



WEST BENGAL STATE COUNCIL OF TECHNICAL & VOCATIONAL EDUCATION AND SKILL DEVELOPMENT

(A Statutory Body under West Bengal Act XXVI of 2013)

(Technical Education Division)

Karigari Bhavan, 4th Floor, Plot No. B/7, Action Area-III, Newtown, Rajarhat, Kolkata-700 160

WBSCTVESD Curriculum for Diploma Courses in Engineering and Technology

Semester I (Common to all Branches)

Sl. No	Category of Course	Course Title	Hours per week			Total contact hrs/ week	Credits	Marks
			L	T	P			
1.	Basic Science	Mathematics-I	2	1	0	3	3	100
2.	Basic Science	Applied Physics-I	2	1	0	3	3	100
3.	Basic Science	Applied Chemistry	2	1	0	3	3	100
4.	Humanities & Social Science	Communication Skills in English	2	0	0	2	2	100
5.	Engineering Science	Engineering Graphics	0	0	3	3	1.5	100
6.	Engineering Science	Engineering Workshop Practice	0	0	3	3	1.5	100
7.	Basic Science	Applied Physics-I Lab	0	0	2	2	1	100
8.	Basic Science	Applied Chemistry Lab	0	0	2	2	1	100
9.	Humanities & Social Science	Sports and Yoga	0	0	2	2	1	100
10.	Humanities & Social Science	Communication Skills in English Lab	0	0	2	2	1	100
Total Credits and Marks							18	1000

Syllabus for Engineering Mathematics-I

Course Title:	Engineering Mathematics-I
Course Code:	BS101/M-I
Number of Credits :	3(L: 2+1: T) P: 0
Pre Requisites :	1) Basic Formulae of Algebra, Trigonometry should be known 2) Preliminary knowledge of the vector
Total Contact Hours :	45 hrs.

Aim: Engineering Mathematics is the backbone of engineering students. The curriculum of mathematics has undergone changes from time to time in accordance with the need of engineering branches. The revised syllabus has been designed keeping in view the emerging needs of all categories of students. Great emphasis has been laid on the application of various contents like algebra, complex numbers, vectors, trigonometry and derivative. This course will develop analytical abilities to make exact calculations and provide a continuing educational base for the students.

Course Objectives: After the completion of the course the students will be able to

- apply the basic concepts of logarithm, complex number, quadratic equation and binomial theorem for solving the engineering and practical problems.
- find the solutions of vector oriented problems like work done, moment etc by applying vector algebra.
- simplify trigonometric expressions and solve trigonometric equations which will be useful in solving the scientific problems.
- analyze limit, continuity, derivatives of different functions and physical interpretation of derivatives which will be applicable in real situation.

Course Content

Unit-1

Algebra

1.1 Logarithm:

3 Hours

1.1.1 Definition of natural and common logarithm.

1.1.2 General Properties of logarithm and simple problems

Syllabus for Engineering Mathematics-I

1.2 Complex Numbers:

5 Hours

- 1.2.1 Definition of Complex numbers, Real and Imaginary parts of a complex number, Equality of two complex numbers, Conjugate of a complex number
- 1.2.2 Modulus and Argument of a complex number and simple problems
- 1.2.3 Polar and Cartesian forms of a complex number and their relation.
- 1.2.4 Algebraic operations (Addition, Subtraction, multiplication, Division) of complex numbers
- 1.2.5 De Moivre's Theorem (without proof) and simple problems.
- 1.2.6 Cube roots of unity and their properties with problems.

1.3 Quadratic Equations:

4 Hours

- 1.3.1 Definition of Quadratic Equations.
- 1.3.2 Finding the roots of a quadratic equation, conjugate roots & simple problems
- 1.3.3 Nature of the roots using discriminant & problems
- 1.3.4 Relation between roots and co-efficients & problems
- 1.3.5 Formation of quadratic equations if roots are given.

1.4 Binomial Theorem:

4 Hours

- 1.4.1 Definition of factorial of a number, permutation(nPr) & combination (nCr) with formula only
- 1.4.2 Binomial Theorem (without proof) for any index, simple problems on positive index only
- 1.4.3 General Term and Middle Term and problems
- 1.4.4 Expansion of $(1+x)^{-1}$, $(1-x)^{-1}$, where $|x| < 1$, exponential & logarithmic series only (no problem)

Unit-2

Vector Algebra

7 Hours

- 2.1 Definition of vector and types of vectors
- 2.2 Concept of a position vector and Ratio formula & simple problems
- 2.3 Rectangular resolution of a vector
- 2.4 Equality, addition, subtraction of vectors and multiplication of a vector by a scalar
- 2.5 Scalar (dot) and Vector (cross) product of two vectors with properties & simple problems
- 2.6 Application of dot product -- work done by a force, projection of a vector upon another
- 2.7 Application of cross product -- finding area of a triangle and parallelogram, moment of a force

Syllabus for Engineering Mathematics-I

Unit-3

Trigonometry

10 Hours

- 3.1 Concept of trigonometrical angles, measurement of angles in degree, radian and grade & their relation only.
- 3.2 Trigonometrical ratios of angles, associated angles, Trigonometric ratios of some standard angles, problems
- 3.3 Compound angles formula (without proof), multiple, sub-multiple angles & simple problems
- 3.4 Solutions of Trigonometrical Equations, simple problems (angle lies between 0 and 2π)
- 3.5 Inverse Circular Function & simple problems
- 3.6 Properties of triangle, basic formulae only

Unit-4

Function, Limit & Continuity, Derivative

4.1 Function

2 Hours

- 4.1.1 Definition of variables & constants
- 4.1.2 Definition of function with examples, domain and range of a function
- 4.1.3 Types of functions (even-odd, increasing-decreasing, inverse, periodic) with simple examples
- 4.1.4 Graph of trigonometric functions, $\sin x$, $\cos x$, $\tan x$ only

4.2 Limit & Continuity

2 Hours

- 4.2.1 Definition of limit (with left hand limit & right hand limit), Fundamental Theorem on limit (only statement), standard limits and simple problems
- 4.2.2 Continuity of functions, elementary test for continuity of functions (finite limit)

4.3 Derivative

8 Hours

- 4.3.1 Definition of derivatives
- 4.3.2 Derivatives of standard functions
- 4.3.3 Rules of differentiation of sum, difference, product and quotient of functions.
- 4.3.4 Derivatives of composite functions (Chain Rule)
- 4.3.5 Derivatives of inverse circular functions, implicit functions and logarithmic differentiation
- 4.3.6 Derivative of parametric functions, derivative of a function with respect to another function

Syllabus for Engineering Mathematics-I

4.3.7 Second order derivatives with simple problems

4.3.8 Application of derivatives –Physical & Geometrical interpretation of derivative, checking increasing-decreasing functions, finding velocity & acceleration, Maxima-Minima of function of single variable with simple problems.

Examination Scheme:

A. Semester Examination pattern of 60 marks:

1. Objective questions- 20 marks (1 mark each question), (At least 5 question from each **group**)
2. Subjective questions- 40 marks (at least 2 questions of 10 marks from each **group**)
 - **Group- A** contains Unit-1 & Unit-2 (At least 40 marks); **Group-B** contains Unit-3 (At least 20 marks); **Group-C** contains Unit-4(At least 20 marks)

N.B.- Student will answer objective type questions of 20 marks and for subjective question of 40 marks, taking at least one question from each **group** of the above three **groups**.

B. For the internal Assessment 40 marks:

1. Class Test Examination/Internal Examination; 20 marks; choose best two out of three Class Test Examinations/ Internal Examinations
2. Class Attendance; 10 marks
3. Viva/ Quiz/Presentation/Assignment/Project/Report etc.; 10 marks

Text Books & Reference -

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics, Konch & Dey, Bhagabati Publication
3. Engineering Mathematics, Babu Ram, Pearson
4. Trigonometry, S.L.Loney, S.Chand & Co.
5. Higher Algebra, H. S. Hall & Knight, Book Palace, New Delhi
6. Advanced Engineering Mathematics, E. Kreyszig, Wiley
7. Engineering Mathematics, A. Sarkar, Naba Publication
8. Diploma Engineering Mathematics, B. K. Paul, U.N.Dhar & Sons
9. Analytic Geometry Two & Three Dimensional and **Vector Analysis**, R. M. Khan, New Central Book Agency
10. Higher Algebra: Classical, S.K. Mapa, Sarat Book House
11. Introduction to Real Analysis, S.K. Mapa, Sarat Book House
12. Engineering Mathematics, Reena Garg, Khanna Publishing House, New Delhi
13. Calculus and Analytic Geometry, G. B. Thomas, R. L. Finney, Addison Wesley
14. Engineering Mathematics, V. Sundaram, R. Balasubramanian, K.A. Lakshminarayanan, Vikas Publishing House.
15. Advanced Engineering Mathematics, Reena Garg & Chandrika Prasad, Khanna Publishing House, New Delhi
16. Web portal: <https://www.ndl.gov.in/homestudy/science>
<https://ncertbooks.ncert.gov.in/login>
<https://epathshala.nic.in/>
<https://webscte.co.in/>
<https://en.wikipedia.org/wiki/>
<https://openlibrary.org/>
<https://www.youtube.com/>
<http://content.inflibnet.ac.in/>
<https://doabooks.org/>
<https://www.oapen.org/home>
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17. Apps in Google Play Store: National Digital Library
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Applied Physics for Sem-I (Theory)

Reviewed and prepared by Syllabus-Sub-committee, on the basis of recommendation of AICTE

Sem –I (Theory)

Course Code	:	BS103
Course Title	:	Applied Physics-I
Number of credits	:	3 (L: 2, T: 1, P: 0)
Prerequisites	:	High School Level Physics
Course Category	:	BS

Course Content:

Unit 1: Physical world, Units and Measurements

Physical quantities; fundamental and derived, Units and systems of units (CGS and SI units),

Dimensions and dimensional formulae of physical quantities, Principle of homogeneity of dimensions, Dimensional equations and their applications (conversion from one system of units to other, checking of dimensional equations and derivation of simple equations), Limitations of dimensional analysis.

Measurements: Need, measuring instruments, least count, types of Measurement (direct, indirect), Errors in Measurements (systematic and random), absolute error, relative error, error propagation, error estimation and significant figures.

Unit 2: Force and Motion

Force, Momentum, Conservation of linear momentum, its applications such as recoil of gun, numerical problems rockets (concept only), Impulse and impulsive force.

Circular motion, definition of angular displacement, angular velocity, angular acceleration, frequency, time period, relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical), concept of Centripetal and centrifugal forces with examples (No derivation, only formula) banking of roads and bending of cyclist, concept and formula and numerical problems.

Unit 3: Work, Power and Energy

Work: Concept and units, examples of zero work, positive and negative work

Friction: concept, types, laws of limiting friction, coefficient of friction, reducing friction and its engineering applications, Work done in moving an object on rough inclined plane.

Energy and its units, kinetic energy and potential energy, Conservation of mechanical energy for freely falling bodies(simple numerical problems), transformation of energy (examples only).

Power and its units, power and work relationship, calculation of power (numerical problems).

Unit 4: Rotational Motion

Translational and rotational motion with examples, Definition of torque and angular momentum and their relation, Conservation of angular momentum (quantitative) and its applications.

Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid); (Formulae only). Simple numerical problems.

Unit 5: properties of Matter

Elasticity: definition of stress and strain, moduli of elasticity, Hooke's law, significance of stress-strain curve.

Surface tension: Concept, units, cohesive **and adhesive forces**, angle of contact, Capillary rise (formula only), applications of surface tension, effect of temperature and impurity on surface tension.

Viscosity and coefficient of viscosity: terminal velocity, Stoke's law and effect of temperature on viscosity.

Hydrodynamics: Fluid motion, stream line and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem (only formula and numericals) and its applications (mention name only).

Unit 6: Heat and Thermometry

Concept of heat and temperature, basic concepts of measurements of heat and temperature, modes of heats transfer (conduction, convection and radiation with examples), Co-efficient of thermal conductivity simple numerical problems.

Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions of solids and relation amongst them, specific heats C_p & C_v of a gas and their relationship (Mention only).

References:

1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
2. Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi.
3. Concepts in Physics by HC Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi
4. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
5. Engineering Physics by DK Bhattacharya & Poonam Tandan; Oxford University Press, New Delhi
6. Comprehensive Practical Physics, Vol,I & II, JN Jaiswal, Laxmi Publications (P) Ltd., New Delhi
7. Practical Physics by C.L. Arora, S. Chand Publication.
8. Comprehensive Physics Vol,I & II.

Applied Physics for Sem-I (Lab)

Course Code	:	BS107
Course Title	:	Applied Physics-I Labs
Numbers of Credits	:	1 (L:0, T:0, P:2)
Prerequisites	:	NIL
Course Category	:	BS

Course Objectives:

Study of Applied Physics aims to give an understanding of physical world by observations and predictions. Concrete use of physical principles and analysis in various fields of engineering and technology is very prominent. The course aims to supplement the factual knowledge gained in the lecture by first hand manipulation of apparatus. This will develop scientific temper and help to apply the basic concepts and principles in solving engineering and technology based problems. In addition, students get necessary confidence in handling equipment and thus learn various skills in measurement.

List of Practical's/Activities(To perform minimum 8 practical's).

1. To measure the volume of the material of a given hollow cylinder, using a Vernier calipers.
2. To determine the area of cross section of a thin wire using a screw gauge.
3. To determine radius of curvature of a convex and a concave mirror/ surface using a spherometer.
4. To find the co-efficient of friction between wood and glass using a horizontal board.
5. To determine force constant of a spring using Hook's law.
6. To find the moment of inertia of a flywheel.
7. To find the viscosity of a given liquid (Glycerin) by Stoke's law
8. To find the co-efficient of linear expansion of the material of a rod.
9. To **verify** Boyle's law.
10. To determine the relative density of sand by using a sp. gr. Bottle.

Reference books:

1. Text books of Physics for Class-XI & XII (Part-I & II); N.C.E.R.T., Delhi.
2. Comprehensive Practical Physics, Vol-I & II, JN Laxmi Publications (P) Ltd.,
3. Practical Physics by C.L. Arora, S. Chand Publication.

Applied Chemistry

Course Code	:	BS105
Course Title	:	Applied Chemistry
Number of Credits	:	3 (L: 2, T: 1, P: 0)
Prerequisites	:	High School Level Chemistry
Course Category	:	BS

Course Objectives:

There are numerous number materials used in fabricating and manufacturing devices for the comfort of life. The selection, characterization and suitability assessment of natural raw materials essentially requires principles and concepts of Applied Chemistry for technicians. On successful completion of this course content will enable technicians to understand, ascertain and analyse and properties of natural raw materials require for producing economical and eco-friendly finished products.

- Solve various engineering problems applying the basic knowledge of atomic structure and chemical bonding.
- Use relevant water treatment method to solve domestic and industrial problems.
- Solve the engineering problems using knowledge of engineering materials and properties.
- Use relevant fuel and lubricants for domestic and industrial applications
- Solve the engineering problems using concept of Electrochemistry and corrosion.

Instruction on question setting:

- Question paper contains three groups A, B and C. Unit 1 and unit 2 are included in group A, unit 3 and unit 4 in group B, unit 5 in group C.
- 20 (twenty) number of questions are of objective types consisting of all groups, each carrying 1 (one) mark.
- 5 (five) questions are to be answered taking at least one from each group (each question carries 8 marks).

Course Content:

• Unit 1: Atomic Structure, Chemical Bonding and Solutions

Rutherford model of atom, Bohr's theory (expression of energy and radius to be omitted), and hydrogen spectrum explanation based on Bohr's model of atom, Heisenberg uncertainty principle, Quantum numbers - orbital concept. Shapes of s, p and d orbitals. Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau rule, electronic configuration.

Type of chemical bonding: ionic, covalent, metallic and hydrogen bonds. Example of each type. Hybridization, sp^3 , sp^2 , sp , example: $BeCl_2$, BF_3 , CH_4 , NH_3 , H_2O ; structure of diamond, graphite.

Solution - idea of solute, solvent and solution, methods to express the concentration of solution - molarity (M = mole per liter), ppm, mass percentage, volume percentage and mole fraction.

• Unit 2: Water

Graphical presentation of water distribution on Earth (pie or bar diagram). Classification of soft and hard water based on soap test, salts causing water hardness, unit of hardness and simple numerical on water hardness.

Cause of poor lathering of soap in hard water, problems caused by the use of hard water in boiler (scale and sludge, foaming and priming, corrosion etc), and quantitative measurement of water hardness by EDTA method, total dissolved solids (TDS) alkalinity estimation.

- 1) Water softening techniques - soda lime process, zeolite process and ion exchange process.
- 2) Municipal water treatment (in brief only) - sedimentation, coagulation, filtration, sterilization.

Water for human consumption for drinking and cooking purposes from any water sources and enlist Indian standard specification of drinking water (collect data and understand standards).

• Unit 3: Engineering Materials

Natural occurrence of metals - minerals, ores of iron, aluminium and copper, gangue (matrix), flux, slag, metallurgy - brief account of general principles of metallurgy. Extraction of iron from haematite ore using blast furnace, aluminium from bauxite along with reactions, reactions during copper extraction. Alloys – definition, purposes of alloying, ferrous alloys and non-ferrous with suitable examples, properties and applications.

General chemical composition, composition based applications (elementary idea only details omitted):

Port land cement and hardening, Glasses Refractory and Composite materials.

Polymers - monomer, homo and co polymers, degree of polymerization, simple reactions involved in preparation and their application of thermoplastics and thermosetting plastics (using PVC, PS, PTFE, nylon - 6, nylon - 66, Bakelite only), rubber and vulcanization of rubber.

• Unit 4: Chemistry of Fuels and Lubricants

Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV and LCV), calculation of HCV and LCV using Dulong's formula.

Proximate analysis and ultimate analysis of coal solid fuel

petrol and diesel - fuel rating (octane and cetane numbers),

Chemical composition, calorific values and applications of LPG, CNG, water gas, coal gas, producer gas and biogas.

Lubrication - function and characteristic properties of good lubricant, classification with examples, lubrication mechanism - hydrodynamic and boundary lubrication, physical properties (viscosity and viscosity index, oiliness, flash and fire point, cloud and pour point only) and chemical properties (coke number, total acid number saponification value) of lubricants.

• Unit 5: Electro Chemistry

Electronic concept of oxidation, reduction and redox reactions.

Definition of terms: electrolytes, non-electrolytes with suitable examples, Faradays laws of electrolysis and simple numerical problems.

Elementary concept of pH and buffer.

Industrial Application of Electrolysis –

- Electrometallurgy
- Electroplating
- Electrolytic refining.

Application of redox reactions in electrochemical cells –

- Primary cells - dry cell,
- Secondary cell - commercially used lead storage battery, fuel and Solar cells.

