments, earth moving equipments, hauling equipments, hoisting equipments, aggregate and concrete production equipments, pile driving equipments, time and motion studies, waiting line theory, factors affecting selection of construction equipments, equipment maintenance.

**Note-**Practical Syllabus will be based on detailed syllabus

#### **Text Books:**

Construction Engineering and Management – S. Seetharaman (Umesh Publications, New delhi, 1997)  
PERT & CPM – Punmia, B.C. and Khandelwal, K.K. (Laxmi Publications, New Delhi 1997)  
Construction Management and Planning – Sen Gupta & Guha (Tata McGrawHill)

#### **Reference Books:**

Construction Planning Equipment and Methods – Peurify/ Schexnayder, 6th Edition (Tata McGraw Hill)  
PERT & CPM – Sreenath, I.S. (East West Press, New Delhi, 1975)  
Construction Management and Accounts – Vazirani, V.N. & Chandola, S.P. (Khanna Publishers, New Delhi, 2002)  
Construction Planning and Management – Gahlot & Dhir (New Age Publisher)

DICE505

# Entrepreneurship Development & Management

## RATIONALE

Entrepreneurship Development and Management is one of the core competencies of technical human resource. Creating awareness regarding entrepreneurial traits, entrepreneurial support system, opportunity identification, project report preparation and understanding of legal and managerial aspects can be helpful in motivating technical/ vocational stream students to start their own small scale business/enterprise. Based on the broad competencies listed above, following detailed contents are arrived to develop the stated competencies.

## DETAILED CONTENTS

### Unit-I

#### Entrepreneurship

- Concept/Meaning
- Need
- Competencies/qualities of an entrepreneur

#### Entrepreneurial Support System

- District Industry Centres (DICs)
- Commercial Banks
- State Financial Corporations
- Small Industries Service Institutes (SISIs), Small Industries Development Bank of India (SIDBI), National Bank for Agriculture and Rural Development (NABARD), National Small Industries Corporation (NSIC) and other relevant institutions/organizations at State level

### Unit-II

#### Market Survey and Opportunity Identification (Business Planning)

- How to start a small scale industry
- Procedures for registration of small scale industry
- List of items reserved for exclusive manufacture in small scale industry
- Assessment of demand and supply in potential areas of growth
- Understanding business opportunity
- Considerations in product selection
- Data collection for setting up small ventures

### Unit-III

### **Project Report Preparation**

- Preliminary Project Report
- Techno-Economic feasibility report
- Project Viability

### **Managerial Aspects of Small Business**

- Principles of Management (Definition, functions of management viz planning,organisation, coordination and control)
- Operational Aspects of Production
- Inventory Management
- Basic principles of financial management
- Marketing Techniques
- Personnel Management
- Importance of Communication in business

### **Unit-IV**

#### **Legal Aspects of Small Business**

- Elementary knowledge of Income Tax, Sales Tax, Patent Rules, Excise Rules
- Factory Act and Payment of Wages Act

#### **Environmental considerations**

- Concept of ecology and environment
- Factors contributing to Air, Water, Noise pollution
- Air, water and noise pollution standards and control
- Personal Protection Equipment (PPEs) for safety at work places

### **Unit-V**

#### **Motivation**

- Factors determining motivation
- Characteristics of motivation
- Methods of improving motivation
- Incentives – pay, promotion, rewards

#### **Leadership**

- Need for leadership
- Functions of a leader
- Factors to be considered for accomplishing effective leadership

## **REFERENCE BOOKS**

1. A Handbook of Entrepreneurship, Edited by BS Rathore and Dr JS Saini; AapgaPublications, Panchkula (Haryana)
2. Entrepreneurship Development by CB Gupta and P Srinivasan, Sultan Chand and Sons, New Delhi
3. Environmental Engineering and Management by Suresh K Dhamija, SK Kataria and Sons, New Delhi
4. Environmental and Pollution Awareness by Sharma BR, Satya Prakashan, New Delhi
5. Thakur Kailash, Environmental Protection Law and policy in India: Deep and DeepPublications, New Delhi
6. Handbook of Small Scale Industry by PM Bhandari
7. Marketing Management by Philip Kotler, Prentice Hall of India, New Delhi
8. Total Quality Management by Dr DD Sharma, Sultan Chand and Sons, New Delhi.
9. Principles of Management by Philip Kotler TEE Publication