Introduction to Corrosion of metals –

- definition, types of corrosion (chemical and electrochemical), H_2 liberation and O_2 absorption mechanism of electrochemical corrosion, factors affecting rate of corrosion.

Internal corrosion preventive measures –

- Purification, alloying and heat treatment and

External corrosion preventive measures: a) metal (anodic, cathodic) coatings, b) organic inhibitors.

Suggested Sessional work:

- **Unit 1: Atomic Structure, Chemical Bonding and Solutions**

Assignments: Writing electronic configuration of elements up to atomic number 30 ($Z = 30$). Numerical on molarity, ppm, mass percentage, volume percentage and mole fraction of given solution.

Seminar: 1. Quantum numbers,
2. Discuss the metallic properties such as malleability, ductility, hardness, high melting point, conductance of heat and electricity, magnetic properties of metals.

Projects: Model of molecules BeCl_2 , BF_3 , CH_4 , NH_3 , H_2O

- **Unit 2: Water**

Assignments: Simple problems on hardness calculation.

Seminar: 1. Quality and quantity requirement of water in house and industry.
2. Quality of control measures of effluents (BOD & COD).

Projects: Collect water samples from different water sources and measure of hardness of water.

- **Unit 3: Engineering Materials**

Assignments: Preparation of table showing different ores of iron, copper and aluminium metals along with their chemical compositions and classify in to oxide sulphide halide ores.

Seminar: Discuss the chemical reactions taking place in Blast Furnace in extraction of iron; Reactions occurring during extraction of copper and aluminium metals.

Projects: Make table showing place of availability of different ores in India and show places on India map.

- **Unit 4: Chemistry of Fuels and Lubricants**

Assignments: Calculation of HCV and LCV of fuel using fuel composition in Dulong's formula.

Seminar: Chemical structure of fuel components influence on fuel rating.

Projects: Mapping of energy resources in India. Collection of data of various lubricants available in the market.

- **Unit 5: Electro Chemistry**

Assignments: Simple problems on Faradays laws of electrolysis.

Seminar: 1. Corrosion rate and units.
2. Corrosion preventions.

Projects: Mapping of area in India prone to corrosion. Collection of data of various electrochemical cells batteries used in equipment and devices and available in market. Visit to sites such as Railway station to watch corrosion area in railways and research establishment in and around the institution.

References/Suggested Learning Resources:

(a) Books:

- 1) Text Book of Chemistry for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
- 2) Agarwal, & Shikha, Engineering Chemistry, Cambridge University Press; New Delhi, 2015.
- 3) C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
- 4) S. S. Dara & S.S.Umare, Engineering Chemistry, S. Chand. Publication, New Delhi, New Delhi, 2015.
- 5) Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.
- 6) S. Vairam, Engineering Chemistry, Wiley India Pvt.Ltd., New Delhi, 2013.
- 7) G. H. Hugar & A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.
- 8) Rajesh Agnihotri, Chemistry for Engineers, Wiley India Pvt.Ltd., 2014.

(b) Open source software and website address:

- 1) www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
- 2) www.visionlearning.com (Atomic structure and chemical bonding)
- 3) www.cheml.com (Atomic structure and chemical bonding)
- 4) <https://www.wastewaterelearning.com/elearning/> (Water Treatment)
- 5) www.capital-refractories.com (Metals, Alloys, Cement, and Refractory Materials)
- 6) www.em-ea.org/guide%20books/book-2/2.1%20fuels%20and%20combustion.pdf (Fuel and Combustion)
- 7) www.chemcollective.org (Metals, Alloys)
- 8) www.wqa.org (Water Treatment)

Applied Chemistry Lab

Course Code	:	BS109
Course Title	:	Applied Chemistry Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	BS

Course Objectives:

There are numerous number of materials used in fabricating and manufacturing devices for the comfort of life. The selection, characterization and suitability assessment of natural raw materials essentially requires principles and concepts of Applied Chemistry for technicians. The course aims to supplement the factual knowledge gained in the lectures by first hand manipulation of processes and apparatus. This will develop scientific temper and help to apply the basic concepts and principles in solving engineering problems.

LIST OF PRACTICALS:

Perform any 12 (twelve) Laboratory Practicals:

Volumetric and Gravimetric analysis.

1. Preparation of standard oxalic acid and standard potassium dichromate solution.
2. To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution and phenolphthalein as indicator.
3. Standardization of potassium permanganate solution using standard oxalic acid and determination of percentage of iron present in given Hematite ore by KMnO_4 solution
4. a) Standardization of sodium thiosulphate using standard potassium dichromate solution by IODOMETRY.

- b) Iodometric estimation of copper in copper pyrite ore.
- 5. Volumetric estimation of total acid number (TAN) of given oil.
- 6. Volumetric estimation of
 - a. Total hardness of given water sample using standard EDTA solution.
 - b. Alkalinity of given water sample using 0.01N sulphuric acid.
- 7. Proximate analysis of coal
 - a. Gravimetric estimation moisture in given coal sample.
 - b. Gravimetric estimation ash in given coal sample

Instrumental analysis

- 8. Determine the conductivity of given water sample.
- 9. Determination of the Iron content in given cement sample using colorimeter.
- 10. Determination of viscosity of lubricating oil using Redwood viscometer.
- 11. Determination of flash and fire point of lubricating oil using Able's flash point apparatus.
- 12. To verify the first law of electrolysis of copper sulfate using copper electrode.
- 13. Construction and measurement of emf of electrochemical cell (Daniel cell).
- 14. To study the effect of dissimilar metal combination on cell emf.
- 15. To apply thin layer chromatography for separation of mixture of inorganic/organic compounds.
- 16. Qualitative detection of ARSENIC in a given sample of water (~5 ppm solution of sodium arsenite)
- 17. Determination of dissolved oxygen in a sample of water.
- 18. Determination of pH value of unknown solution.

Reference book

VOGELS INORGANIC QUANTITATIVE ANALYSIS.

Members present in Syllabus Committee:

- 1. **Dr. Ujjval Kumar Bhattacharyya** (convener, lecturer, North Calcutta Polytechnic).
- 2. **Dr. Gandhi Kumar Kar** (Professor and head of the Dept. of Chemistry, Presidency University, Kolkata)
- 3. **Dr. Shyamal Kumar Chattopadhyay** (Professor IEST, Shibpur).
- 4. **Dr. Mrinal Kanti Bain**, lecturer, Calcutta Technical School.
- 5. **Dr. Dipankar Maity**, lecturer, Birla Institute of Technology.
- 6. **Dr. Ranjal Paul**, Sr. Manager, Sun Pharmaceuticals Baroda.
- 7. **Prolay Roy**, lecturer, Memari Government Polytechnic.

Syllabus of Communication Skills in English

{The syllabus for the subject has been prepared by the Syllabus Sub-committee for the subject “Communication Skills in English” in accordance with the following instructions / directions received from Mr. B. Samanta (WBSCTVESD) vide his mail dated Dec. 6, 2019 at 12.04 PM}:-

“A meeting was held on 31.10.2019 at the Council. In the meeting following decisions were taken by the Council

- 1. It was decided unanimously to adopt the curriculum structure of the AICTE model syllabus 2019(attached) for all diploma courses of WBSCTVESD.*
- 2. New curriculum structure and syllabus of diploma courses shall be prepared as per AICTE model Syllabus 2019 and implemented from the next academic session i.e. 2020-21 in phase manner.*
- 3. Content of the syllabus of diploma courses shall be customized as per the requirement and as per the advice of the syllabus sub- committee.”*

Sl. No.	Code No.	Course Title	Hours per week (Total-4)			Semester	Credits
			Lecture	Tutorial	Practical		
1	HS 101	Communication Skills in English	2	0	0	1	2
2	HS105	Communication Skills in English - Lab	0	0	2	1	1
Total number of weeks – 17 (seventeen)							

Preamble:

Engineering is a service, and therefore it exists to meet human needs. Needs are communicated through language. No engineer, no matter how brilliant, can do a good job if she or he does not know what the job is for, who they are serving, for what purpose, and what needs to be done to render this service. Feedback also has to be communicated in language: figures are not enough without explanation. Communication, spoken or written, is thus essential for any service provider to do their job.

However, in most cases the courses and syllabi offered to STEM undergraduates do not adequately address the need to make them good communicators. It is often assumed that this question has been addressed by schooling, or they attempt to adapt liberal arts courses to the needs of STEM workers, thereby failing to address those needs. In a country such as India where language learning in general and English learning in particular tend to be neglected or mis-taught, this problem is compounded. To be successful, communicative language learning has to be a two way process, with communication between the teacher and student, and between students. However, the culture of student passivity in the classroom which prevails in India is poor soil for these skills to take root.

We have therefore attempted in this course to produce a system that allows, (within the known constraints) even in a limited form, for project work and conversations, collaboration and role-play, to mitigate the ‘keep quiet’ culture of the Indian classroom and to encourage young people to find their voices. Polytechnic, College and university students are just one small step away from becoming young professionals, and once they take that step their livelihoods (and also the safety and happiness of their clients) will depend upon how well they can ask and answer questions in the real world.

Without adequate practice, confidence-building and positive reinforcement, the practice of teaching them the pedantic small points of the rules of English grammar, or obsessing over their pronunciation, only serves to silence them further. What they need is an environment where they can communicate with each other and then troubleshoot the results, go over bad communication and make it better, identify their mistakes and correct them without being terrorised by cultural stereotypes. Graduate education should be a safe space for them to do this before work in the real world attaches real penalties to the results of bad communication. With this syllabus and attached guidelines, we have tried to take a small step in the right direction.

Course Title: **Communication Skills in English**

Course Code No.: **HS101**

Hours per week: **02 (Lecture), Total contact hours / week: 02**

Credits: **02**

Course Objectives (AICTE): Communication skills play an important role in career development. This course aims at introducing basic concepts of communication skills with an emphasis on developing personality of the students. Thus the main objectives of this course are:

- To develop confidence in speaking English with correct pronunciation
- To develop communication skills of the students i.e. listening, speaking, reading and writing skills
- To introduce the need for personality development – Focus will be on developing certain qualities which will aid students in handling personal and career challenges, leadership skills etc.

Course Content (Theory)

Unit – 1 Communiucation: Theory and Practice

- Basics of communication: Introduction, meaning and definition, process of communication etc.
- Types of communication: formal and informal, verbal, non-verbal and written. Barriers to effective communication
- 7 Cs for effective communication (considerate, concrete, concise, clear, complete, correct, courteous).
- Art of Effective communication,

- Choosing words
- Voice
- Modulation
- Clarity
- Time
- Simplification of words
- Technical Communication

Unit – 2 Soft Skills for Professional Excellence

- Introduction: Soft Skills and Hard Skills.
- Importance of Soft Skills.
- Life skills: Self-awareness and Self-analysis, adaptability, social skills, emotional intelligence, Interpersonal relationship and empathy etc.
- Applying soft skills across cultures – Corporate work culture, Work persona, Professionalism, Time Management
- Case Studies

Unit – 3: Reading Comprehension

Note Taking, Comprehension, vocabulary enhancement and grammar exercises based on reading of texts.

Unit – 4: Professional Writing

The art of writing Report and Memo
CVs
Letters: Job Application and Business
Drafting e-mail, minutes of a meeting, etc

Unit – 5: Vocabulary and Grammar

Remedial Grammar and Exercises
Professional Workplace Communication
Parts of speech, active and passive voice, tenses etc.

Course outcomes (AICTE):

At the end of this course, the participants will:

- Develop basic speaking and writing skills including proper usage of language and vocabulary so that they can become highly confident and skilled speakers and writers.
- Be informed of the latest trends in basic verbal activities such as presentations, facing interviews and other forms of oral communication.
- Also develop skills of group presentation and communication in team.
- Develop non-verbal communication such as proper use of body language and gestures

Course Title: **Communication Skills in English - Lab**

Course Code No.: **HS105**

Hours per week: **02 (Practical), Total contact hours / week: 02**

Credits: **01**

Course Objectives (AICTE):

Communication skills play an important role in career development. This course aims at introducing basic concepts of communication skills with an emphasis on developing personality of the students. Thus the main objectives of this course are:

1. To develop listening skills for enhancing communication.
2. To develop speaking skills with a focus on correct pronunciation and fluency.
3. To introduce the need for Personality development – Focus will be on developing certain qualities which will aid students in handling personal and career challenges, leadership skills, etc. for that purpose group discussion, extempore and other activities should be conducted during lab classes.

Course Content:

Unit – 1:

Basic Common Communication Problems and their Solutions

Unit – 2:

Introduction to Phonetics

Sounds: consonant, vowel. Transcription of words (IPA), weak forms etc.

Unit – 3:

Speaking and Listening Skills

Standard and Formal Speech: Oral presentations, Group Discussions, Public Speaking, Business presentations etc. Conversation practice and role playing, Job interviews, Note taking etc.

Unit – 4:

Non-verbal Communication

Proxemics, Haptics and Kinesics

Members of the Syllabus Sub-committee for *Communication Skills in English*:-

1. Prof. Rimi B. Chatterjee (Expert),
Professor, Department of English, Jadavpur University and former Professor of English at IIT, Kharagpur, West Bengal.
(Prof. Chatterjee, the subject expert, has wide ranging experience in teaching Communication Skills in English to Engineering students, both in IIT, Kanpur and Jadavpur University).
2. Ms. Purna Biswas (Member), Lecturer in Humanities, EIJE, Dalalpukur, Howrah
3. Mr. Santanu Mitra (Member), Lecturer in Humanities, Women's Polytechnic, Kolkata
4. Mr. Hemadri Chatterjee (Convener), Lecturer in Humanities, Ramakrishna Mission Shilpapitha, Belgharia, Kolkata

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Proposed Syllabus for Engineering Graphics

Name of the Course :		Engineering Graphics	
Course Code :		Semester : First	
Duration : 17 Weeks		Maximum Marks :	: 100
Lecture : Nil		Assignment	: 20
		Class Performance	: 20
Tutorial : Nil		Viva Voce	: 10
		Attendance	: 10
Practical : 3 hrs./week		External (Viva, Sketch Book & Drawing Sheet)	: 40
Credit : 1.5			

Aim :

1. The Course is aimed to develop the basic graphic skills so that the students can prepare Engineering Drawing in their practical field.
2. Understand the fundamentals of Engineering Graphics.
3. Read and interpret object drawing.
4. To develop the skills of Computer Aided Drafting and can easily cope up the skill of drafting for modern drawing offices/industries.

Objectives :

1. To develop sense of Scale and drawing technique of different curves and their application.
2. To develop drafting and sketching skills, to know the applications of drawing equipment and get familiarize with Indian Standards related to engineering drawing.
3. To develop concept of Orthographic Projection and to draw Orthographic Views for different objects.
4. To visualize three dimensional objects from Orthographic Views and to draw isometric views/projections.
5. To be familiar with AutoCAD and to develop the skill of drafting in AutoCAD by using different commands.

Pre-requisites :

1. Unambiguous and clear visualization.
2. Sound Pictorial Intelligence.

Unit No.	Contents
Unit 1	1.1 Letters and numerals (Single Stroke Vertical) 1.2 Conventions of lines and their applications 1.3 Concept of Representative Fraction (R.F), Reduced scale, Enlarged scale & Full Scale, Engineering Scale such as Plain Scale & Diagonal Scale. 1.4 Dimensional Techniques - Unidirectional System and Aligned System.
Unit 2	2.1 Geometrical Construction : a) Draw Regular Polygons, Ellipse, Parabola, hyperbola b) Draw Curve passing through given no. of points, cycloid, involute of a circle and polygon
Unit 3	3.1 Introduction to Orthographic Projection : Concept of First Angle & Third Angle of projection. Projections of lines(limited to both ends in 1st quadrant) : parallel to the reference planes, inclined to the reference planes (1 st Angle Method) 3.2 Projections of solid body: Regular Polygonal Pyramid, Cylinder, Cone - inclined to only one reference plane (1 st Angle Method)

Unit 4	4.1 Conversion of Pictorial Views into orthographic views (Simple Objects & First Angle Projection Method Only)
Unit 5	5.1 Introduction to Isometric Projections, Concept of Isometric Scale and Isometric Views 5.2 Conversion of Orthographic views into Isometric Views/Projections : Simple Objects e.g. regular prism, pyramid, cone, cylinder.
Unit 6	6.1 Free hand sketches of engineering elements such as thread profile, nuts, bolts, studs, set screws, washers, locking arrangements etc. and their conventional representation (For branches other than Mechanical Engineering, the teachers should select branch specific elements for free hand sketching)
Unit 7	7.1 Introduction to different commands and toolbars of AutoCAD a) Draw command : Lines, Circle, Polygon, Arc, Ellipse, Polyline, Fillet, Chamfer, Hatch, Array (Rectangular & Polar) etc. b) Modify Command : Offset, Trim, Extend, Erase, Fillet, Chamfer, Break, Lengthen, Copy, Move, Mirror, Stretch, Match Properties, Pedit etc. c) View : Zoom All, Zoom Window, Zoom Extent etc. d) Dimensioning : Dimension Setting, Linear, Aligned, Radial, Diameter, Leader, Angular etc. e) Text : Text Style, Dtext, Mtext, DDedit etc. f) Format : Limits, Layers, Pan etc. 7.2 Making a few simple 2D drawings in AutoCAD.

Sl. No.	Practical Exercise	Unit No.	Hrs.
1	Draw horizontal, vertical, 30°, 45°, 60°, 75°, different types of lines, dimensioning styles using Tee and Set Squares / Drafters. (Do this exercise in Sketch Book)	1	02
2	Write single stroke vertical alphabets and numerical (7:4 ratio) (Do this exercise in Sketch Book)	1	02
3	Draw regular geometric constructions and redraw/copy the given figure (Do this exercise in Sketch Book)	1	02
4	Draw at least two problems on plain scale and two problems on diagonal scales (Do this exercise in Sketch Book)	1	03
5	Draw problems on ellipse, parabola, involute and cycloid (Do this exercise in Sketch Book)	2	06
6	Draw at least two problems on lines and two problems on solid (First Angle Projection method) (Do this exercise in A2 size drawing sheet)	3	09
7	Plan, Elevation and Side View of at least two pictorial views to be drawn on one A2 size Drawing Sheet along with dimensions	4	06
8	At least Two Isometric Views and two Isometric Projections to be drawn on one A2 size Drawing Sheet	5	06

9	Draw free hand sketches / conventional representation of machine elements such as thread profile, nuts, bolts, studs, set screws, washers, locking arrangements etc.	6	03
10	Simple geometrical figures such as triangle, rectangle, polygon, circle, ellipse, and simple orthographic views of brackets, gaskets etc. to be drawn in AutoCAD and Printout to be taken on A4 size Sheet. At least two sheets to be prepared.	7	12
Total Period			51

Text Books:

Name of Authors	Title of the Book	Edition	Name of the Publisher
N.D.Bhatt	Engineering Drawing	53 rd Edition	Charotkar Publishing House
R.K.Dhawan	Engineering Drawing	Revised Edition 2015	S.Chand & Co.
K. Venugopal & V. Prabhuraja Raja	Engineering Drawing and Graphics + AutoCAD		New Age Publication

Reference Books:

Name of Authors	Title of the Book	Edition	Name of the Publisher
S.N. Lal	Engineering Drawing		CENGAGE
Basant Agrawal & C M Agrwal	Engineering Drawing		Tata McGrew Hill
Dhananjay A Jolhe	Engineering Drawing with an Introduction to AutoCAD		Tata McGrew Hill
S.P.Dey	AutoCAD 2014		Vikas Publisher
P.S. Gill	Engineering Drawing		S.K.Kataria & Sons.