**DICE506**

**Industrial Training**



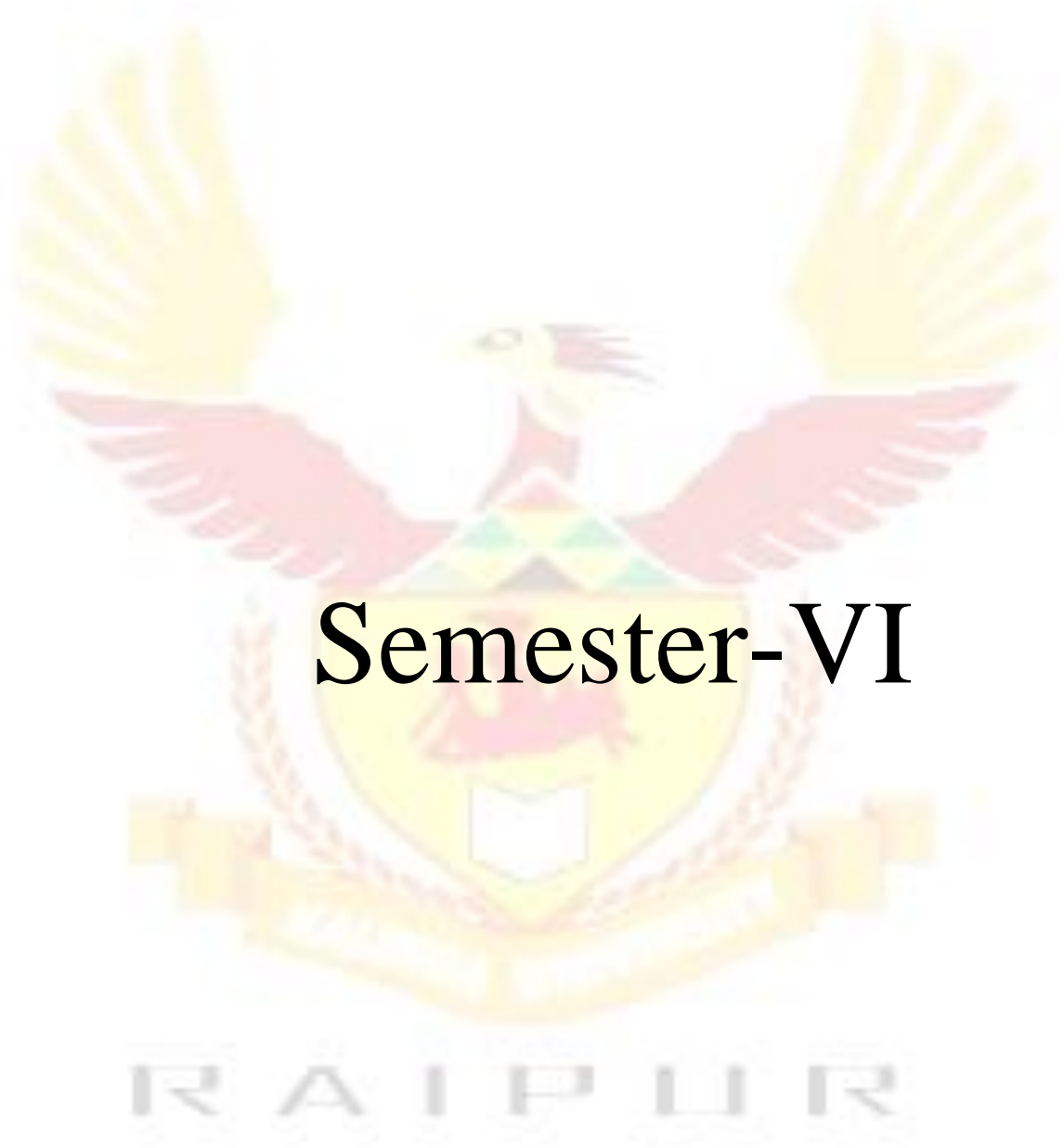
Industrial Training aims at exposing the students to field practices, size and scale of operation and work culture at practical sites. For this purpose, students at the end of fourth semester are required to be sent for a period of 4 weeks to industry. Each student is supposed to study the material and technology used at site and prepares a detailed report of the observation of process seen by him/her. These students should be supervised and guided by respective subject teachers. Each teacher may guide a group of four to five students. The teacher along with field supervisors will conduct performance assessment of students.

The components of evaluation will include the following.

- a) Punctuality and regularity 15%
- b) Initiative in learning new things 15%
- c) Relationship with workers 15%
- d) Industrial training report 55



RAIPUR



# Semester-VI

## **EARTHQUAKE RESISTANT BUILDING CONSTRUCTION**

### **RATIONAL**

Diploma holders in civil engineering have to supervise construction of various earthquake resistant buildings. Therefore, the students should have requisite knowledge regarding terminology of earthquake and the precautions to be taken while constructing earthquake resistant buildings

### **DETAILED CONTENTS**

#### **Unit: I**

##### **Elements of Engineering Seismology**

General features of tectonic of seismic regions. Causes of earthquakes, Seismic waves, earthquake size (magnitude and intensity), Epicentre, Seismograph, Classification of earthquakes, Seismic zoning map of India, Static and Dynamic Loading, Fundamental period.

#### **Unit: II**

##### **Seismic Behaviour of Traditionally-Built Constructions of India**

Performance of building during earthquakes and Mode of failure (Out-of-plane failure, in-plane failure, Diaphragm failure, Connection failure, Non-structural components failure)

**Special construction method, tips and precautions to be observed while planning, designing and construction of earthquake resistant building.**

#### **Unit: III**

##### **Introduction to IS: 4326, IS: 13828, IS: 1893(Part 1), 154326 and IS: 13920 (latest edition)**

Seismic Provision of Strengthening and Retrofitting Measures for Traditionally-Built Constructions, Brick and RCC Structures

**Provision of reinforcement detailing in masonry and RC constructions**

#### **Unit: IV**

**7. Disaster Management: Disaster rescue, psychology of rescue, rescue workers, rescue plan, rescue by steps, rescue equipment, safety in rescue operations, debris clearance and casualty management. (06hrs)**

#### **Unit: V**

##### **INSTRUCTIONAL STRATEGY**

The student may be taken for visit to various building construction sites where precautions related to earthquake resistant construction are being taken so that the students may appreciate the importance of the subject.

#### **Reference Books:**

1. Elements of Earthquake Engineering by Jai Krishana and AR Chandrasekaran; Sarita Parkashan, Meerut.
2. Manual Published by Earthquake Engineering department, IIT Roorkee / IIT Kanpur
3. IS 13920, IS: 13827, IS: 13828, IS 1893, IS 4326 (latest edition)
4. Singh, Harbhajan “ Earthquake Resistant Building Construction” Abhishek Publishers, Chandigarh



# **RAILWAYS, BRIDGES AND TUNNELS**

## **RATIONALE**

The subject will cater to the needs of those technicians who would like to find employment in the construction of railway tracks, bridges and tunnels. The subject aims at providing broad based knowledge regarding various components and construction of railway track, bridges and tunnels