References :

- 1.Engineering Graphics Syllabus of AICTE Model Curriculum 2019.
2. Syllabus of Technical Drawing (Old) of W.B.S.C.T.E

Engineering Workshop Practice

Course Code	:	
Course Title	:	Engineering Workshop Practice
Number of Credits	:	3(L-0, T-0, P-3)
Prerequisites	:	
Course Category	:	Engineering Science
Semester	:	First

COMPETENCY

The Engineering Workshop Practice Course should be taught and implemented with the aim to develop the following Course Outcomes (COs) so that the students will be able to prepare simple jobs on the shop floor of the engineering workshop.

COURSE OUTCOMES

The theory and practical experiences associated with the course, the students will gain the following industry oriented COs:

- Read and interpret job drawings
- Select tools, equipment and machineries according to the job.
- Use the hand tools in different shops for performing different operations
- Prepare the job according to drawing
- Adopt safe working practice.
- Maintenance of workshop tools, equipment and machineries.
- Acquaint with the specifications on all raw materials, tools and equipments used.

COURSE CONTENT

Course Content: There are 9 (nine) modules out of which 6 modules should be taught. Selection of these six modules should be in the following manner. Module 1, 2 and 3 are compulsory and any three from rest as deemed fit for the branch and availability in the institute.		
Module No. & Name	Details of Workshop Content	Hours
1. <i>Electrical Wiring</i>	1. Introductory Session <ul style="list-style-type: none">• Safety precautions to be followed in Electrical Works• Electric shock, methods of shock treatment• Safety measure: Earthing, Fuse, circuit breakers, etc.• Different types of wire-gauge & strands and their applications• Different tools used in Electrical wiring works• General wiring accessories & their uses.	

	<ul style="list-style-type: none"> • Types of switches and their application. • Types of wiring and joints. <p>Practical (any three)- Group works</p> <ol style="list-style-type: none"> 1. Study/ demonstration of single phase electrical service connection from pole to house including consumer installation. 2. Study of different types of wiring and connection of Single Phase Motor (Fan). 3. Circuits for one lamp controlled by one switch by surface conduit wiring, 4. Lamp circuits- connection of lamp and socket by separate switches, Connection of Fluorescent lamp/tube light, 5. Simple lamp circuits- install bedroom lighting 6. Simple lamp circuits- install stair case wiring. 7. Wiring of calling-bell 	10 hrs
2. Fitting	<p>1. Introductory Session</p> <ul style="list-style-type: none"> • Demonstration of different tools and equipment used in fitting shop. • Study of different precious measuring instrument such as micrometer, vernier calipers, bevel protectors. • Care and maintenance of the above mentioned tools and equipment. • Study of drilling machines and power tools used in fitting shop. • Safety measure to be followed in Fitting shop. <p>2. Practical/ Demonstration</p> <ul style="list-style-type: none"> • Demonstration of different fitting job operations like chipping, filing, drilling, tapping, sawing, cutting etc. <p>Job Preparation -Individual Works</p> <ul style="list-style-type: none"> • One simple fitting job involving practice of chipping, filing, marking, drilling, tapping, cuttingetc. 	10 hrs
3. Welding	<p>1. Introductory Session</p> <ul style="list-style-type: none"> • Purpose of welding, advantages & disadvantages of it over other joining processes. • Types of welding processes (in brief) • Specification, usage, care & maintenance of various welding machines, tools & equipment used in the shop. • Selection of welding methods and electrodes. • Safety measures & equipment required while working in welding shop. 	10 hrs

	<p>2. Practical/ Demonstration</p> <ul style="list-style-type: none"> • How to start an Arc & use it for Arc Welding, sustainably. • Demonstration of various welding m/c, tools, equipment available in the shop. • Demonstration of shielded metal arc welding (SMAW), Gas welding and cutting. • Repairing of broken metal structures using welding. • Defects of welding & their remedies. <p>Job Preparation (Any One)-Individual Works Job 1 – Butt Joint Job 2 – Lap Joint Job 3 – ‘T’ Joint</p>	
<i>4. Carpentry</i>	<p>1. Introductory Session</p> <ul style="list-style-type: none"> • Raw materials used in carpentry shop: wood & alternative materials. • Specification, usage, care & maintenance of various tools, equipment and machineries used in the Carpentry shop. • Types of wood. Difference between hard and soft wood. • Timber: characteristics, usage and defects. Difference between wood and timber. • Seasoning of wood. • Different types of joints such as cross half-lap joint, through tenon and mortise joint, dove tail joints, etc. • Safety measures to be taken in carpentry shop. <p>2. Practical/Demonstration</p> <ul style="list-style-type: none"> • Demonstration of use of different tools, equipment and machineries. • Demonstration of different wood working processes, like planing, marking, chiseling, grooving, turning of wood etc. <p>Job Preparation -Individual Works One simple job involving any one joint.</p>	10 hrs
<i>5. Sheet Metal Working</i>	<p>1. Introductory Session</p> <ul style="list-style-type: none"> • Briefing on different types of sheet metal, like Stainless Steel Sheet Metal, Copper Sheet Metal, Brass Sheet Metal, Corrugated Sheet Metal, Galvanized Sheet Metals etc., and their uses. • Demonstration of different types of Tools& machines and their use in sheet metal work. 	

	<ul style="list-style-type: none"> • Demonstration of different types sheet metal joints and their applications. • Demonstration of different types of sheet metal working: cold working, hot working, warm working, bending, drawing, end curling, shearing, piercing, sheet metal presses, etc. • Sheet metal joining operation like welding, brazing, soldering and riveting. • Safety measure to be followed in sheet metal work. <p>2. Practical: Making of any simple job(example: sheet metal mug) involving different sheet metal operations including soldering and riveting.</p>	10 hrs
6. Smithy/Forging	<p>1. Introductory Session</p> <ul style="list-style-type: none"> • Purpose of Smithy / Forging Works • Different types of Hearths used for Smithy / Forging works • Specification, usage, care and maintenance of various tools and equipment used in the shop. • Types of raw materials used in Smithy / Forging shop & their required temperature for it. • Types of fuel used in hearth and the respective maximum temperature obtained. • Uses of Fire Bricks & Clays in Smithy/Forging Work Shop. • Types of heat treatment processes involved in Smithy / Forging shop and its effect on forged items. • Hot forge & cold forge utility. • Safety measures & equipment required while working in Smithy / Forging Shop <p>2. Practical/ Demonstration</p> <ul style="list-style-type: none"> • Practice / Demonstration of firing of hearth / Furnace, Cleaning of Clinkers and Temperature Control of Fire. • Practice / Demonstration on different basic Smithy / Forging operations such as Upsetting, Drawing down, Setting down, Necking, Cutting, Bending, Fullering, Swaging, Punching and Drifting etc. <p>Demonstration on making of</p> <ul style="list-style-type: none"> • Cube, hexagonal cube, hexagonal bar from round bar. • Hexagonal /octagonal flat chisel including tempering of edges. 	10 hrs

	<p>Job Preparation (Any one) – group effort by students</p> <ul style="list-style-type: none"> • Job 1 Making a cold / hot flat chisel • Job 2 Simple Tong • Job 3 Production of any other utility tools/ items -e.g. Chain-links, door ring, hexagonal bolt / square shank boring tool, fan hook (long S-type) etc. 	
7. <i>Machine shop Practice</i>	<p>1. Introductory Session</p> <ul style="list-style-type: none"> • Purpose of a machine shop/ workshop in industry. • Demonstration of all available tools & tackles of machine shop. • Inculcation of basic idea of machine tool; differentiation between machine & machine tool. • Familiarization of all machine tools in the machine shop. • Safety precautions for working in a machine shop. <p>2. Practice in Machine Shop</p> <ul style="list-style-type: none"> • Identification of different parts of a lathe and utility of those parts. • Demonstration of all possible machining operation on a lathe, e.g. turning, facing, parting, taper turning, drilling, threading etc. • Demonstration to operate a drilling machine or shaping machine and identifying different parts of that m/c tool. <p>Job Practice-(Individual work)</p> <p>Preparation of one job in Lathe, involving simple machining operations (e.g. turning, facing, grooving, threading, knurling etc.).</p>	10 hrs
8. <i>Electronic Shop</i>	<p>1. Introductory Session</p> <ul style="list-style-type: none"> • Discussion on active and passive electronic components. • Discussion on soldering and its use. • Introduction on multi-meter and its use. • Discussion on use of test equipment in fault finding. • Discussion on resistor, capacitor, amplifiers, relay, diodes, zener diode and LEDs. • Safety measure to be followed in electronic shop. <p>2. Practical/ Demonstration</p> <ul style="list-style-type: none"> • Familiarization, identification and testing of active and passive components. • Soldering and de-soldering practice. 	10 hrs

	<ul style="list-style-type: none"> • Use of Multi meter (both Analog and digital). • Demonstration of resistor, capacitor, amplifiers, relay, diodes, zener diode and LEDs. 	
9. <i>Demonstration</i>	<p>Following demonstration may be conducted:</p> <ol style="list-style-type: none"> 1. Demonstration of measurement of Current, Voltage, Power and Energy for an electrical system/ wiring. 2. Demonstration of advanced power tools such as pneumatic tools, electrical portable grinding tools and accessories. 3. Demonstration of bourdon tube pressure gauge. 4. Demonstration of ball bearing and roller bearing. 5. Demonstration of portable power tools for Cutting and drilling, etc. 	10 hrs

LEARNING OUTCOMES (LOs)

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

- Understand the basic safety measure to be followed in different works.
- Understand basic engineering processes for manufacturing and assembly.
- Understand and interpret job drawings, produce jobs, and inspect the job for specified dimensions.
- Understand the various types of wiring systems and acquire skills in electrical wiring.

References

- [1] S.K. HazraChaudhary, Workshop Technology, Volume I&II, Media Promoters and Publishers, Mumbai.
- [2] B.S. Raghuwanshi, Workshop Technology, Volume I&II, DhanpathRai and Sons, New Delhi 2014
- [3] K. Venkat Reddy, Workshop Practice Manual, BS Publications, Hyderabad 2014
- [4] Kents Mechanical Engineering Hand book, John Wiley and Sons, New York
- [5] H.S. Bawa, Workshop Practice, Mcgrawhill HED
- [6] R.P. Singh, Electrical Workshop: Safety, Commissioning, Maintenance & Testing of Electrical Equipment, Wiley

Teachers should use the following strategies to achieve the various outcomes of the course.

- Different methods of teaching and media to be used to attain classroom attention.
- Massive open online courses (MOOCs) may be used to teach various topics/sub topics.
- 15-20% of the topics which are relatively simpler of descriptive in nature should be given to the students for self-learning and assess the development of competency through classroom presentations.
- Micro-projects may be given to group of students for hand-on experiences
- Encouraging students to visit to sites such as Railway station and research establishment around the institution.

Learning Outcomes:

At the end of the course student will be able to

- To express quantitative measurements accurately.
- To practice and adapt good measuring techniques.
- To use various apparatus for precise measurements.
- To understand and differentiate different methods of quantitative analysis.
- To know and understand principles of quantitative analysis using instruments.
- To construct different electrochemical cells used in developing batteries.
- To understand and appreciate methods of corrosion abetments.

Reference Books:

1. Text Book of Chemistry for Class XI & XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
2. Dr. G. H. Hugar and Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTTR, Chandigarh, Publications, 2013-14.
3. Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt.Ltd., 2014.
4. Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.

Course Code	:	HS103
Course Title	:	Sports and Yoga
Number of Credits	:	1(L:0,T:0,P:2)
Prerequisites	:	NIL
Course Category	:	HS

Course Objectives:

- To make the students understand the importance of sound health and fitness principles as they relate to better health.
- To expose the students to a variety of physical and yogic activities aimed at stimulating their continued inquiry about Yoga, physical education, health and fitness.
- To create a safe, progressive, methodical and efficient activity based plan to enhance improvement and minimize risk of injury.
- To develop among students an appreciation of physical activity as a lifetime pursuit and a means to better health.

**Course Content:**

- **Introduction to Physical Education**
 - Meaning & definition of Physical Education
 - Aims & Objectives of Physical Education
 - Changing trends in Physical Education
- **Olympic Movement**
 - Ancient & Modern Olympics (Summer & Winter)
 - Olympic Symbols, Ideals, Objectives & Values
 - Awards and Honours in the field of Sports in India (Dronacharya Award, Arjuna Award, Dhyanchand Award, Rajiv Gandhi Khel Ratna Award etc.)
- **Physical Fitness, Wellness & Lifestyle**
 - Meaning & Importance of Physical Fitness & Wellness
 - Components of Physical fitness
 - Components of Health related fitness
 - Components of wellness
 - Preventing Health Threats through Lifestyle Change
 - Concept of Positive Lifestyle
- **Fundamentals of Anatomy & Physiology in Physical Education, Sports and Yoga**
 - Define Anatomy, Physiology & Its Importance
 - Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.)
- **Kinesiology, Biomechanics & Sports**
 - Meaning & Importance of Kinesiology & Biomechanics in Physical Edu. & Sports
 - Newton's Law of Motion & its application in sports.
 - Friction and its effects in Sports.
- **Postures**
 - Meaning and Concept of Postures.
 - Causes of Bad Posture.
 - Advantages & disadvantages of weight training.
 - Concept & advantages of Correct Posture.
 - Common Postural Deformities – Knock Knee; Flat Foot; Round Shoulders; Lordosis, Kyphosis, Bow Legs and Scoliosis.
 - Corrective Measures for Postural Deformities



- **Yoga**
 - Meaning & Importance of Yoga
 - Elements of Yoga
 - Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas
 - Yoga for concentration & related Asanas (Sukhasana; Tadasana; Padmasana & Shashankasana)
 - Relaxation Techniques for improving concentration - Yog-nidra
- **Yoga & Lifestyle**
 - Asanas as preventive measures.
 - Hypertension: Tadasana, Vajrasana, Pawanuktasana, Ardha Chakrasana, Bhujangasana, Shavasana.
 - Obesity: Procedure, Benefits & contraindications for Vajrasana, Hastasana, Trikonasana, Ardha Matsyendrasana.
 - Back Pain: Tadasana, Ardha Matsyendrasana, Vakrasana, Shalabhasana, Bhujangasana.
 - Diabetes: Procedure, Benefits & contraindications for Bhujangasana, Paschimottasana, Pawanuktasana, Ardha Matsyendrasana.
 - Asthma: Procedure, Benefits & contraindications for Sukhasana, Chakrasana, Gomukhasana, Parvatasana, Bhujangasana, Paschimottasana, Matsyasana.
- **Training and Planning in Sports**
 - Meaning of Training
 - Warming up and limbering down
 - Skill, Technique & Style
 - Meaning and Objectives of Planning.
 - Tournament – Knock-Out, League/Round Robin & Combination.
- **Psychology & Sports**
 - Definition & Importance of Psychology in Physical Edu. & Sports
 - Define & Differentiate Between Growth & Development
 - Adolescent Problems & Their Management
 - Emotion: Concept, Type & Controlling of emotions
 - Meaning, Concept & Types of Aggressions in Sports.
 - Psychological benefits of exercise.
 - Anxiety & Fear and its effects on Sports Performance.
 - Motivation, its type & techniques.
 - Understanding Stress & Coping Strategies.



- **Doping**
 - Meaning and Concept of Doping
 - Prohibited Substances & Methods
 - Side Effects of Prohibited Substances
- **Sports Medicine**
 - First Aid – Definition, Aims & Objectives.
 - Sports injuries: Classification, Causes & Prevention.
 - Management of Injuries: Soft Tissue Injuries and Bone & Joint Injuries
- **Sports / Games**

Following sub topics related to any one Game/Sport of choice of student out of: Athletics, Badminton, Basketball, Chess, Cricket, Kabaddi, Lawn Tennis, Swimming, Table Tennis, Volleyball, Yoga etc.

 - History of the Game/Sport.
 - Latest General Rules of the Game/Sport.
 - Specifications of Play Fields and Related Sports Equipment.
 - Important Tournaments and Venues.
 - Sports Personalities.
 - Proper Sports Gear and its Importance.

References:

1. Modern Trends and Physical Education by Prof. Ajmer Singh.
2. Light On Yoga By B.K.S. Iyengar.
3. Health and Physical Education – NCERT (11th and 12th Classes)

Course Outcomes:

On successful completion of the course the students will be able to:

- (i) Practice Physical activities and Hatha Yoga focusing on yoga for strength, flexibility, and relaxation.
- (ii) Learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.
- (iii) Learn breathing exercises and healthy fitness activities
- (iv) Understand basic skills associated with yoga and physical activities including strength and flexibility, balance and coordination.
- (v) Perform yoga movements in various combination and forms.
- (vi) Assess current personal fitness levels.
- (vii) Identify opportunities for participation in yoga and sports activities.
- (viii) Develop understanding of health-related fitness components: cardiorespiratory endurance, flexibility and body composition etc.
- (ix) Improve personal fitness through participation in sports and yogic activities.
- (x) Develop understanding of psychological problems associated with the age and lifestyle.



- (xi) Demonstrate an understanding of sound nutritional practices as related to health and physical performance.
- (xii) Assess yoga activities in terms of fitness value.
- (xiii) Identify and apply injury prevention principles related to yoga and physical fitness activities.
- (xiv) Understand and correctly apply biomechanical and physiological principles related to exercise and training.

Course Code	:	HS105
Course Title	:	Communication Skills in English - Lab
Number of Credits	:	1 (L: 0, T: 0, P: 2)
Prerequisites	:	NIL
Course Category	:	HS

Course Objectives:

Communication skills play an important role in career development. This lab course aims at actively involving students in various activities to improve their communication skills with an emphasis on developing personality of the students. Thus, the objectives of this course are:

1. To develop listening skills for enhancing communication.
2. To develop speaking skills with a focus on correct pronunciation and fluency.
3. To introduce the need for Personality development- Focus will be on developing certain qualities which will aid students in handling personal and career challenges, leadership skills etc. for that purpose group discussion, extempore and other activities should be conducted during lab classes.