## **DETAILED CONTENTS**

### **Unit: I**

#### **RAILWAY**

1. Introduction - brief history of railways, advantages of railways, Indian railways and its salient features
2. Railway surveys: Factors influencing the railways route, brief description of various types of railway survey
3. Rail Gauge: Definition, types, practice in various countries and India, Uniformity of gauge, unigauge project of Indian Railways
4. Rails - permanent way and its requirements, types of rails, steel for rails, corrugation, corrosion of rails, welding of rails, wear, methods to reduce wear, failure, coning of wheels, hogged rails, buckling, their cause and remedies  
creep:  
definition, causes, effects and remedies

### **Unit: II**

5. Rail Fastenings: Rail joints, types of rail joints, requirements of an ideal fastening,  
fastenings for rails, fish plates, brief idea of spikes, fang bolts, hook bolts, chairs  
and keys; bearing plates
6. Sleepers: Functions of sleepers, types of sleepers, requirements of an ideal material for sleepers. Brief idea of timber and steel sleepers, concrete and prestress  
type sleepers: their salient features and advantages
7. Ballast: Function of ballast, requirements of an ideal material for ballast, various  
methods used, size and quantity of ballast
8. Plate laying: meanings of the terms, methods of plate laying, tram line method, telescopic method, American method, material required per unit length of track, ballast train, relaying a track

### **Unit: III**

9. Maintenance of track: necessity, maintenance of track, inspection of soil, track and fixtures; maintenance and boxing of ballast maintenance gauges, tools
10. Earth work and Drainage: Forms of cross-section, features of rail road, bed level, width of formation, side slopes, drains, methods of construction, requirement of drainage system.

## **BRIDGES**

### 11. Introduction

Bridge - its function and component parts, difference between a bridge and a culvert

### 12. Classification of Bridges

Their structural elements and suitability:

- According to life-permanent and temporary
- According to road way level - Deck, through and semi-through
- According to material -wooden, steel, RCC, pre-stressed and masonry
- According to structural form;
  - Beam type -RCC, T-Beam, steel girder bridges, plate girder and box girder, balanced cantilever. Trussed bridges, N and warren
  - Arch type - open spandrel and filled spandrel barrel and rib type
  - Suspension type - unstiffened sling type, its description with sketches
  - According to the position of highest flood level submersible and non submersible

## **Unit: IV**

### 13. Site Selection and Collection of Data

Factors affecting the selection of site for a bridge, data to be collected

### 14. Foundations

- Depth of foundation, types of foundations, well foundation and caisson (open type only), their details of construction with sketches
- Laying of foundations (i) dry soil (ii) soil charged with water (iii) under water, coffer dams their types and construction

### 15. Piers, Abutments and Wingwalls

- Piers-definition, parts; types -solid (masonry and RCC), open; cylindrical and abutment piers. Definition of the terms: height of pier, water way (natural and artificial); afflux and clearance
- Abutments and wing walls - definition, types of abutments (straight and tee), abutment with wing walls (straight splayed, return and curved)

### 16. Bridge bearings

Purpose of bearings; types of bearings - fixed plate, sliding plate, deep cast base,

- rocker, rocker and roller, their functions with sketches
17. Temporary bridges  
Necessity, description with sketches of pontoon and boat bridges
  18. Maintenance of Bridges
  - 19.1 Inspection of bridges
  - 19.2 Routine maintenance

#### **Unit: V**

#### **TUNNELS**

19. Definition and necessity of tunnels
20. Typical section of tunnels for a national highway and single and double broad gauge railway track
21. Transfer of centre line of tunnel by shaft method
22. Method of construction of tunnels in soft rock by needle beam method
23. Method of construction of tunnels in hard rock with full face method and safety precaution to be taken, other methods of tunneling (names only)
24. Lining of tunnels with concrete
25. Ventilation -necessity and methods of ventilation, by combination of blowing and exhaust
26. Drainage method of draining water in tunnels
27. Lighting of tunnels
28. Shafts, mucking, hauling

**Notes: Field visits may be organized to Bridge construction site or a bridge/Tunnel construction site/Railways tracks to explain the various components**

#### **INSTRUCTIONAL STRATEGY**

This subject is of practical nature. While imparting instructions, teachers are expected to organize demonstrations and field visits to show various components and their construction of railway track, bridges and tunnel.