Course Content:

Unit 1 Listening Skills

Listening Process and Practice: Introduction to recorded lectures, poems, interviews and speeches, listening tests.

Unit II Introduction to Phonetics

Sounds: consonant, vowel, diphthongs, etc. transcription of words (IPA), weak forms, syllable division, word stress, intonation, voice etc.

Unit III Speaking Skills

Standard and formal speech: Group discussion, oral presentations, public speaking, business presentations etc. Conversation practice and role playing, mock interviews etc.

Unit IV Building vocabulary

Etymological study of words and construction of words, phrasal verbs, foreign phrases, idioms and phrases. Jargon/ Register related to organizational set up, word exercises and word games to enhance self-expression and vocabulary of participants.

Recommended Readings:

1. Daniel Jones. *The Pronunciation of English*. Cambridge: Cambridge University Press, 1956.
2. James Hartman & et al. Ed. *English Pronouncing Dictionary*. Cambridge: Cambridge University

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz -10
Practical: Nil	End Semester Exam(ESE) - 70
Credit :- 3	Total Marks 100

Aim:-

1. Developing the surveying skill required for civil engineering.

Objective :-Students will be able to:

1. Use the survey instruments.
2. Take linear and angular measurements.
3. Measure the area of land.
4. Prepare layouts and maps.
5. Set out alignments for roads, railways, canals, pipelines, tunnels etc.
6. Prepare contour map.
7. Compute area and volume from given contour map.

Pre-Requisite :-

Student should be perfect in drawing and sketching.

Sl No	Topic	Contact period	Maximum Marks
1	Unit -1 Types Of Survey	2	6
2	Unit -2 Measurement of horizontal distance	9	12
3	Unit – 3 Compass Survey	9	14
4	Unit – 4 Levelling	14	14
5	Unit – 5 Contouring	4	8
6	Unit – 6 Area measurements	4	10
7	Unit – 7 Plane Table Surveying	6	6
	TOTAL =	48	70

Contents: Theory (Surveying) 3Hrs/week

Unit -1Types of Survey

Definition, objects of surveying, principles of surveying, uses of survey, classification of surveying - primary – plain, geodetic, secondary – based on instruments, method, object, nature of field.

Unit -2 Measurement of horizontal distance

2.1Introduction

2.2 Methods of measuring horizontal distance – pacing, odometer reading, tacheometry, electronic distance measurement, chaining and taping

2.3 Principles of chain surveying and accessories for chaining and taping - chain, tape, ranging rod, arrows, pegs, cross staff, optical square, ranging rod, plumb bob, object rod

2.4 Measurement by chain – on level ground and on sloping ground, reduction to measurement in slope, ranging – direct and indirect ranging

2.5 Systematic errors in linear measurement by chain or tape – incorrect length, tape or chain not horizontal, fluctuation in temperature, incorrect tension or pull, sag and incorrect alignments and chain or tape not straight, necessary corrections, **numerical problems**

2.6 Chain and tape survey of a field - survey lines, check lines, tie lines, base line. taking offsets – perpendicular and oblique offset, long and short offset, degree of offset, error in offset, limiting length of offset, points to be considered in selecting station

2.7 Setting out right angles – a. by instruments (cross staff, optical square, their working methodology and specific use in field) b. by chain or tape

2.8 Obstacles in chaining – obstacles to ranging but not chaining, obstacles to chaining but not ranging, obstacles to both chaining and ranging, **numerical problems**

2.9 chain & cross staff survey for finding area of a field (**numerical problems**)

2.10 Field work for chain survey, booking the field work, conventional signs related to survey, degree of accuracy of chaining

Unit – 3 Compass Survey

3.1 Brief introduction to different types of horizontal angles and directions, Principle of compass survey, bearing of lines – meridian – true, magnetic, and arbitrary bearing, fore bearing, back bearing, whole circle bearing, quadrantal bearing system and reduced bearing, conversion of bearings, finding included angles from bearings, declinations, dip of the magnetic needle. (**Numerical problems**)

3.2 Prismatic compass, and trough compass – component, construction and use.

3.3 Local attraction, causes, precautions to be taken to avoid local attraction and correction of bearings affected due to local attraction, calculation of included angles.

3.4 Traversing – open traverse, closed traverse, check on open and closed traverse, Graphical adjustment for closing error.

3.5 **Numerical problems** on calculation of bearings, angles and local attraction.

3.6 Error in compass surveying – instrumental error, personal error and natural error, permissible value of error

Unit – 4 Levelling

4.1 Definitions – level surface, level line, horizontal line, vertical line, datum surface, mean sea level, reduced level, bench mark and its types.

4.2 Study and use Engineers' level – a. dumpy level – components, construction b. tilting level and c. automatic level or self levelling level

4.3 Terms used in levelling - line of sight, line of collimation, bubble tube axis, leveling staff – telescopic and folding type, foresight, back sight, intermediate sight, change point, height of collimation, fundamental axes and their relationship, recording in level book, temporary adjustments of dumpy level, procedure for permanent adjustment

4.4 Method of reduction of levels – height of instrument method and rise and fall method- relative merit and demerits, arithmetical checks, numerical problems, computation of missing readings.

4.5 Classifications of leveling - simple, differential, profile, cross sectional, fly and check levelling (**numerical problems**)

4.6 Sources of errors in levelling – instrumental error, personal error and natural error, precautions and reducing errors and eliminating mistakes in levelling, error adjustment, permissible error in levelling, difficulties faced in levelling.

Unit – 5 Contouring

5.1 Definitions – contour, contour interval, horizontal equivalent.

5.2 Characteristics of contours (e.g. pond, cliff, overhanging cliff, etc) method of locating contours – indirect method of contouring (interpolation of contours), direct contouring methods, establishing grade contours.

5.3 Uses of contour maps, interpretation of typical contour sheets.

Unit – 6 Area measurements

6.1 Introduction

6.2 Methods of measuring areas

6.2.1 Area of a tract with irregular boundaries – graphical method, mid ordinate rule, average ordinate rule, trapezoidal rule, Simpson's rule (only formula and their applications) – **numerical problems**

6.2.2 Use of planimeter for measurement of area

Unit – 7 Plane Table Surveying

7.1 Introduction – principle of plane table surveying

7.2 Equipment and accessories in plane table surveying, their use

7.3 Working with plane table – fixing, levelling, centering, orientation – by trough compass and by back sighting

7.4 Different methods of plane tabling work: a. radiation, b. intersection, c. traversing and d. resection – three point problem

7.5 Advantage and disadvantage of plane table survey, errors in plane table survey – instrumental, in plotting and due to manipulation and sighting.

Assignment shall consist of record of all practical and projects in field book and drawing of Project work on full imperial size drawing sheets.

- 1) Measurement of distances with chain & tape on ground with direct or indirect ranging.
- 2) Construction and use of optical square and open cross staff for setting out perpendicular and running a survey line for locating details .
- 3) Measurement of area by chain and cross staff survey.
- 4) Use of prismatic compass and observing fore bearing and back bearing.
- 5) Measuring fore bearing and back bearing of 5-6 side closed polygon. Identifying stations affected by local attraction and calculation of corrected f.b. & b.b.
- 6) Measuring fore bearing and back bearing for an open traverse (5 to 6 sided). Calculate direct angles between successive lines.
- 7) Use of dumpy level, temporary adjustments and taking reading on levelling staff. Recording readings in field book.
- 8) Differential levelling practice, reduction of level by h.i. method.
- 9) Differential levelling practice, reduction of level by rise & fall method.
- 10) Carrying bench mark from one point to another point about 200 m by fly levelling with dumpy level/tilting Level.
- 11) Use of auto level and taking observation.
- 12) Measurement of area of irregular figure by polar planimeter/Measuring area enclosed by closed contours on contour map prepared earlier, by simple digital Planimeter
- 12) Using accessories carry out temporary adjustments of plane table. Locating details by method of radiation.
- 13) Locating details with plane table by method of intersection.

Note: during initial phase of implementation of curricula number and nature of jobs within the assignment work may be compromised. However lacuna should be rectified at the earliest.

Text books:

Name	Authors	Publisher	Editions
Surveying and Levelling	R. Subramanian	Oxford University Press	
Fundamental of surveying	S.K.Roy	PHI	

Plane surveying	A.M.Chandra	New age international	
Surveying and Levelling vol. I and II	S. K. Duggal	TATA MC GRAW-HILL	
Surveying and Levelling vol. I and II	Dr. B. C. Punmia	Laxmi Publication	

WBSCTE

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz - 10
Practical: Nil	End Semester Exam(ESE) - 70
Credit :- 3	Total Marks 100

Aim:-Developing the conceptual knowledge in building material, construction, problems and its remedies.

Objective:-

1. Identify various components of buildings and their functions.
2. Mark layout of building on ground.
3. Know the procedure for execution of various constructions activities.
4. Check line, level and plumb of various construction activities.
5. Prepare checklist of operations for supervision of various construction activities.
6. Identify & suggest rectification the various defects in civil engineering works.

Pre-Requisite:-

1. Student should be able to read the building plans.
2. Student should be able to think over the construction problems and their remedies.
3. Student should know the basic properties of material being used in the construction of the building.

Sl No	Topic	Contact period	Maximum Marks
Unit-1	Building components and materials	8	14
	1.1 Building components and types of structure		
	1.2 Masonry materials		
Unit 2	Construction of substructure	8	12
Unit 3	Construction of superstructure	12	14
Unit 4.	Building finishes	11	14
Unit 5	Wall Finishes	3	8
Unit 6	Building maintenance	6	8
	TOTAL =	48	70

Contents: Theory (Building Materials &Construction) 3Hrs/week

Unit -1 Building components and materials

1.1 Building components and types of structure

Building components & their function, Substructure – foundation, plinth, Superstructure – walls, sill, lintel, doors & windows, floor, roof, parapet, beams, columns; Types of structures – load bearing structures, framed Structures, composite structures.

1.2 Masonry materials

Building stones- classification of rocks (physical, chemical), requirement of good building stone, dressing of stones, quarrying of stones, artificial or cast Stones

Bricks – conventional bricks, standard bricks, composition of clay brick, strength of bricks, proportions of burnt clay bricks, testing of bricks, special bricks (fire clay brick, refractory brick, hollow blocks, fly ash bricks).

Mortars – classifications, lime mortar, cement mortar, composite mortar, special mortars, functions of mortar, proportions, properties of mortar and tests for mortar.

Timber & Timber based material - Use of timber, characteristics of good timber, defects in timber, plywood, particle board, veneer, sun mica, artificial timber, rubber wood.

Miscellaneous materials - Glass, plastic, fibers, aluminum, steel, galvanized iron, asphalt bitumen etc, micro silica, pvc, cpvc, ppf, waterproofing and termite proofing materials, admixtures in concrete, bonding agents, epoxy resins, polishing materials etc

Unit 2.Construction of substructure:

2.1 Job layout

Site clearance, preparing job layout, layout for load bearing structure and framed structure by center line, precautions while marking layout on ground.

2.2 Earthwork

Excavation for foundation, Shoring and strutting, earthwork for embankment, material for plinth filling, tools and plants used for earthwork.

2.3 Foundation

Types of foundation – open foundations, shallow foundation, stepped foundation, isolated and combined column footing, raft foundation, deep foundation and pile foundation; Pumping method of dewatering, cofferdams, bearing capacity of foundation soil, under reamed pile foundation.

Unit 3 Construction of superstructure

3.1 Stone masonry - Terms used in stone masonry – facing, backing, hearting, through stone, Corner stone, uncoursed rubble masonry, coursed rubble masonry, point to be observed in construction of stone masonry, mortars for stone masonry, tools and plants used for stone masonry, col-grout masonry.

3.2 Brick masonry - Common terms used in brick masonry, requirements of good brickwork, bonds in brick masonry (English, flemish, stretcher and header bonds, junction of wall – main wall to main wall and main wall to partition wall only), brick laying, line level and plumb of brickwork, striking and raking of Joints, lead and lift, precautions in brick masonry, tools and plants used in brick masonry, pointing, comparison between brick and stone masonry. Hollow concrete block Masonry, composite masonry, Cavity wall- purpose and construction.

3.3 Doors and windows

Doors -components and construction of panelled doors, battened doors, flush doors, collapsible doors, rolling shutters, revolving doors, glazed doors, sizes of door, PVC door

Windows - component and construction of fully panelled, partly panelled and glazed, glazed wooden, steel, aluminum windows, sliding windows, louvered window, ventilators, cement grills, protective treatment for doors and windows, fixtures and fastenings for doors and window, sill, lintel and weather shed - functions, types and construction.

3.4 Vertical communication - Means of vertical communication – stair case, elevator, ramp, requirement of good staircase, types of staircase, fabricated stair.

3.5 Scaffolding and shoring- Purpose, types of scaffolding, process of erection and dismantling; purpose and types of shoring, underpinning, safety precautions.

Unit 4 Building finishes

4.1 Floors and roofs - floor finishes - shahabad, kota, marble, granite, kadappa, ceramic tiles, vitrified, mosaic tiles, chequered tiles, glazed tiles, pavement blocks, concrete floors, tremix floor, skirting and dado, terrazzo flooring, IPS flooring; Process of laying - process of laying and construction, finishing and polishing of floors.

4.2Roofing materials – ac sheets, G.I sheets, plastic sheets, fibre sheets, mangalore tiles etc. Steel trusses. Timber trusses, R.c.c. slab

4.3 Water Proofing Treatment

Introduction, material required for water proofing and its specification, Water proofing of water closet and bath room, procedure & Cross section, Terrace and basement water proofing, Precautions to be taken while water proofing.

4.4 Termite Proofing

Introduction, general principles of termite proofing, Methods of termite proofing, Material used in termite proofing treatment.

4.5 Damp Proofing

Sources of dampness & its effects, Material used for damp proofing, Methods of damp – proofing. Damp proofing treatment, in building such as basement, floors, walls.

Unit 5 Wall finishes

5.1 **Plastering** – necessity of plastering, single coat plaster double coat plaster, neeru finishing and pop, special plasters stucco plaster, Plaster board and wall claddings. Precaution to be taken while, Plastering. Defects in plaster.

5.2 **Pointing** – necessity, types and procedure of pointing.

5.3 **Painting** – necessity, surface preparation, method of application, selecting suitable painting material, white wash and colour wash.

Unit 6. Building maintenance

6.1 **Cracks** - causes and types of cracks, identification and repair of cracks, guniting and grouting, use of epoxy and crack fills, remedial measures

6.2 **Settlement** - causes and remedial measures; Plinth protection – necessity and materials used.

6.3 **Demolition** - Necessity, method of demolition-hand demolition, machine demolition, Controlled blasting demolition, precautions during demolition.

6.4 **Rebaring techniques** - Necessity and equipment for rebaring techniques

List of assignment:

1. Preparing foundation plan and marking on ground layout of load bearing structure by face line method from the given plan of the building.
 2. Preparing foundations plan and marking on ground layout of framed structure by face line method from the given plan of the building.
 3. Checking and transferring line and level of plinth, sill, lintel, flooring, slab level of a building and writing report of the process.
 4. Checking verticality (plumb line) of formwork for column, beam and wall at construction site and writing report of the process.
 5. Laying and constructing the process of construction of brickwork and report writing of the process.
 6. Observing the process of painting in residential / public building and writing a report with reference to process and type of paint selected.
 7. Observing and writing report of the process of plastering.
 8. Observing and writing report of the process of water proofing of terrace or basement.
- Observing the models, specimen of building materials kept in the model room for few building items and writing a report for any five models/materials.

Text books:-

Titles of the book	Name of authors	Edition	Name of the publisher
Construction Materials	D.N. Ghose		Tata Mcgraw-Hill
Building construction Engg	Gurcharan Singh		
Building Construction Vol. I to IV	W. B. Mackay		Pearson
Building Materials	S. K. Duggal		New Age International

Engineering Materials	Sharma		Phi Publication
Building Construction	S. P. Arora And Bindra		Dhanpat Rai Publication
Building Construction	B. C. Punmia		Laxmi Publication
Building Construction	S.K. Sharma		Tata Mcgraw-Hill
Building Construction	Sushil Kumar		Standard Publication
Building materials			NITTTR
A to z of BuildingConstruction	Mantri Construction		Mantri Publication

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	Mid Semester Exam- 20
Tutorial: NIL	Assignment & Quiz - 10
Practical : NIL	End Semester Exam(ESE) - 70
Credit :- 3	Total Marks - 100

Aim:-

1. Study of cement and concrete.

Objective:-The Students will be able to

- 1 Determine the properties of concrete ingredients i.e. cement, sand, coarse aggregate by conducting different tests.
- 2 Use different types of cement as per their properties for different fields applications.
- 3 Design economic mix proportion for different exposure conditions and intended purposes.
- 4 Supervise various concreting operations.
- 5 Carry out field and laboratory tests on concrete in plastic and hardened stage.
- 6 Use different types of admixtures to improve the properties of concrete for different field applications.
- 7 Describe different types of concrete.
- 8 Infer the test results as per relevant I.S. Provisions.

Pre-Requisite:-

1. Student should take survey of different types of materials used in building construction.

Sl No / unit no	Topic	Contact period	Marks
Unit 1	Cement	2	4
Unit 2	Types, Properties and Testing of cement	5	8
Unit 3	Properties of Aggregates and Testing	5	8
Unit 4	Water	2	5
unit 5	Admixtures and Construction Chemicals	3	6
Unit 6	Properties of Concrete	5	8
Unit 7	Concrete Mix Design	9	8
Unit 8	Quality Control of Concrete	10	10
UNIT 9	Concreting under special circumstances	3	5
Unit 10	Properties of Special Concrete	4	8

Contents: Theory (Concrete Technology) 3 Hrs/week

Unit-1 Cement:

- 1.1 Chemical composition, hydration of cement, heat of hydration, cement compounds.

Unit-2. Types, Properties and Testing of cement:

2.1 Physical properties, specifications as per relevant IS codes & field application of the following types of cement:

(i) Ordinary Portland cement (OPC), (ii) Rapid Hardening Portland cement (RHPC), (iii) Low Heat Cement, (iv) Portland Pozzolana Cement (PPC), (v) Blast furnace slag cement, (vi) Sulphate resisting cement, (vii) White cement, (viii) Quick setting Cement, (ix) Hydrophobic Cement

2.2 Testing of cement: (i) Fineness test (ii) Standard Consistency test (iii) Setting Time test (initial & final setting times) (iv) Compressive Strength test (v) Soundness test. Different grades of OPC 33, 43, 53 & their specifications of physical properties as per relevant I. S. codes. Adulteration of cement (field test), storing of cement at site, effect of storage of cement on properties of cement / concrete.

2.3 Field testing of cement

Unit -3 Properties of Aggregates and Testing:

3.1 Properties of fine aggregates:

Classification, Concept of size, shape, surface texture, strength, specific gravity, bulk density, water absorption, surface moisture, soundness, bulking impurities, alkali-aggregate reaction, source.

3.2 Determination of fineness modulus & grading zone of sand by sieve analysis, determination of silt content in sand & their specification as per IS 383 (**simple problems on fineness modulus**)

3.3 Bulking of sand, phenomenon of bulking, its effect on concrete mix proportion.

3.4 Properties of coarse aggregates :

Classification, Concept of size, shape, surface texture, water absorption, soundness, specific gravity & bulk density

3.5 Determination of fineness modulus of coarse aggregate by sieve analysis, grading of Coarse Aggregates and its effect on concrete mix proportion.

3.6 Determination of crushing value, impact value & abrasion value of coarse aggregate, flakiness index & elongation index of coarse aggregate and their specification.

Unit – 4 Water:

4.1 Qualities of water and its use as per IS:456-2000.

Unit – 5 Admixtures and Construction Chemicals

5.1 General, Types of admixtures and its effect on properties of concrete.

Unit – 6 Properties of Concrete:

6.1 Introduction to concrete: Definition of concrete, necessity of supervision for concreting operation, different grades of concrete (ordinary concrete, standard concrete & high strength concrete as per provisions of IS:456- 2000), minimum grade of concrete for different exposure conditions, minimum grade of concrete for R.C.C., water retaining structure & in sea water construction, durability of concrete.

6.2 Water cement ratio

Definition of w/c ratio, Duff Abraham w/c law, significance of w/c ratio

6.3 Properties of fresh concrete

Definition of workability, factors affecting workability of concrete. Determination of workability of concrete by slump cone test, compaction factor test, vee bee consistometer & flow table tests. Range values of workability requirement for different types of concrete works, cohesiveness, segregation, harshness, bleeding.

6.4 Properties of hardened concrete

Definition of compressive strength, durability, impermeability, elastic properties of concrete, modulus of elasticity of concrete. Creep, factors affecting creep, shrinkage, factors affecting shrinkage

Unit – 7 Concrete Mix Design

Definition, Objectives of mix design, list of different methods of mix design ,study of mix design procedure by I.S. method as per IS:10262-2009, determination of design mix proportion by mass for M20 grade of concrete using I.S. Method for given data (such as grading zone of sand, proportion of 20 mm & 10 mm aggregates, specific gravities of cement, sand & aggregates , water absorption , surface moisture of fine & coarse aggregate, compacting factor and exposure condition).

Unit – 8 Quality Control of Concrete:

8.1 Selection of ingredients of concrete, Batching, Volume & weigh batching, volume batching for nominal mixes & weigh batching for design mix concrete, Different Types of Mixers(tilting & non-tilting type). Different types of vibrators - needle vibrator, surface vibrator, table vibrator, principle & application of each type of vibrator.

8.2 Transportation, placing, compaction & finishing of concrete:

Modes of transportation of concrete , precautions to be taken during transportation and placing of concrete in formwork compaction of concrete, methods of compaction, care to be taken during compaction, purpose of finishing, types of finishing & methods of application (surface treatment, expose aggregate finish, applied finish, coloured finish), requirement of good finish.

8.3 Curing of concrete:

Definition of curing, necessity of curing, different methods of curing and their application (spraying water, membrane curing, steam curing, curing by infra red radiations, curing by wet gunny bags, ponding methods).

8.4 Testing of concrete

Significance of testing, determination of compressive strength of concrete cubes at different ages, interpretation & co-relation of test results

8.5 Non- destructive testing of concrete

Importance of NDT, methods of NDT - rebound hammer test & ultrasonic pulse velocity test, working principle of rebound hammer and factors affecting the rebound index, specification for deciding the quality of concrete by ultrasonic pulse velocity as per I.S. 13311 (part 1 & 2). Determination of rebound index & compressive strength of concrete by rebound hammer test as per I.S. 13311, determination of quality of concrete by ultrasonic pulse velocity test

8.6 Waterproofing of concrete & joints in concrete construction:

Importance & need of waterproofing, methods of waterproofing & materials used for waterproofing, types of joints, joining old & new concrete, methods of joining, materials used for filling joints.

8.7 Repair materials and rehabilitation of concrete structures.

Unit – 9 Concreting under special circumstances

9.1 Extreme weather concreting

Effect of cold weather on concrete, effect of hot weather on concrete, precautions to be taken while concreting in hot & cold weather condition.

9.2 Under water concreting

Unit – 10 Properties of Special Concrete:

Properties, Advantages & Limitations of the following types of Special concrete:-

- i) Ready mix Concrete
- ii) Steel-fibre reinforced Concrete
- iii) Prestressed Concrete
- iv) Precast Concrete
- vi) Light –weight concrete

vii) High performance Concrete

viii) High strength concrete

ix) Polymer concrete

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
A.R.Santhakumar	Concrete Technology		Oxford Univ.Press
M. S. Shetty	Concrete Technology		S. Chand Publication
M. L. Gambhir	Concrete Technology		Tata Mc Graw . Hill Publishing Co. Ltd. New Delhi
P. D. Kulkarni	Text book of Concrete technology		M. H. Ghosh and Phull publication
H.R. Rixom	Chemical Admixtures for concrete		Powells' Books
Reference Books			
A. M. Neville & J J Brooks	Concrete Technology		Pearson Education (Singapore) Pvt. Ltd. New Delhi

Reference I.S. Codes:

A. 1. I.S.4031- (Part 1 to Part 6) Indian standard method of physical tests for hydraulic cement, BIS, New Delhi.

2. I.S.4031(Part 1) - 1996 Part 1 – Determination of fineness by dry sieving.
3. I.S.4031(Part 2) -1999 Part 2 – Determination of fineness by air permeability method.
4. I.S.4031(Part 3) -1988 (reaffirmed 2000) Part 3– Determination of soundness
5. I.S.4031(Part 4) - 1988 (reaffirmed 1995) Part 4 - Determination of consistency of standard cement paste.
6. I.S.4031(Part 5) – 1988, (reaffirmed 2000) Part 5 - Determination of initial and final setting times
7. I.S:4031(Part 6) – 1988, (reaffirmed 2000) Part 6 - Determination of compressive strength of hydraulic cement other than masonry cement

B. I.S:2386 (Part i to Part vi) – 1963 Indian standard methods of test for aggregate for concrete. BIS, New Delhi.

- Part i - Particle size and shape. (reaffirmed 1997)
- Part ii - Estimation of deleterious materials and organic impurities. (reaffirmed 2002)
- Part iii - Specific gravity, density, voids, absorption & bulking. (reaffirmed 1997)
- Part iv - Mechanical properties (reaffirmed 1997)
- Part v - Soundness. (reaffirmed 1997)
- Part vi - Measuring mortar making properties of fine aggregate. (reaffirmed 2002)

C.I.S. : 383 – 1970 Indian standard specification for coarse & fine aggregates from natural sources for concrete. B.I.S., New Delhi.

D. I.S.:1911- 1959 (reaffirmed) Indian Standard methods of sampling and analysis of concrete), B.I.S., New Delhi.

E. I.S. : 456 - 2000 Indian standard , plain and reinforced concrete – code of practice. (fourth revision), B.I.S., New Delhi.

F. I.S. : 516 – 1959 Indian standard methods of tests for strength of concrete (xii reprint December 1987), B.I.S., New Delhi.

G. I.S. : 8112- 1989 Indian standard - 43 grade ordinary portland cement Specification

H. I.S. : 12269 – 1987 (reaffirmed 1999) Indian standard specification for 53 grade O.P.C..

I.I.S. : 9103 – 1999 Indian standard –concrete admixtures specification

J. I.S. : 455- - 1989 (reaffirmed 1995) –Indian standard – Portland slag cement specification

K. I.S. : 1489 (part 1) 1991 – Portland – Pozzolana Cement – specification part 1 fly ash based

L. I.S. : 7861 (part 1) 1975 (reaffirmed 1997) – Indian standard of practice for extreme weather concreting part 1 recommended practice for hot weather concreting

M. I.S.: 7861 (part 2) – 1981 (reaffirmed 1997) – Indian standard of practice for extreme weather concreting part 2 – recommended practice for cold weather concreting

N. I.S. : 8041 – 1990 – Indian standard – rapid hardening Portland Cementspecification BIS- New Delhi

O. I.S. : 12330 – 1988 (reaffirmed 1995) – Indian standard specification forsulphate resisting Portland cement

P. I.S. : 12600 - 1989 (reaffirmed 1995) - Portland cement, low heat Specification

Q. I.S. : 10262 – 2009 Indian standard recommended guidelines for concrete mixDesign

R. SP 23 handbook on concrete mixes (based on Indian standards)

S.I.S. 13311 (part-1 & 2)- 1992 methods of non-destructive testing of concrete.(part-1 ultrasonic pulse velocity, part-2 rebound hammer

Teaching Scheme	Examination Scheme
Theory : 4 lecture per week	Mid Semester Exam- 20
Tutorial: NIL	Assignment & Quiz - 10
Practical : NIL	End Semester Exam(ESE) - 70
Credit :- 4	Total Marks - 100

Aim:-

Study of mechanics of the structures.

Objective: - The students will be able to:

1. Calculate stresses in simple and composite sections.
2. Calculate deformations of the specimen subjected to uni-axial, bi-axial &
3. Tri-axial stress system.
4. Analyse the truss by using different methods.
5. Draw shear force and bending moment diagrams.
6. Calculate moment of Inertia of standard plane section & their composites
7. Calculate shear stress & bending stress in beam cross section.

Pre-Requisite:-

1. Student should be perfect in basic concepts of engineering mechanics and mathematical analysis.
2. Student should be sound in curricula of 'Strength of Materials' pursued in semester 2.

Unit no	Topic	Contact period	Marks
1	Elastic Constants & Principal Stresses	6	5
2	Shear Force And Bending Moment	4	8
3	Stresses In Beams	6	8
4	Analysis of Trusses	4	9
5	Strain Energy	2	4
6	Direct and Bending Stresses	4	7
7	Slope And Deflection	4	8
8	Beams with one or both end fixed	8	8
9	Continuous Beam	8	8
10	Column	2	5

Contents : Theory (**Mechanics of Structures**) **4 Hrs/week**

Unit -1: **Elastic Constants & Principal Stresses**

- 1.1 Volumetric strain due to uni-axial force and change in volume
- 1.2 Biaxial and tri-axial stresses and volumetric strain & change in volume
- 1.3 Definition of bulk modulus, volumetric strain.
- 1.4 Relation between modulus of elasticity, modulus of rigidity and bulk modulus.
- 1.5 Definition of principal planes & principal stresses
- 1.6 Principal planes & stress due to bi-axial stress system & due to state of simple shear. (Analytical method and by Mohr's circle diagram)[simple numerical problems]

Unit – 2 **Shear Force And Bending Moment**

2.1 Shear force and bending moment diagrams for simply supported beams, overhanging beams and cantilever subjected to couples and uniformly varying load point of contra flexure (simple numerical problem)

Unit – 3 **Stresses In Beams**

3.1 Bending Stresses in Beams: Concept of pure bending, theory of simple bending, assumptions in theory of bending, neutral axis, neutral plane bending stresses and their nature, bending stress distribution diagram, moment of resistance.

3.2 Application of theory of bending to symmetrical and unsymmetrical sections. (rectangular, circular, T-section and I-section)[**simple numerical problems**]

3.3 Shear stresses in beams: Shear stress equation(no deduction), meaning of terms in equation, shear stress distribution for rectangular, hollow rectangular, circular and hollow circular sections, T-section and I-section[**Stresses In Beams**]

3.4 Relation between max. shear stress and average shear stress. [**simple numerical problems**]

3.5 Introduction to concept of torsion, its formula (no deduction)and signification of notation used, some practical application [**simple numerical problems**]

Unit- 4: **Analysis of Trusses**

4.1 Definition frames, classification of frames, perfect, imperfect, redundant and deficient frame, relation between members and joints, assumption in analysis. Method of joint, method of section and graphical method to find nature of forces

Unit 5: **Strain Energy**

5.1 Types of loading – gradual, suddenly applied load & Impact load

5.2 Definition of strain energy, modulus of resilience and proof resilience.

5.3 Comparison of stresses due to gradual load, sudden load and impact load.

Unit -6: **Direct and Bending Stresses**

6.1 Concept of direct and eccentric loads, eccentricity about one principal axis, nature of stresses, maximum and minimum stresses, resultant stress distribution diagram.

6.2 Condition for no tension or zero stress at extreme fiber, limit of eccentricity, core of section for rectangular and circular cross sections.

6.3 Columns, pillars and chimneys of uniform section subject to lateral wind pressure, coefficient of wind resistance, stress distribution at bases

Unit -7 **Slope and Deflection**

7.1 Concept of slope and deflection, stiffness of beam

7.2 Relation between slope, deflection and radius of curvature, differential equation (no derivation), double integration method to find slope and deflection of simply supported and cantilever beam

7.3 Application of 'Moment area theorem' for determining the slope and deflection at a particular point of a simply supported and cantilever beam for point loading, UDL and moment.

Unit –8 **Beams with one or both end fixed**

8.1 Concept of fixity, effect of fixity, advantages and disadvantages of fixed beam.

8.2 Principle of superposition and its application in finding fixed end moments for beam subjected to UDL over entire span, point load and moment at any point, drawing SF and BM diagram

Unit – 9 **Continuous Beams**

9.1 Definition, effect of continuity practical example, nature of moments induced due to continuity, concept of deflected shape

9.2 Clapeyron's theorem of three moment (no derivation)- its application maximum up to two spans (one end may be fixed and with one overhanging span) and one unknown support moment only, Support at same level, spans having same moment of inertia subjected to concentrated loads and uniformly distributed loads over entire span

9.3 Introduction to moment distribution methods, sign convention, Carry over factor, stiffness factor, distribution factor - its application maximum up to two spans (one end may be fixed and with one overhanging span) and one unknown support moment only, Support at same level, spans having same moment of inertia subjected to concentrated loads and uniformly distributed loads over entire span

9.4 Drawing SF and BM diagrams for continuous beams.

9.5 Application of moment distribution method to single storey single bay symmetrical portal frames, SF and BM diagrams

Unit – 10 Columns

10.1 Application of Rankin's and Euler theory, designing solid circular or hollow circular sections

List of assignment

1. Drawing of Shear force and Bending Moment diagrams on Graph Paper (6 Problems)
2. Graphical Solution and analytical solution of Two Problems on simple frames i) Cantilever ii) Simply supported on A2 size sheet with their analytical solutions
3. Graphical solution and analytical solution of two problems on truss

Name of Authors	Titles of the Book	Edition	Name of the Publisher
T.S. Thandavamoorthy	Analysis of Structures		Oxford University Press
Debabrata Nag and Abhijit Chanda	Strength of Materials		Wiley - India
Ramamrutham	Strength of Materials		Dhanpat Rai
I. B.Prasad	Strength of Materials		
Timoshenko	Strength of Materials		
S. B. Junarkar	Mechanics of Structures- vol I		
Vazirani & Ratwani,	Analysis of Structures- Vol I		Khanna Publishers
M. Chakraborty	Strength of Materials		
R.S. Khurmi	Strength of Materials		S.Chand & Company Ltd, New Delhi

Reference books: - Nil

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments/Tutorial :- Nil

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	Mid Semester Exam- 20
Tutorial: NIL	Assignment & Quiz - 10
Practical : NIL	End Semester Exam(ESE) -70
Credit :- 3	Total Marks - 100

Aim:-

1. Study of hydraulics.

Objective:-

The student will able to:

1. Compute the total hydro static pressure & center of pressure.
2. Describe the principle of pressure measuring devices.
3. Identify the concept of fluid flow.
4. Compute the loss of water flowing through pipes.
5. Design most economical channel section.
6. Describe working of the velocity measuring devices.

Pre-Requisite:-

Student should know the basic properties of fluid

Unit No	Topic	Contact period	Marks
1	Properties of Fluid	4	6
2	Hydrostatic Pressure	8	10
3	Fundamentals Of Fluid Flow	6	8
4	Flow Of Liquid Through Pipes	11	16
5	Flow Through Open Channel	7	14
6	Flow Measuring Devices	8	10
7	Hydraulic Machines	4	6

Contents: Theory (Hydraulics)3 Hrs/week

Unit -1 Properties of Fluid

1.1 Definition of fluid, Difference in behavior of fluid with respect to solids. Introduction to fluid mechanics and hydraulics, Historical background of development of the subject Fluid mechanics and hydraulics, Branches of hydraulics- Hydrostatics and hydrodynamics, Importance of Hydraulics with respect to Irrigation and Environmental engineering.

1.2 Physical properties of fluid Mass density, Weight density, Specific volume, Specific gravity, Surface tension and capillarity, capillary rise, Compressibility, Viscosity, Newton's law of viscosity – Dynamic and kinematics viscosity., classification of different types of fluid with respect to its viscosity, concept of adhesion and cohesion and related physical phenomenon, Ideal and Real liquids

Unit -2 Hydrostatic Pressure

2.1 Free liquid surface, Definition of pressure and its SI unit, Hydrostatic pressure at point, Pascal's law Variation of pressure in horizontal and vertical direction in static liquid, Pressure diagram, concept of pressure prism and its use in determination of force developed on the immersed surface or surface in contact with the liquid

2.2 Concept of pressure head and its unit, concept of gauge pressure, atmospheric pressure and absolute pressure, Conversion of pressure head of one liquid in to other, devices for pressure measurements in pipes – Piezometer, U-tube manometer, Bourdon's pressure gauge, their principle of working and limitations, Measurement of pressure difference using differential manometer – U-tube differential manometer and inverted U-tube differential manometer. Numerical Problems.

2.3 Total hydrostatic pressure and center of pressure, Determination of total pressure & center of pressure on vertical & inclined faces of dams, sluice gates, sides and bottom of water tanks, determination of total hydrostatics pressure & center of pressure on sides and bottom of tank containing two liquids, determination of net hydrostatic pressure and center of pressure on vertical surface in contact with liquid on either side. Numerical Problems.

Unit – 3 Fundamentals Of Fluid Flow

3.1 Concept of flow, Gravity flow and pressure flow. Types of flow – steady and Unsteady, uniform and non-uniform and their combination with practical example, Laminar and turbulent. various combinations of flow with practical examples, Reynolds number and its application, one, two and three dimensional flow, description of flow pattern - stream line, pathline, stream tube, streak line

3.2 Basic principles of fluid flow – principle of conservation of mass, principles of conservation of energy and conservation of momentum, concept of control volume, discharge and its units, Continuity equation for fluid flow, Datum head, pressure head, velocity head and total head, Bernoulli's theorem (no deduction, statement only), Loss of head and modified Bernoulli's theorem, limitation of bernoulli's theorem, Impulse momentum theorem, Numerical Problems based on the above principles.