**Note-** Practical Syllabus will be based on given syllabus

#### **Reference Books:**

1. Vaswani, NK; "Railway Engineering" , Roorkee Publishing House
2. Rangwala, SC; "Railway Engineering" , Anand, Charotar Book Stall
3. Deshpande, R: "A Text Book of Railway Engineering" , Poonam United Book Corporation
4. Algia, JS "Bridge Engineering" , Anand Charotar Book Stall
5. Victor Johnson, "Essentials of Bridge Engineering" Oxford and IBH
6. Rangwala, "Bridge Engineering" , Aand, Charotar Book Stall
7. IRC Bridge Codes
8. MOST drawings for various types of bridges

9. MOST pocket books for bridge Engineers, 2000 (First Revision)

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## **QUANTITY SURVEYING AND VALUATION**

### **RATIONALE**

Diploma holders in Civil Engineering are supposed to prepare material estimates for various Civil Engineering works namely; buildings, irrigation works, public health works and roads etc. In addition, they must have basic knowledge regarding analysis of rates, contracting, principles of valuation. Therefore, this subject has great importance for diploma holders in Civil Engineering.

### **DETAILED CONTENTS**

#### **Unit: I**

**Introduction to quantity surveying and its importance. Duties of quantity surveyor**

Types of estimates .

- Preliminary estimates
  - Plinth area estimate
  - Cubic rate estimate
  - Estimate per unit base
- Detailed estimates

#### **Definition**



Stages of preparation – details of measurement and calculation of quantities and abstract

### 3. Measurement (03 hrs)

- Units of measurement for various items of work as per BIS:1200
- Rules for measurements
- Different methods of taking out quantities – centre line method and long wall and short wall method

### **Unit: II**

#### **Preparation of Detailed and Abstract Estimates from Drawings for:**

- A small residential building with a flat roof and pitched roof building comprising of  
Two rooms with W.C., bath, kitchen and verandah
- Earthwork for unlined channel
- WBM road and pre-mix carpeting
- Single span RCC slab culvert
- Earthwork for plain and hill roads
- RCC work in beams, slab, column and lintel, foundations
- users septic tank - 10 users

### **Unit: III**

#### **Calculation of quantities of materials for**

- Cement mortars of different proportion
- Cement concrete of different proportion
- Brick/stone masonry in cement mortar
- Plastering and pointing
- White washing, painting
- R.C.C. work in slab, beams

#### **Analysis of Rates**

- Steps involved in the analysis of rates. Requirement of material, labour, sundries, contractor's profit and overheads
- Analysis of rates for finished items when data regarding labour, rates of material and labour is given:  
Earthwork in excavation in hard/ordinary soil and filling with a concept of lead and lift  
RCC in roof slab/beam/lintels/columns  
Brick masonry in cement mortar  
Cement Plaster  
White washing, painting  
Stone masonry in cement mortar

### **Unit: IV**

#### **Contractorship**

- Meaning of contract
- Qualities of a good contractor and their qualifications
- Essentials of a contract
- Types of contracts, their advantages, dis-advantages and suitability, system of payment

- Single and two cover-bids; tender, tender forms and documents, tender notice, submission of tender and deposit of earnest money, security deposit, retention money, maintenance period

Classification and types of contracting firms/construction companies

### **Preparation of Tender Document based on Common Schedule Rates (CSR)**

- Introduction to CSR and calculation of cost based on premium on CSR
- Exercises on writing detailed specifications of different types of building works from excavation to foundations, superstructure and finishing operation
- Exercises on preparing tender documents for the following
  - a) Earth work
  - b) Construction of a small house as per given drawing
  - c) RCC works
  - d) Pointing, plastering and flooring
  - e) White-washing, distempering and painting
  - f) Wood work including polishing
  - g) Sanitary and water supply installations
  - h) False ceiling, aluminum (glazed) partitioning
  - i) Tile flooring including base course
  - j) Construction of W.B.M/Concrete road

### **Unit: V**

#### **9. Exercises on preparation of comparative statements for item rate contract**

#### **10. Valuation (04 hrs)**

- a) Purpose of valuation, principles of valuation
- b) Definition of various terms related to valuation like depreciation, sinking fund, salvage and scrap value, market value, fair rent, year's purchase etc.
- c) Methods of valuation (i) replacement cost method (ii) rental return method

### **INSTRUCTIONAL STRATEGY**

This is an applied engineering subject. Teachers are expected to provide working drawings for various Civil Engineering works and students be asked to calculate the quantities of materials required for execution of such works and use of relevant software for preparing estimates. Teachers should conceptualize making analysis of rates for different items of works. It will be advantageous if students are given valuation reports for reading.

**Note-** Practical marks will be based on given syllabus.

#### **Reference Books:**

1. Pasrija, HD, Arora, CL and S. Inderjit Singh, "Estimating, Costing and Valuation (Civil)", New Asian Publishers, Delhi,
2. Rangwala, S.C, "Estimating and Costing", Anand, Charotar Book Stall
3. Chakraborti, M, "Estimating, Costing and Specification in Civil Engineering", Calcutta
4. Dutta, BN, "Estimating and Costing"

5. Mahajan Sanjay, “Estimating and Costing” Satya Parkashan, Delhi

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## **REPAIR AND MAINTENANCE OF BUILDINGS**

### **RATIONALE**

One of the major concerns of a civil engineer is to take care of the building works, already constructed, in order to keep these buildings in utmost workable conditions. Usually it is being felt that the buildings deteriorate faster for want of care and proper maintenance. The buildings usually have a shabby appearance due to cracks, leakage from the roofs and sanitary/water supply fittings. Thus the need for teaching the subject in proper perspective has arisen making students aware of importance of maintenance of buildings.

### **DETAILED CONTENTS**

#### **Unit: I**

##### **Need for Maintenance (06 hrs)**

- Importance and significance of repair and maintenance of buildings
- Meaning of maintenance
- Objectives of maintenance
- Factors influencing the repair and maintenance

##### **Agencies Causing Deterioration (Sources, Causes, Effects)**

- Definition of deterioration/decay

- Factors causing deterioration, their classification
- Human factors causing deterioration
- Chemical factors causing deterioration
- Environmental conditions causing deterioration
- Miscellaneous factors
- Effects of various agencies of deterioration on various building materials  
i.e. bricks, timber, concrete, paints, metals, plastics, stones

## **Unit: II**

### **Investigation and Diagnosis of Defects**

- Systematic approach/procedure of investigation
- Sequence of detailed steps for diagnosis of building defects/problems
- List non-destructive and others tests on structural elements and materials to evaluate the condition of the building and study of three most commonly used tests

### **Defects and their root causes**

- Define defects in buildings
- Classification of defects
- Main causes of building defects in various building elements
- Foundations, basements and DPC
- Walls
- Column and Beams
- Roof and Terraces
- Joinery
- Decorative and protective finishes
- Services
- Defects caused by dampness

## **Unit: III**

### **Materials for Repair, maintenance and protection**

- Compatibility aspects of repair materials
- State application of following materials in repairs:
- Anti corrosion coatings
- Adhesives/bonding aids
- Repair mortars
- Curing compounds
- Joints sealants
- Waterproofing systems for roofs
- Protective coatings

### **Remedial Measures for Building Defects**

- Preventive maintenance considerations
- Surface preparation techniques for repair
- Crack repair methods
- Epoxy injection
- Grooving and sealing
- Stitching
- 6.3.4 Adding reinforcement and grouting
- Flexible sealing by sealant