3.3 Concept of flow net and its properties, stream line and equipotential line and their salient features and practical use of flow net

Unit – 4 Flow Of Liquid Through Pipes

4.1 Loss of head due to friction, Darcy-Weisbach Equation, Friction factor, relative roughness. Moody's diagram and its use. Common range of friction factor for different types of pipe material.

4.2 Minor loss of head in pipe flow- loss of head due to sudden contraction, sudden expansion, gradual contraction & expansion (no deduction), at entrance and exit of pipe, in various pipe fittings, pipes in series and parallel equivalent pipe – Dupuit's equation, numerical problems

4.3 Hydraulic gradient line and Energy gradient line, Siphon, Water hammer in pipes – cause effects and remedial measures, Use of Nomograms for design of water distribution system, Numerical

Unit – 5 Flow Through Open Channel

5.1 Types of channels- artificial & natural, purposes of artificial channel, Different shapes of artificial channels, Geometrical properties of channel section – wetted area, wetted perimeter, hydraulics radius, Prismatic channel sections, steady- uniform flow through prismatic channel section.

5.2 Chezy's equation and Manning's equation for calculation of discharge through an open channel, common range of values of Chezy's constants and Manning's constant of different types of channel surfaces, Most economical channel section, conditions for most economical channel sections – for rectangular and trapezoidal section.

5.3 Concept of specific energy, Froude's number and its significance. Alternate depth, expression for critical depth, critical velocity and minimum specific energy, Critical, sub-critical and supercritical flow in channel, physical phenomenon, numerical problems, hydraulic jump its occurrence in field, uses of hydraulic jump, equation for sequent depth, simple numerical problems.

Unit – 6 Flow Measuring Devices

6.1 Velocity measuring devices for open channels, Floats-surface, subsurface and float rod Pitot tube – principle, expression for velocity, Current meter-cup type & propeller type (simple numerical problems)

6.2 Discharge measuring devices for channels Notches -Types of notches, expression for discharge. Francis formula, end contraction and velocity of approach Weirs - Broad crested weir, ogee spillway and expression for discharge. Flumes - Venturi flume, standing, wave flume, expression for discharge.

Velocity area method for measurement of discharge through open channels. Discharge measuring devices for pipes. (simple numerical problems)

6.3 Venturimeter – Component parts, principle of working, Study and use of venturi meter, Flow through orifice Orifice- Definition and use, Types of orifice - based on various criteria. Coefficient of contraction, coefficient of velocity and coefficient of discharge, Relationship between them. Discharge through small sharp-edged circular orifice and large orifice (discharging free condition), Determination of hydraulic coefficient of orifice, Orificemeter – component parts, working principles, study and use of orificemeter, Numerical.

Unit – 7 Hydraulic Machines

Pumps - Definition and types, Suction head, delivery head, static head and manometric head, Centrifugal pump - component parts and their functions, principle of working, priming, Reciprocating pump - component parts and working. Submersible pump and Jet pump, Selection and choice of pump, Computation of power required for pumps.

Turbines - Definition and types.

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
C.S.P. Ojha & others	Fluid Mechanics and Machinery		Oxford University Press
Dr. P.N.Modi & Dr. S.M.Seth	Hydraulics & Fluids Mechanics		Standard Book House, Dehli
A. K. Upadhyaya	Hydraulics		
S.Ramamrutham	Hydraulics & Fluids Mechanics		Dhanpat Rai & Sons, Delhi
Dr. Jagdish Lal	Fluids Mechanics Hydraulics		Metropolitan Book Co. Private Ltd.
R.S.Khurmi	A Text Book of Hydraulics, Fluids Mechanics Hydraulics Machines		S.Chand & Company Ltd. New Delhi
R.K.Rajput	A Text Book of Fluids Mechanics Hydraulics Machines		S.Chand & Company Ltd. New Delhi
S.K.Likhi	Hydarulics Laboratory Manual		T.T.T.I. Chandhigrah

Reference books :-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Streter & Willey	Fluid Mechanics		McGraw Hill Co.
Messy	Fluid Mechanics		
Daugherty	Fluid Mechanics		McGraw Hill Co

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments/Tutorial :- Nil

Teaching Scheme	Examination Scheme
Theory : Nil	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz: 10
Practical : Nil	End Semester Exam(ESE) : 70
Credit :- Nil	Total Marks – 100

Aim :-

1. To develop the ideas, vision and its practical reality through engineering graphics.
2. Developing the approach of visualization, drafting, modeling and analysis.
3. To develop the concept and applicability of engineering graphics to construction sector.

Objective :-

The students will be able to

1. Read, interpret and draw the building drawings.
2. Prepare submission drawings for the building.
3. Prepare working drawings for the building.
4. Plan various types of buildings considering the functional requirements.
5. Apply the building rules, regulations and byelaws.

Pre-Requisite :-

1. Perfection in geometry and sketching.
2. The students should be perfect in plotting the geometrical shapes and skill of reading the geometrical designs.
3. Students should be conversant with content in 'Drawing' of semester 1 and semester 2

Unit No	Topic	Marks
1	Introduction	4
2	Planning of Building	12
3	Culverts	18
4	Steel connections	18
5	Steel Roof truss	18

Contents: Theory (Civil Engineering Drawing) NILHrs/week Marks

Unit 1 Introduction

Recapitulation of previous semester

Unit -2 Planning of Building

Note: single storeyed building shall comprise of two rooms, bath, WC, kitchen, front verandah with a provision of staircase and mummy for utilisation of roof space. Same plan used in subject 'Estimating and Costing' is to be used.

- 2.1 Principles of planning of Residential and Public building.
- 2.2 Space requirements and norms for various units of Residential and Public building. Rules and byelaws of local governing authorities for construction.
- 2.3 Drawing of line plans for Residential and Public building.

- 2.4 Development of line plan – ground floor plan and roof plan with provision for drainage layout
- 2.5 Elevation (front elevation)
- 2.6 Two Sectional elevation (section must pass through stair-case, bath WC, kitchen and front verandah)
- 2.7 Site plan (to be developed from a Mouza map for conception of location plan)
- 2.8 Foundation details (trench plan, section of main wall and a partition wall/ isolated footing with tie beam if provided)

Unit – 3 Culverts

- 3.1 Introduction to culvert & its different components and types and specific use along with demonstration of a model
- 3.2 Half sectional plan and half sectional elevation and side view of a single span slab culvert
- 3.3 Half sectional elevation of a single span two hume-pipe culvert

Unit – 4 Steel connections

- 4.1 Plan elevation and side view of stanchion connected with base plate with gusset plate in concrete foundation
- 4.2 Connection of main beam with secondary beam in one side
- 4.3 Connection of beam with column
- 4.4 Unequal column splicing
- 4.5 Equal beam splicing
- 4.6 Column bracket

Unit – 5 Steel Roof truss

- 5.1 Introduction to truss – wooden (king post and queen post), steel (with angles and tubular truss) along with demonstration of model
- 5.2 Details of a fink truss with welded/riveted joints and details of column connection

Assignments: Following exercises should be drawn:

- 1 Drawing various types of doors and windows etc. used in construction
- 2 Measured Drawing of an his/her residential building (Load bearing/ Framed structure Type), showing Plan , Elevation, Sections, Construction notes, Schedule of openings, Site Plan,
- 3. Area statement and other details of building drawing in sheet 1
- 4 Working Drawing of building drawing in sheet 1
- 5. drawing of a wooden king post and queen post truss of the buiding drawing in sheet

Teaching Scheme	Examination Scheme
Theory : Nil	Term Work (TW)- 25
Tutorial: Nil	Practical (PR) - 25
Practical : 6	
Credit :- 3	Total marks in the semester - 50

Aim:-

1. To develop the ideas, vision and its practical reality through engineering graphics.
2. Developing the approach of visualization, drafting, modeling and analysis.
3. To develop the concept and applicability of engineering graphics to construction sector.

Objective:-

The students will be able to

1. Read, interpret and draw the building drawings.
2. Prepare submission drawings for the building.
3. Prepare working drawings for the building.
4. Plan various types of buildings considering the functional requirements.
5. Apply the building rules, regulations and byelaws.

Pre-Requisite:-

1. Perfection in geometry and sketching.
2. The students should be perfect in plotting the geometrical shapes and skill of reading the geometrical designs.
3. Students should be conversant with content in 'Drawing' of semester 1 and semester 2

Unit no	Topic	Contact period	Marks
1	Introduction	3	----
2	Planning of building	24	12.5
3	Culvers	24	12.5
4	Steel Connections	21	12.5
5	Steel roof truss	24	12.5

Contents: Practical/Sessional (Civil Engineering Drawing) 6 Hrs/week Marks

Unit 1 Introduction

Recapitulation of previous semester

Unit -2 Planning of Building (PLATE 1)

Note: single storeyed building shall comprise of two rooms, bath, WC, kitchen, front verandah with a provision of staircase and mummy for utilisation of roof space. Same plan used in subject 'Estimating and Costing' is to be used.

- 2.1 Principles of planning of Residential and Public building.
- 2.2 Space requirements and norms for various units of Residential and Public building. Rules and byelaws of local governing authorities for construction.
- 2.3 Drawing of line plans for Residential and Public building.

2.4 Development of line plan – ground floor plan and roof plan with provision for drainage layout

2.5 Elevation (front elevation)

2.6 Two Sectional elevation (section must pass through stair-case, bath WC, kitchen and front verandah)

2.7 Site plan (to be developed from a Mouza map for conception of location plan)

2.8 Foundation details (trench plan, section of main wall and a partition wall/ isolated footing with tie beam if provided)

Unit – 3 Culverts (Plate no 2) (problems to be supplied by the subject teacher(s))

3.1 Introduction to culvert & its different components and types and specific use along with demonstration of a model

3.2 Half sectional plan and half sectional elevation and side view of a single span slab culvert

3.3 Half sectional elevation of a single span two hume-pipe culvert

Unit – 4 Steel connections (Plate no 3) [riveted or welded] (problems to be supplied by the subject teacher(s))

4.1 Plan elevation and side view of stanchion connected with base plate with gusset plate in concrete foundation

4.2 Connection of main beam with secondary beam in one side

4.3 Connection of beam with column

4.4 Unequal column splicing

4.5 Equal beam splicing

4.6 Column bracket

Unit – 5 Steel Roof truss (Plate no 4) (problems to be supplied by the subject teacher(s))

5.1 Introduction to truss – wooden (king post and queen post), steel (with angles and tubular truss) along with demonstration of model

5.2 Details of a fink truss with welded/riveted joints and details of column connection

Practical:

Skills to be developed:

Intellectual Skills:

1. Read and interpret the building drawings
2. Plan residential and public buildings
3. Apply the building rules, regulations and byelaws.

Motor Skills:

1. Prepare line plans of Residential and Public Buildings
2. Prepare Detailed Plans, Elevations, Sections and other working drawings for the buildings.

➤ **Plate 1 to 4 are to be submitted as 'Term Work' during semester**

Text Books:-

Titles of the Book	Name of Authors	Edition	Name of the Publisher
Text Book of Building Drawing	Shah, Kale,		Patki --
Elements of Building Drawing	D. M. Mahajan		
Planning and Design of Building.	Y. S. Sane --		
Civil Engineering Drawing	Malik & Mayo		New Asian Publishers New Delhi

Teaching Scheme	Examination Scheme
Theory : NIL	Term work (TW) – 50
Tutorial: NIL	Practical (PR) - 50
Practical : 6	Total marks - 100
Credit :- 3	

Practical:

Skill to be developed:

Intellectual Skills:

1. Analyze the given data
2. Select proper method for analysis
3. Interpret the results

Motor Skills :

1. Measure the quantities accurately
2. Handle instruments properly

Group I – Physical tests on ordinary Portland cement:

- Determination of fineness of cement preferably by Blaine's air permeability apparatus or by sieving.
- Determination of standard consistency of OPC/PPC
- Determination of initial & final setting times of OPC/PPC.
- Determination of compressive strength of OPC/PPC
- Determination of soundness of OPC/PPC

Group II – Physical tests on fine aggregate and coarse aggregate:

Fine aggregate:

- Determination of silt content in sand by volume
- Determination of maximum % of bulking of sand of a given sample
- Determination of grading zone of a given sample of a
- Determination of moisture content of a given sample of sand
- Determination of specific gravity of sand

Coarse aggregate:

- Determination of aggregate impact value.
- Determination of aggregate abrasion value.
- Determination of aggregate crushing value.
- Determination of bulk density & specific gravity of a given sample of coarse aggregate.
- Determination of flakiness index and elongation index of a given sample of coarse aggregate
- Determination of surface moisture and water absorption of a given sample of coarse aggregate
- Determination of grading zone of a given sample of coarse aggregate

Group III - Physical tests on Concrete

- Determination of workability of concrete – a. slump test b. compacting factor test and c. Vee-Bee consistometer test
- Compressive strength of concrete – a. cylinder and b. cube mould

Group IV - Physical test of Bricks

- Determination of physical properties of bricks – a. size b. shape c. weight d. colour e. water absorption f. efflorescence test g. crushing strength test

Group V - Brick bonding –

1. Laying [1,3,5, ... & 2,4,6,...] to form
 - a. English bond (1 brick and 1 and half brick thick)
 - b. Flemish bond ((1 brick and 1 and half brick thick) including corner joint;
2. Laying of conventional brick to form a 200 mm thick wall; header and stretcher bond; connection between a main wall and partition & partition wall & partition wall

Teaching Scheme	Examination Scheme
Theory : NIL	Term work (TW) – 25
Tutorial: NIL	Practical (PR) - 25
Practical : 3	Total marks - 50
Credit :- 2	

Aim :-

- Development and evaluation of individual skills
- Enhancement in soft skills through innovation.

Objective: Student will be able to:

1. Acquire information from different sources.
2. Prepare notes for given topic.
3. Present given topic in a seminar.
4. Interact with peers to share thoughts.
5. Prepare a report on industrial visit, expert lecture.

Pre-Requisite :- Communication skill must be perfect.

Contents 3Hrs/week

Unit -1 Industrial Visits

Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the term work. Industrial visits may be arranged in the following areas / industries:

- Building construction site

Unit -2 Lectures by Professional / Industrial Expert be organized from **ANY THREE** of the following areas:

- Batching plant
- Different types of construction machineries and equipment

Unit – 3 Individual Assignments:

Any two from the list suggested OR Conduct **ANY ONE** of the following activities through active participation of students and write report

- Preparation of drawing of an existing structure
- Plot measurement
- Study of building rules – in panchayat, municipality and corporation areas
- Study of different fitting and fixtures and components of different types of shuttering

Unit – 4 Modular courses (Optional):

A course module should be designed in the following areas for max. 12 hrs. Batch size – min. 15 students. Course may be organized internally or with the help of external organizations.

- Erection of shuttering

Total 48 Hrs.

Text Books:- Nil

Reference books :- Nil

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments/Tutorial :- Nil

Name of the Course: **Diploma in Civil Engineering** Subject: **Advanced Surveying**
 Course code: **CE** Course Duration: 6 semester Course offered in the Semester: **Fourth**
 Subject code: Question code: Marks : **100**

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz - 10
Practical : Nil	End Semester Exam(ESE) : 70
Credit :- 3	Total Marks in semester - 100

Aim:-

1. Development of advanced skill in surveying.

Objective:-The Students will be able to:

- Record the data in field book and plot the collected data.
- Find out horizontal and vertical distances with a tachometer
- Set out simple curve using Theodolite.
- Introduction of Modern Survey equipments/methodology – Total station and EDM.
- Apply principles of surveying and leveling for Civil Engineering works.

Pre-Requisite :-

- Student should have skill in reading, drawing and sketching.
- Students should know the basic principles, requirements and purpose of surveying.

Unit no	Topic	Contact period	Marks
1	Electronic distance measurement (EDM)	7	8
2	Theodolite Survey	12	18
3	Tacheometric Survey	7	10
4	Curves	6	10
5	Volume measurement	4	8
6	Aerial Survey and Remote sensing & GIS	7	8
7	Construction Surveying	5	8

Contents: Theory (Advanced Surveying) 3 Hrs/week Marks

Unit -1 Electronic distance measurement (EDM)

- 1.1 Introduction
- 1.2 Basic concept
- 1.3 Classification of electromagnetic radiation
- 1.4 Basic principles of electronic distance measurement, computing the distance from phase difference
- 1.5 Basic description of different types of instruments, TOTAL STATION instruments, 1.6 Effect of atmospheric condition on wave velocity, instrumental error in EDM
- 1.7 Education of slope measurement in EDM

Unit 2 Theodolite Survey

- 2.1 Components of Transit Theodolite and Their functions. Technical terms used. Temporary adjustments of Transit Theodolite Swinging the telescope, Transiting, Changing the face.
- 2.2 Measurement of Horizontal angle, method of Repetition, errors eliminated by method of repetition
- 2.3 Measurement of Deflection angle.
- 2.4 Measurement of Vertical angle.

- 2.5 Measurement of magnetic bearing of a line by Theodolite .
- 2.6 Prolonging a Straight line.
- 2.7 Sources of errors in Theodolite Surveying.
- 2.8 Permanent adjustment of transit Theodolite (only relationship of different axes of theodolite.).
- 2.9 Traversing with Theodolite – Method of included angles, locating details, checks in closed traverse, Calculation of bearings from angles.
- 2.10 Traverse Computation - Latitude, Departure, Consecutive Co-ordinates, error of Closure, Distribution of a angular error, balancing the traverse by Bowditch rule and Transit Rule, Gale's traverse table (simple problems on above topic.)
- 2.11 Area of a closed traverse – meridian distance method, double meridian distance method, double parallel distance method, departure and total latitude method, independent coordinate methodology (simple numerical problems)s

Unit – 3 Tacheometric Survey

- 3.1 Principle of Tacheometry. Instruments in tacheometry
- 3.2 Essential requirements of Tacheometer.
- 3.3 Different types of tacheometric measurement – a. stadia system (fixed hair method and movable hair method) b. tangential system c. subtense bar system
- 3.4 Determination of tacheometric constants- additive constant and multiplying constant, simple numerical problems on above topics.
- 3.5 Distance and elevation formula : Fixed hair method: Use of Theodolite as a Tacheometer I. Inclined sight and staff vertical for both angle of elevation and angle of depression ii. Inclined sight with staff normal to the line of sight (for both angle of elevation and angle of depression) (No derivation). [numerical problem based on above conditions]

Unit – 4 Curves

- 4.1 Types of curves used in road and railway alignments, Notations of simple circular curve, Designation of curve by radius and degree of curves.
- 4.2 Method of Setting out curve by offset from Long chord method and Rankine's method of deflection angles. Simple Numerical problems on above topics.
- 4.3 setting out a compound curve, reverse curve and a transition curve (spiral), a summit curve and a valley curve

Unit – 5 Volume measurement

- 5.1 Introduction, different method of volume computation – cross section method, unit area or borrow pit method and contour method
- 5.2 Cross section method – level section, two level section, side hill two level section, three level section and multilevel section; formula for volume computation -volume average end areas, trapezoidal rule, prismoidal rule (simple numerical problems)
- 5.3 Volume through transitions – in highway/railway construction, volume from spot level 9 for foundation of underground reservoir, volume from contour plan
- 5.4 salient features of Mass Haul diagram and its applications

Unit – 6 Aerial Survey and Remote sensing & GIS

- 6.1 Aerial Survey Introductions, definition, Aerial photograph
- 6.2 Remote Sensing – Introduction, Electro-Magnetic Energy , Remote sensing system-Passive system , Active system, Applications – mineral, land use / Land cover, Natural Hazards and Environmental engineering system.

Unit – 7 Construction Surveying

- 7.1 Introduction, requirements of setting out, horizontal and vertical control
- 7.2 Setting out a pipe line
- 7.3 Setting out of building and structure
- 7.4 Staking out a highway

LIST OF Assignment: (minimum 12 practical from list given below)

- 1. Understanding the components of Theodolite and their functions, reading the vernier and temporary adjustments of theodolite.
- 2. Measurement of Horizontal angle by transit theodolite.

3. Measurement of Horizontal angle by method of Repetition.
4. Measurement of vertical angles by theodolite.
5. Measurement of Magnetic bearing of a line using theodolite.
6. Measurement of deflection angle by taking open traverse of 4 –5 sides.
7. To find Reduced levels and horizontal distances using theodolite as a Tacheometer.
8. To find constants of a given Tacheometer.
9. Study and use of 1 second Micro Optic Theodolite for measurement of Horizontal and Vertical angles
- 10 Study of E.D.M. for knowing its components.
11. Use of EDM for finding horizontal and vertical distances and reduced levels.
12. Determine the geographical parameters by total station.

Text Books:

Name	Authors	Publisher	Editions
Surveying and Levelling	R. Subramanian	Oxford University Press	
Fundamental of surveying	S.K.Roy	PHI	
Plane surveying	A.M.Chandra	New age international	
Surveying and Levelling vol. I and II	S. K. Duggal	TATA MC GRAW-HILL	
Surveying and Levelling vol. I and II	Dr. B. C. Punmia	Laxmi Publication	

Name of the Course: **Diploma in Civil Engineering** Subject: **Geo-Technical Engineering-I**
 Course code: **CE** Course Duration :6 semester Course offered in the Semester: **Fourth**
 Subject code: Question code: Marks: **100**

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz - 10
Practical :Nil	End Semester Exam(ESE) : 70
Credit :- 3	Total Marks in semester - 100

Aim:-

Study of geo-technical virtue of the surroundings required for building construction.

Objective:- Students will be able to:

1. Explain soil as three phase system and establish relationship between properties of soil.
2. Determine properties of soil by following standard test., procedure and plot particle size distribution curve.
3. Determine permeability by constant head and falling head test using Darcy's Law
4. Obtained OMC & MDD for any soil sample by performing Proctor Compaction test.
5. Calculate shearing strength of soil, using Coulomb's law

Pre-Requisite:-

- Students should think over the nature and profile of the geo-region where the building is to be constructed.
- Student should be conversant with the basics of Mechanics of Structure and Fluid Mechanics

Unit no	Topic	Contact period	Marks
1	Overview Geotechnical Engineering	2	2
2	Physical Properties of Soil	8	12
3	Permeability of Soil & Seepage Analysis	4	10
4	Compaction of Soil & Stabilization	6	10
5	Compresssibility & Consolidation of soil	12	10
6	Shear Strength of Soil	6	10
7	Earth Pressure	6	8
8	Site Investigation And Sub Soil Exploration	4	8

Contents :**Theory (Geotechnical Engineering I) 3 Hrs/week**

Unit -1Overview Geotechnical Engineering

- 1.1 Definition of soil – with respect to Civil Engineers, formation of soil, general types of soil
- 1.2 Importance of soil in Civil Engineering as construction material in Civil Engineering Structures and as foundation bed for structures
- 1.3 Field application of geotechnical engineering in foundation design, pavement design, design of earth retaining structures, design of embankments, underground and buried structures, slope stability, settlement related problems (brief ideas only)
- 1.4 Historical development of 'Geotechnical Engineering'
- 1.4 Implication of the term 'Geotechnical Engineering'

Unit -2Structure, Physical & index Properties of Soil and its weight-volume relationship

- 2.1 Introduction to soil structure – a. soil particle structure – tetrahedral unit and octahedral unit, Kaolinite mineral, halloysite mineral, montmorillonite, illite b.soil mass structure – single grained, flocculent and honey-combed structure
- 2.2 Clay particle-water relationship
- 2.3 Soil as a three phase system
- 2.4 Definition of Water/moisture content- determination of water content by oven drying method as per IS code& rapid water/moisture content determination
- 2.5 Definition of Void ratio, density index, porosity, degree of saturation, air content,
- 2.6 Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight
- 2.7 Determination of bulk unit weight and dry unit weight by core cutter method and sand replacement method as per IS code
- 2.8 Specific gravity of soil solid - determination of specific gravity by pycnometer.
- 2.9 Deduction of different inter-relations among the physical properties of soil mass
- 2.10 Consistency of soil, stages of consistency, Atterberg's limits of consistency viz. Liquid limit, plastic limit and shrinkage limit, plasticity index, liquidity index, toughness index, activity number, shrinkage ratio, classification based on these index properties
- 2.11 Determination of liquid limit, plastic limit and shrinkage limit as per I.S code.
- 2.12 Particle size distribution, mechanical sieve analysis as per IS code, particle size distribution curve, effective diameter of soil, Uniformity coefficient and coefficient of curvature, well graded and uniformly graded soils.
- 2.13 Classification of soils – its requirement, field identification of soil – dilatancy test, shaking test, toughness test, sedimentation, IS classification of soil

Unit – 3Permeability of Soil & Seepage Analysis

- 3.1 Definition of permeability and its application
- 3.2 Darcy's law of permeability, coefficient of permeability, typical values of coefficient of permeability for different soil, average and seepage velocity of flow
- 3.3 Factors affecting permeability of soil
- 3.4 Determination of coefficient of permeability in laboratory by constant head and falling head permeability tests (no deduction), simple problems related to determine coefficient of permeability.
- 3.5 Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines and equipotential lines, exit gradient, quick sand condition (no deduction)
- 3.6 Flow net, characteristics of flow net, application of flow net (nonnumerical problems)

Unit- 4 Compaction of Soil & Stabilization

- 4.1 Concept of compaction, purpose of compaction, field situations where compaction is required.
- 4.2 Standard proctor test&Modified proctor test – test procedure as per IS code, Compaction curve, optimum moisture content, maximum dry density, Zero air voids line.
- 4.3 Factors affecting compaction
- 4.4 Field methods of compaction – rolling, ramming, kneading& vibration and Suitability of various compaction equipments.
- 4.5 California bearing ratio, CBR test, significance of CBR value
- 4.6 Concept of soil stabilization, necessity of soil stabilization
- 4.7 Different methods of soil stabilization – Mechanical soil stabilization, lime stabilization, cement stabilization, bitumen stabilization & fly-ash stabilization

Unit- 5 Compressibility& Consolidation of soil

- 5.1 Principle of consolidation, spring-analogy method, Terzaghi's one dimension consolidation theory, its assumption and field of application, standard one dimensional consolidation test by consolidometer
- 5.2 Normally consolidated clay and over consolidated clay and over consolidation ratio

5.3 typical e-log p, e-p curve, compression index, coefficient of compressibility, coefficient of volume compressibility, coefficient of consolidation and their inter-relation (no deduction, only mathematical expression), swelling index

5.4 computation of ultimate settlement – simple numerical problems

5.5 difference between consolidation and compaction

Unit – 6 Shear Strength of Soil

6.1 Shear failure of soil, field situation of shear failure

6.2 Concept of shear strength of soil

6.3 Components of shearing resistance of soil – cohesion, internal friction

6.4 Mohr-coulomb failure theory, establishment of relation between major and minor principal stresses and angle of failure plane, Strength envelope, strength equation – for purely cohesive, cohesion less soils and for C- Φ soil

6.5 Laboratory determination of shear strength of soil – Direct shear test, Unconfined compression test & laboratory vane shear test, plotting strength envelope, determining shear strength parameters of soil

Unit -7 Earth Pressure

7.1 Estimation of vertical earth pressure – by approximate method, overburden pressure, pressure bulb, isobar (simple numerical problems on approximate method)

7.2 Lateral earth pressure – Rankine's theory of lateral earth pressure, assumptions and mathematical expression (no deduction) for the following cases – vertical faces with horizontal surface having cohesionless soil and cohesive soil with or without ground water table and with or without surcharge loading (simple numerical problems)

Unit – 8 Site Investigations and Sub Soil Exploration

8.1 Necessity of site investigation & sub-soil exploration.

8.2 Types of exploration – general, detailed.

8.3 Method of site exploration open excavation & boring

8.4 Criteria for deciding the location and number of test pits and bores

8.5 Disturbed & undisturbed soil samples for lab testing and field testing

8.6 Empirical correlation between soil properties and SPT values.

8.7 Format for soil report of a residential project

List of assignment: Numerical Problems as per discretion of subject teacher

Text Books:

Name of the book	Author	Edition	Publisher
Soil Mechanics and Foundation Engineering	P.P.Raj		Pearson
Soil mechanics and foundation engineering	B M Das		Thomson
Soil mechanics and foundation engineering	B C Punmia		
Soil mechanics and foundation engineering	VNS Murthy		Dhanpat Rai & Sons

Reference books:

Name of the book	Author	Edition	Publisher
Soil Mechanics in Engineering Practice	Karl Terzaghi, Peck and Mesri		Jhon Willey & Sons
Soil Mechanics	Lambe and Whitman		Willey Eastern Limited

Name of the Course: **Diploma in Civil Engineering** Subject: **Transportation Engineering I**
 Course code: **CE** Course Duration: 6 semester Course offered in the Semester: **Fourth**
 Subject code: Question code: Marks: **100**

Teaching Scheme	Examination Scheme
Theory : 3 lecture per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz - 10
Practical : Nil	End Semester Exam(ESE) : 70
Credit :- 3	Total Marks in semester - 100

Aim:-

Development of conceptual knowledge in transportation engineering.

Objective :-

Students should be able to:

1. Know component parts of railway
2. Understand methods of survey and investigation of alignment of railway
3. Organize
4. Understand

Pre-Requisite :-

1. Student should take survey of required places to know basic terms.
2. Student should have the knowledge and modes of transportation.

Unit no	Topic	Contact period	Marks
1	Overview of Transportation Engineering	2	4
2	Railway Engineering	22	26
3	Bridge Engineering	14	26
4	Tunnel Engineering.	10	14

Contents: Theory (Transportation Engineering -I) 3 Hrs/week Marks

Unit -1 Overview of Transportation Engineering

- 1.1 Role of transportation in the development of nation.
- 1.2 Modes of transportation system – roads, railway, airways, waterways, other mode of transport, Importance of each mode, comparison and their relative merits and demerits.
- 1.3 Necessity & importance of Cross drainage works for roads & railways.

Unit -2 Railway Engineering.

2.1 Railway as a mode of land transport, Classification of Indian Railways, zones of Indian Railway, classification of indian railway lines, general features of Indian railway, organization of Indian railway; Alignment- Factors governing rail alignment; Rail Gauges – types, factors affecting selection of gauge, advantages of uniform gauge; Rail track cross sections – standard cross section of BG & M.G; Single & double line in cutting and embankment.

2.2 **Permanent ways:** Ideal requirement, component parts, conning of wheel, tilting of rail and adzing of sleepers

Rails: function & its types. Requirement of ideal rail section, standard rail section, weight, length and specification of rail section, important test for determining servicibility of rail section, wear in rail and methods to reduce wear; defects in rail, failure in rail

Rail Joints – requirements, types; welded rails – purpose, advantage and success of welding of rails, length of welded rails; Creep of rail – causes, measurement & prevention of creep.

Sleepers: functions & Requirement, types – wooden, metal, concrete sleepers & their suitability and relative merits and demerits, sleeper density. (problem on sleeper density)

Ballast: function & requirements of good ballast, different types with their properties, relative merits & demerits., size and section of ballast, quantity and renewal of ballast, terminology – packing, boxing and ballast crib

Rail fixtures & fastenings: fish plate, bearing plates, spikes, bolts, keys, anchors & anti creepers.

2.3 Railway Track Geometrics: Gradient & its types, grade compensation on curves(problems) Super elevation – governing formula, limits of Super elevation on curves, cant deficiency, cant excess and negative cant (along their permissible value), realignment of curves by string line method

2.4 Branching of Tracks: Definition of point & crossing, a simple split switch turnout consisting of points and crossing lines. Sketch showing different components, their functions & working.

Line sketches of track junctions- symmetrical split, three throw switch, crossovers, scissor cross over, diamond crossing, single and double slip, gathering lines or ladder track, triangle

Inspection of points and crossings

2.5 Station and Yards: Site selection for railway stations, Requirements of railway station, Types of stations (way side, crossing, junction & terminal), Station yards, types of station yard, Passenger yards, Goods yard, Locomotive yard – its requirements, water column, Marshalling yard – its types; level crossing

2.6 Track laying: Preparation of subgrade; collection of materials; setting up a material depot and carrying out initial operations such as adzing of sleepers bending of rails, assembling of crossing. Definition of base and rail head, transportation by material trollies, rail carriers and material train; methods of track laying (parallel, telescopic and American method); organization of labour at rail head; ballasting the track

2.7 Track Maintenance: Necessity, types, routine maintenance of formation and side slopes, rails, fixtures and drainage, special maintenance of defective rails and sleepers; Tools required and their function, organisation, duties of permanent way inspector, gang mate, key man

2.8 Track Drainage: need for proper track drainage, Sources of percolated water in track, requirements of a good track drainage system, practical tips of good surface drainage, track drainage system, subsurface drainage

2.9 Modern Method of track maintenance: Mechanised method of track maintenance, off-track tampers, on-track tampers, future of track machines in Indian railways, measured shovel packing, directed track maintenance, classification of track renewal, criteria of track renewal, through sleeper renewal, track relaying works, mechanised relaying, track renewal trains

Unit – 3 Bridge Engineering :

3.1 Site selection and investigation, Factors affecting selection of site of a bridge. Bridge alignment, Collection of design data, Classification of bridges according to function, material, span, size, alignment, position of HFL.

3.2 Component parts of bridge. Plan & sectional elevation of bridge showing component parts of substructure & super structure. Different terminology such as effective span, clear span, economical span, waterway, afflux, scour, HFL, freeboard, etc.

Foundation – function, types (well foundation & caisson [open type only], their details of construction with sketches, laying of foundation on a. dry soil b. soil charged with water and c. under water, coffer dam – their types and construction, depth of foundation

Piers- definition, parts, function - requirements, types -solid (masonry and RCC), open cylindrical and abutment piers, terminology – height of piers, water way, afflux and clearance.

Abutment – function, types

Wing walls – functions and types.

Bearing – functions, types of bearing for RCC & steel bridges.

Approaches –in cutting and embankment.

Bridge flooring- open and solid floors

3.3 Permanent and Temporary Bridges:- *Permanent Bridges* - Sketches & description in brief of culverts, causeways, masonry, arch, steel, movable steel bridges, RCC girder bridge, prestressed girder bridge, cantilever, suspension bridge.

Temporary Bridges- timber, flying, floating bridges

3.4 Inspection & Maintenance Of Bridge: Inspection of bridges, Maintenance of bridges & types – routine & special maintenance.

Unit – 4 Tunnel Engineering.

4.1 Definition, necessity, advantages, disadvantages

4.2 Classification of tunnels.

4.3 Shape and Size of tunnels

4.4 Tunnel Cross sections for highway and railways

4.5 Tunnel investigations and surveying –Tunnel surveying locating center line on ground, transferring center line inside the tunnel.

4.6 Shaft - its purpose & construction.

4.7 Methods of tunnelling in Soft rock-needle beam method, fore-poling method. line plate method, shield method.

4.8 Methods of tunnelling in Hard rock-Full-face heading method, Heading and bench method, drift method.

4.9 Precautions in construction of tunnels

4.10 Drilling equipments-drills and drills carrying equipments

4.11 Types of explosives used in tunnelling.

4.12 Tunnel lining and ventilation.

Text Books:-

Titles of the Book	Name of Authors	Edition	Name of the Publisher
A Text Book of Railway Engineering	S.C. Saxena		Dhanpatrai& sons
Railway Engineering	Chandra and Agarwal		Oxford
Railway Track	K.R. Antia		The New Book Co. Pvt. Ltd Mumbai
Principles of Railway Engineering	S.C. Rangwala		Charotar Publication
Principles and Practice of Bridge Engineering	S.P. Bindra		Dhanpat rai & sons
A Text Book of Transportation Engineering	N.L.Arora and S.P.Luthra		IPH New Delhi
Elements of Bridge Engineering	J.S. Alagia		Charotar Publication
Bridge Engineering	D.R. Phatak		Everest Publisher
Elements of Bridges	D. JohnosVictor		Oxford & IBH Publishing co.
Road, Railway and Bridges	Birdi & Ahuja.		Std. Book House
Tunnel Engineering	S.C. Saxena		Dhanpatrai & sons

Reference books :- Nil

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments/Tutorial :- Nil

Name of the Course: **Diploma in Civil Engineering** Subject: **Estimating & Costing**
 Course code: **CE** Course Duration: 6 semester Course offered in the Semester: **Fourth**
 Subject code: Question code: Marks :**100**

Teaching Scheme	Examination Scheme
Theory – 4 lecture per week	CT- 20
Tutorial - nil	Attendance, Assignment, Quiz - 10
Practical - Nil	End Semester Exam(ESE) - 70
Credit - 4	Total Marks in the semester – 100

Aim:-

1. Study of financial budget and costing of building construction.

Objective:-

Students should be able to

1. Decide approximate cost of civil engineering structure.
2. Prepare check list of items of construction.
3. Prepare estimate for civil engineering work.
4. Prepare rate analysis of item of construction.
5. Take measurement of completed work.
6. Compare actual quantity with estimated quantity

Pre-Requisite:-

1. Student should know accounting process, mensuration and drawing.

Unit no	Topic	Contact period	Marks
1	Overview of Estimating & Costing	6	8
2	Building estimate	30	32
3	Estimate of other structure	18	16
4	Rate analysis	10	14

Contents: Theory (Estimating & Costing) 4 Hrs/week

Unit -1 Overview of Estimating & Costing

1.1 Meaning of the terms estimating, costing. Purpose of estimating and costing, factors affecting estimate

1.2 Types of estimate - Approximate and Detailed. Approximate estimate Types- Plinth area rate method, Cubic Content method, Service Unit method, Typical bay method, Approximate Quantity method, Problems on Plinth area rate method & application of Service unit method for selection of service unit for different types of civil Engineering Structures, Approximation for W.S. Sanitary & Electrification, Knowledge of empirical method of approximate material estimation as per CBRI formulae and its application

1.3 Types of detailed estimate: Detailed estimate for new work, Revised estimate, Supplementary estimate, Revised & Supplementary estimate, Maintenance & Repair estimate, complete estimate; phase of the detailed estimate – quantity survey and abstract estimate, Uses of detailed estimate

1.4 Explanation of relevant technical terms: Contingencies, work-charge establishment, overhead, tools and plants, schedule of rates and quantities, specification, administrative approval, technical sanction, plinth area, carpet area, floor area, horizontal and vertical circulation area, floor area ratio

1.5 Degree of accuracy, mode of measurement as per BIS 1200

Unit 2: Building estimate

Note: single storeyed building shall comprise of two rooms, bath, WC, kitchen, front verandah with a provision of staircase and mummy for utilisation of roof space

2.1 Centre line method and long & short wall method

2.2 Items of work –earth work in excavation for foundation, brick flat soling(under foundation and floor subgrade, foundation concrete, brick in substructure, earth work in filling, DPC, plinth filling by silver sand, brickwork in superstructure, formwork, RCC excluding reinforcement, reinforcement (by percentage of component of structure, lime terracing or other similar roof treatment, finishing items – plastering, painting (on plastered surface wall, RCC surface, doors windows, grill etc), floor – (IPS, terrazzo, tiles, stone), rain water pipe,

2.3 Preparation of bar bending schedule – lintel and chajja, column, slab (one way and two way), beam and their estimate

2.4 Estimate of door and window – panelled door, one third glazed and two-third panelled timber window, fully glazed steel window provided with a grill (inclusive of all fittings and fixtures)

2.5 estimate of a tube-well

2.6 estimate of a septic tank with soakpit

2.7 Estimate for surface drain with plinth protection around the building and under ground reservoir

2.8 Estimation of symmetrical/unsymmetrical boundary wall with a provision of gate.

Unit 3 Estimate of other structure

3.1 Estimate of a single span slab culvert/pipe culvert

3.2 estimate of a man-hole

3.3 Estimate of simple fink type roof truss

Unit – 4 Rate analysis

4.1 Meaning of term Rate analysis and its purposes –Factors affecting rate analysis,lead, lift, task work, materials and labour component, MarketRate and labour rate.