- Repair of surface defects of concrete
- Bug holes
- Form tie holes
- Honey comb and larger voids
- Repair of corrosion in RCC elements
- Steps in repairing
- Prevention of corrosion in reinforcement
- Material placement techniques with sketches

#### **Unit: IV**

##### **Pneumatically applied (The gunite techniques)**

- Open top placement
- Pouring from the top to repair bottom face
- Birds mouth
- Dry packing
- Form and pump
- Preplaced – aggregate concrete
- Trowel applied method
- Repair of DPC against Rising Dampness
- Physical methods
- Electrical methods
- Chemical methods
- Repair of walls
- Repair of mortar joints against leakage
- Efflorescence removal
- Waterproofing of wet areas and roofs
- Water proofing of wet areas

#### **Unit: V**

##### **Water proofing of flat RCC roofs**

- Various water proofing systems and their characteristics
- Repair of joints in buildings
- Types of sealing joints with different types of sealants
- Techniques for repair of joints
- Repair of overhead and underground water tanks

#### **INSTRUCTIONAL STRATEGY**

This is very important course and efforts should be made to find damaged/defective work spots and students should be asked to think about rectifying/finding solution to the problem. Visits to work site, where repair and maintenance activities are in progress can be very useful to students. The students will also prepare a project report based upon the available water proofing materials, sealant, special concrete for repair and adhesives and other repair material available in the market.

**Note-** Practical syllabus will be based on given syllabus.

#### **Reference Books:**

1. Gahlot P.S. and Sanjay Sharma, “Building Defects and Maintenance

- Management”, CBS Publishers, New Delhi
2. Nayak, BS, "Maintenance Engineering for Civil Engineers", Khanna Publishers, Delhi
  3. Ransom, WH "Building Failures - Diagnosis and Avoidance", Publishing E and F.N. Span
  4. Hutchinson, BD; et al, "Maintenance and Repair of Buildings", Published by Newness – Butterworth

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## **ENVIRONMENTAL ENGINEERING**

### **RATIONALE**

Civil Engineering diploma holders must have the knowledge of different types of environmental aspects related to development activities so that they may help in maintaining the ecological balance and control pollution. They should also be aware of the related environmental laws for effectively combating environmental pollution. The class room instructions should be supplemented by field visits to show the pollution caused by urbanization and the combatment measures being adopted at site. Extension lectures by experts may be encouraged.

### **DETAILED CONTENTS**

#### **Unit: I**

#### **Study of Importance of Environmental Engineering**

Importance of clean environment, control of environmental pollution with respect to air, land and water. Conservation of natural resources, environmental education and awareness, sustainable development.

### **Environments and Ecology**

Definition and understanding of environment and ecology concept, ecosystem and types of ecosystems, energy flow in an ecosystem, food chain, ecological pyramids, consortium and ecological balance

### **Water Pollution**

Causes of pollution in surface and underground water eutrophication of lakes and its preventing measure; BIS standards for water quality.

### **Unit: II**

#### **Air Pollution**

Definition, principal air pollutants, atmospheric parameters influencing air pollution, types of air contaminants and their sources, effects of air pollution on human beings, plants, animals, automobile pollution, BIS ambient air quality standards and measures to combat air pollution

#### **Noise Pollution**

Definition, unit of measurement of noise, sources and effects of noise pollution and control of noise pollution

#### **Effects of mining, blasting and deforestation**

Ill effects of mining, blasting and deforestation on the environment human life and wild life.

### **Unit: III**

#### **Land Use**

Effect of land use on environmental quality, land use and natural disasters,(land slides etc) soil degradation problems - erosion, water logging, soil pollution etc.

#### **Environmental Impact Assessment**

Definition and requirements, environmental impact assessment. Flow chart of environmental impact assessment methodology. Describe the need and importance of EIA.

#### **Legislation to Control Environmental Pollution (idea)**

Indian legislative acts for water, land and air pollution control – provisions, scope and implementation

### **Unit: IV**

#### **Global Issues of Environmental Engineering**

Global warming, ozone depletion, acid rain, oil pollution; radiation hazards and their control, concept of clean technology and carbon credits.

#### **Renewable Source of Energy**

Role of non-conventional sources of energy (biogas, solar, wind etc) in environmental protection. Conservation of energy resources like coal, oil etc., alternative fuels, bio-diesel etc.

### **Unit: V**

#### **INSTRUCTIONAL STRATEGY**

Students should be encouraged to undertake project work related to environmental problems. They should visit industrial effluent treatment plant, water treatment plant and environmental engineering laboratory and study the impact of utilization of reclaimed by products

### **Reference Books:**

1. Deswal DS and Deswal SS “Environmental Engineering” Dhanpat Rai and Company (P) Ltd., Delhi
2. Odum EP, “Fundamentals of Ecology”, Amarind Publication Co., Delhi
3. Dhamija SK “Environmental Engineering and Management ; SK Kataria and Sons, Delhi
4. De AK, “Engineers Chemistry”, New Age Publication, Delhi
5. Kendeigh SC, “Ecology”, Prentice Hall of India, Delhi
6. Khitoliya, RK, “Environmental Pollution’, S Chand & Co. Ltd., New Delhi
7. Bhatia, HS, “A text book of Environmental Pollution and Control”, Galgotia Publishers, Delhi

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### **Major Project Work**

As far as possible students should be given live project problems with a view to :

- i) Develop understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the courses of study.
- ii) Develop understanding of subject based knowledge given in the classroom in the context of its application at work places.
- iii) Develop firsthand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems of the world of work.
- iv) Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

For the fulfillment of above objectives, polytechnic may establish close linkage with 8-10 relevant organization for providing such an experience. It is necessary that each organisation is visited well in advance and activities to be performed by students are well defined. The chosen activities should be



such which are of curricular interest to students and of professional value to industrial/field organisations. Each teacher is expected to supervise and guide 5-6 students.

Effort should be made to identify actual field problems to be given as project work to the students. Project selected should not be too complex which is beyond the level of the students. The placement of the students for such a practical cum project work should match with the competency profile of students and the project work assigned to them. Students may be assessed both by industry and polytechnic faculty. The suggested performance criteria is given below:

- a) Punctuality and regularity
- b) Initiative in learning/working at site
- c) Level/proficiency of practical skills acquired
- d) Sense of responsibility
- e) Self expression/Communication skills
- f) Interpersonal skills
- g) Report Writing skills
- h) Viva voce

Some of suggested projects are given below:

1. Construction of a small concrete road consisting of following activities
  - Survey and preparation of site plan
  - Preparation of drawings i.e. L-Section and X-Section
  - Estimating and earth work
  - Preparation of sub grade with stone ballast
  - Laying of concrete
  - Testing of slump, casting of cubes and testing
  - Material estimating and costing with specifications
  - Technical report writing
2. Water Supply system for a one or two villages
  - Surveying
  - Design of water requirements and water distribution system
  - Preparation of drawing of overhead tank
  - Material estimating and costing
  - Specifications - Technical report writing
3. Construction of sitting benches in polytechnic campus
4. Welding of angle iron and Expanded metal jali to prepare fencing in polytechnic campus
5. Construction of toilets and baths for a shopping complex in a township
6. Construction of a Chowkidar hut
7. Construction of bridal path 4 kms long
8. Construction of shopping complex detailing of RCC drawings, estimating and costing of material
9. Rainwater harvesting - Assessment of catchment area - Intensity of rainfall - Collection of water - Soak pit design - Supply of water - Monitoring during rainy season
10. Providing of septic tank with soak pits
11. Preparing plumbing detailed drawings of a two storey building and material estimate and costing
12. Planning and design of sports stadium in a township or cluster of villages
13. Design and drawings of fishery ponds in a village

14. Design of small residential building including structural members, specifications, estimating and costing of materials, report writing and municipal drawings for water supply and sewerage system



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