4.2 Transportation of Materials, load factor for different materials. Standard lead, extra lead, Transportation Charges, Labour - Categories of labours, labour rates, overheads, contractor's profit, water charges, taking out quantities of materials for different items of works (earthwork, brickwork, flooring, roofing, plastering and pointing, whitewash, colour wash, distemper, synthetic enamel, plastic paints, emulsion paint, cement concrete, reinforcement, formwork, grill for window

4.3 Preparing rate analysis of different items of work - (earthwork, brickwork, flooring, roofing, plastering and pointing, whitewash, colour wash, distemper, synthetic enamel, plastic paints, emulsion paint, cement concrete, reinforcement, formwork, grill for window

Assignments:

Skills to be developed:

Intellectual Skills:

- List various items of work with their units in a Civil Engineering Structure.
- Calculate quantities of various items of work.
- Prepare rate analysis.

List of Assignments: (Drawings shall be provided for the above exercises by subject teacher.)

1. The entire job as per syllabus are to be submitted in the form of assignments.

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
M. Chakraborti	Estimating & costing, Specification and Valuation in Civil Engineering		M. Chakraborti , Calcutta
B.N. Datta	Estimating & costing in Civil engineering		UBS Publishers
S.C. Rangwala	Estimating & costing		Charotar Publication
B.S. Patil	Civil Engineering Contracts and Accounts Vol I , II		Orient Longman
G. S. Birdie	ESTIMATING & COSTING		DhanpatRai and Sons

Video cassettes / cds: msbtecai package

Q. E. PRO software

IS CODES:

IS 1200- Method of Measurement of building and Civil engineering works

Reference books :- Nil

Suggested List of Laboratory Experiments :- Nil

Name of the Course: **Diploma in Civil Engineering** Subject: **Irrigation Engineering**
 Course code: **CE** Course Duration: 6 semester Course offered in the Semester: **Fourth**
 Subject code: Question code: Marks :**100**

Teaching Scheme	Examination Scheme
Theory – 3 lecture per week	CT - 20
Tutorial - nil	Attendance, Assignment, Quiz - 10
Practical - Nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks in the semester – 100

Aim:-

Study of irrigation engineering.

Objective:-

The students will be able to:

- 1 Collect the data for irrigation system.
- 2 Calculate the yield from catchments.
- 3 Calculate the capacity of Canals
- 4 Calculate the storage capacity of reservoirs.
- 5 Find out and fix the control levels of reservoirs.
- 6 Decide the section of Dams, Weirs and Barrages.
- 7 Classify the Canals and design the Canals.
- 8 Classify different irrigation systems.

Pre-Requisite :-

1. Student should be able to read and draw morphological nature of land.
2. Student should know regarding hydrological pressures.

Unit no	Topic	Contact period	Marks
1	Introduction	2	4
2	Hydrology	4	6
3	Water Requirement Of Crops	4	7
4	Investigation And Reservoir Planning	5	7
5	Dams And Spillways	7	10
6	Bandhara, Percolation Tanks And Lift Irrigation	4	6
7	Diversion Head Works	6	7
8	Canals	6	7
9	Watershed Management	4	6
10	Water logging and Land Drainage	4	6
11	FLOOD CONTROL	2	4

Content : Theory (Irrigation Engineering) 3 hours per week

Unit-1 Introduction

Definition – Irrigation and irrigation engineering, advantages of irrigation, ill effects of over irrigation, types of irrigation project – purpose wise and administrative wise, Methods of irrigation.

Unit -2 Hydrology

Definition of rainfall , rain gauge and rain gauge station, types of rain gauges (names only), average annual rain fall and its calculation, definition of run- off, factors affecting run off, calculation of run off by run of coefficient, Inglis' formula, Stranges and Binnie's tables and curves. Maximum flood discharge and methods of calculation, Yeild and Dependable yield and methods calculation.

Unit – 3 Water Requirement Of Crops

Cropping seasons and crops in West Bengal. Definition – Crop period, base period, Duty, Delta, factors affecting Duty, relation between Duty, Delta and base period, Definition – CCA , GCA, IA, intensity of irrigation, time factor, capacity factor. Problems on water requirement and capacity of canal .Modified Penman method .Assessment of irrigation water.

Unit – 4 Investigation And Reservoir Planning

Survey for irrigation project, Data collected from irrigation project. Silting of reservoir, Factors affecting silting , Methods to control levels and respective storage in reservoir.

Unit – 5 Dams And Spillways

Types of dams – Earthen dams and Gravity dams (masonry and concrete) ,Comparison of earthen and gravity dams with respect to foundation, seepage, construction and maintenance of Earthen Dams – Components and their function, typical cross section seepage through embankment and foundation seepage control, though embankment and foundation, methods of constructions, types of failure of earthen dams and remedial measures.

Gravity Dams- Theoretical and practical profile, typical cross section, drainage gallery, joint in gravity dam, high dam and low dam

Spillways-Definition, function, location and components. Emergency and services, ogee spillway and bar type spillway, discharge over spillway. Spillway with and with out gates.

Unit – 6 Bandhara, Percolation Tanks And Lift Irrigation

Advantages and disadvantages of bandhara irrigation layout and component parts,solid and open bandhara, Layout of lift irrigation scheme, Irrigation department standard design and specification.

Unit – 7 Diversion Head Works

Weirs – components parts, function and types, layout of diversion head works withits components and their function, canal head regular, silt excluders and slit ejectors.

Barrages – components and their function, Difference between weir and barrage, Irrigation department standard design and specifications.

Unit – 8 Canals

CANALS – classification of canals according to alignment and position in the canalnetwork. Design of most economical canal section, Canal lining – Definition, purpose, types of canal lining advantages of canal lining properties of good canal lining material.

Cross Drainage works- different C.D. Works and their practical applications, canal falls, escapes, cross regulators and canaloutlets.

Unit-9 Watershed Management

Introduction- Definition of watershed, definition of watershed management, need for watershed management. Soil conservation, need of Soil conservation, Water Harvesting-Definition, need of rainwater harvesting, techniques of rainwater harvesting.

Unit- 10 Water logging and Land Drainage

Introduction – ill effects of water logging, causes of water logging, factors responsible for water logging.
 Anti-water-logging measures – preventive measure – names of the different measures with short description; curative measures – names of the different measures with short description
 Definition and necessity of land reclamation, characteristics of affecting fertility of soils, Purposes of land reclamation processes; methods of land reclamation – name the methods with brief description.
 Land drainage – methods of drainage with brief description mentioning location, construction and cost.

Unit – 11 FLOOD CONTROL

Definition of flood, causes of flood, effects of flood.

Methods of flood control – flood control reservoirs, flood walls, channel improvement, flood ways.

Assignments: shall consist of the following :

Data should be collected from IRRIGATION ENGINEERING DEPARTMENT or Irrigation Project and processed accordingly

1. Collection of information and prepare list of documents and drawings required for irrigation project.
2. Calculation of yield from given Tope sheet of a catchment area, plotting catchment area, determination of catchment area by plan meter.
3. Canal capacity calculation from a given command area and cropping pattern.
4. Plotting of area capacity curve of a given contour map of irrigation project
5. From a given data fixation of control levels of reservoir.
6. Layout of drainage in earthen dam on A4 size plate
7. Neat labeled sketch of ogee spillway with gate and energy dissipation arrangement.
8. Study of National Water Policy and Maharashtra Water Policy.

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
S. K. Garg	Irrigation and hydraulic structure		Khanna publisher, New Delhi
Irrigation Engineering	H.M.Raghunath		Wiley-india
B.C.Punmia	Irrigation Engineering		Laxmi Publication, Delhi
P.N.Modi	Irrigation Water Resources Water Power		Standard Book House
Birdi & Das	Irrigation Engineering		Dhanpat Rai & Sons

Name of the Course: **Diploma in Civil Engineering** Subject: **Field Survey Practice-I**
 Course code: **CE** Course Duration: 6 semester Course offered in the Semester: **Fourth**
 Subject code: Question code: Marks :**100**

Teaching scheme	Examination scheme
Theory - Nil	Term Work (TW) - 50
Tutorial - Nil	Practical(PR) - 50
Sessional/Practical – 3 classes/hour per week or can be conducted as crash course in 12 days	Total marks - 100
Credit of the subject - 2	

Practical:

Skills to be developed:

Intellectual skills:

1. Identify the different instruments for linear measurement and levelling
2. Record and observing necessary observation with the survey instruments
3. Classify and discriminating various types of survey instruments.
4. Identify the errors of the survey instruments.

Motor skills:

1. Measure distances, bearings and finding reduced levels with survey instruments.
2. Prepare drawing using survey data.
3. Prepare contour map of a given terrain/topography.
4. Measure area of an irregular shape figure with planimeter.

Instructions:

- 1) Group size for survey practical work should be maximum 15 students. (May be compromised depending on instrument condition and other local condition of the polytechnic)
- 2) Each student from a group should handle the instrument independently to understand the function of different components and use of the instrument.
- 3) Drawing, plotting should be considered as part of practical. A student from a group should know the basic philosophy of raw data collection, data handling, calculation required for plotting and drawing.
- 4) 3-4 full day per project is required for carrying out project work.

Surveying projects:-

- 1) **Chain & compass traverse survey** – a simple closed traverse of 5-6 sides enclosing a building
 Reconnaissance, preparation of index map, selection of station and finalisation of station, taking FB & BB of lines, ranging a line, chaining a line, calculation of included angles, angular error adjustment, closing error and its balancing by Bowditch method, taking offset with chain and tape, setting out right angles, locating details and plotting them on a A1 size imperial drawing Sheet.
- 2) **Block contouring** – a block of 100 x 150m with spot levels at 10x10m plotting the contours (indirect method) on A-1 size imperial drawing sheet with a contour interval suitable for the site.
- 3) **Profile levelling survey** – running a longitudinal section for a length of 500 m for a road /canal /railway alignment. Cross section shall be taken suitably. Plotting plan, L- section including profile leveling and Cross section on a A1 size imperial drawing sheet.
- 4) **Plane table surveying –Demonstration** of accessories and other function; centering, levelling and orientation of plane table; traversing by plane table and adjustment of closing error graphically; plane surveying of a small area including filling in details by radiation and intersection method on a A1 size imperial drawing sheet

Name of Course: **Diploma in Civil Engineering** Subject: **Application of CAD in Civil Engineering I**
 Course code: **CE** Course Duration: 6 semester Course offered in Semester: **Fourth**.
 Subject code: Question code: Marks : **75**

Teaching Scheme	Examination Scheme
Theory : Nil	Term Work (TW) - 35
Tutorial: Nil	Practical(PR) - 40
Practical : 3	Total marks in the semester - 75
Credit :- 2	

Aim:-

1. Development of computer based knowledge in surveying.

Objective:- Students will be able to:

1. Use different CAD commands for drawing.
2. Prepare line plans with CAD software.
3. Prepare submission drawing/working drawing for the buildings with CAD software.
4. Prepare drawings of civil engineering structures.

Pre-Requisite:-

- Student should know basic functions of computers
- Student should follow the topics of AutoCAD covered in earlier semester

Unit no	Topic	Contact period	marks
1	Getting started	2	3
2	Basic command to get started	4	3
3	Setting up a drawing	3	5
4	Developing drawing strategies	8	8
5	Using layers to organize drawing	6	6
6	Using Blocks and W blocking	5	5
7	Generating elevation	6	10
8	Working with hatches and fills	3	5
9	Controlling drawing texts	3	6
10	Dimensioning in drawing	3	8
11	External references	1	5
12	Getting families with proper shape	3	8
13	Printing an auto CAD drawing	1	3

Contents: practicals/sessional (Application of CAD in Civil Engineering I) 3 Hrs/week

1. Getting started:

Starting up AutoCAD, introduction to the graphics window, command window, drop down menus, toolbars (flying out, calling up and arranging etc of toolbars)

2. Basic command to get started

Point and line command, coordinates, relative coordinates, Cartesian and Polar coordinates, drawing a box (as an example rectangle) by coordinates; offset, fillet, extend, divide and trim commands (use to generate walls and opening as exercise).

3. **Setting up a drawing**

Drawing unit, drawing size and scale, the grid, drawing limit, drawing with grid and shape, saving a drawing

4. **Developing drawing strategies**

Note: the preliminary exercise should be based on rectangular building because at the initial stage too complex drawing may distract and confuse the students

Laying out the walls, exterior walls and interior walls, creating wall opening, creating doors, swing of doors, copying objects, mirroring objects, finishing the swinging doors, drawing a sliding glass door, paneled door (by using fillet command) drawing steps and threshold

The balcony (balcony should be circular/elliptical to learn the control over circle and elliptical command)

Laying out Kitchen: counter, stove and refrigerator sink

Constructing bathroom and W.C. (setting and running object shapes): drawing shower unit, bathing block and W.C.

5. **Using layers to organize drawing**

Layers as an organizing tool, setting up layers, layers and line-type properties dialog box. Assigning objects to layers. Freezing and turning off layers, drawing the header (portion above opening beneath the ceiling), Drawing the roof, Colour, Line types and layers. Assigning a colour or line-type to an object, Making a colour and a line-type current. Assigning an individual line-type scale factor.

6. **Using Blocks and W blocking**

Making a block for a door, Inserting the door block, Finding the block in a drawing, Using grips to detect a block, Using the list command to detect a block. Using the properties button to detect a block, Creating the window block., inserting the window block, rotating a block during insertion, using guidelines when inserting a block, using point filters to insert a block, using blips to help in inserting block, finishing the windows revising a block, W blocking, inserting a DWG file into a DWG file

7. **Generating elevation**

Drawing the front elevation, setting up lines for height, trimming lines in elevation, drawing the roof in elevation, putting in the door, step and windows, finishing touches, generating the other elevations, making rear elevation making the left and right elevation, drawing scale consideration, interior elevations/sections

8. **Working with hatches and fills**

Ornamenting the front elevation by hatching looking at hatch pattern special effects modifying hatch pattern providing hatch to floor (for ornamentation)

9. **Controlling drawing texts**

Setting up text styles, text and drawing scales, defining text styles, using single line text, placing title of views in the drawing, placing room label in the floor plan, using text in a grid, creating a title block and border, using multiline text

10. **Dimensioning in drawing**

Dimension styles, making a new dimension style, placing dimension on the drawing, horizontal dimension, vertical dimension, other dimension, radial, leader line, angular and aligned dimension modifying dimension text, dimension overrides, dimensioning short distances

11. **External references**

Drawing site plan, using bearings (surveyor's unit), laying out property lines, setting up external reference dialog box, controlling the appearance of an External reference (External reference), Modifying an External reference drawing, application for External reference, additional features of

external references, the External reference path, binding External reference, other features of External reference

12. Getting families with proper shape

Setting up proper space, drawing a border in paper space, designing a title block for paper space, creating floating view path, zooming view part to 1/Xp, working with multiple viewport in paper space, setting up multiple viewports, aligning viewports, finishing drawing setting up viewports to different scale adding text to paper space turning off viewports, tile mode variable and tiled viewport

13. Printing an auto CAD drawing

The print / plot configuration dialog box, device and default information, pen parameter, paper size, and orientation, scale rotation and origin, additional parameters, printing a drawing, determining line weight for a drawing setting up the other parameters for the print, previewing a print, printing a drawing with paper space, printing drawing with multiple viewports, printing site plan.

Practical:

1. Draw a wooden door (2/3 rd glazed and 1/3 paneled using sash-bar) with standard dimension
2. Draw a wooden window (raised panel with fanlight) with standard dimension
3. Building drawing

Note 1 : single storied building shall comprise of two rooms, bath, WC, kitchen, front verandah with a provision of staircase and mummy for utilisation of roof space. Same plan used in subject 'Estimating and Costing' as well as 'Civil Engineering Drawing' is to be used.

- Development of line plan – ground floor plan and roof plan with provision for drainage layout
- Elevation (front elevation)
- Two Sectional elevation (section must pass through stair-case, bath WC, kitchen and front verandah)
- Site plan (to be developed from a Mouza map for conception of location plan)
- Foundation details (trench plan, section of main wall and a partition wall/ isolated footing with tie beam if provided)

Note 2: any theoretical aspects required for practicals mentioned above should be covered in the practical periods

Text Books:-

Name of Books	Name of the author	Edition	Name of the Publisher
Autodesk official training guide	Scott Onstott		Wiley-India
Autodesk official training guide	George Omura		Wiley-India
Reference Manual of AutoCAD			AutoDesk

Suggested List of Laboratory Experiments: - Nil

Suggested List of Assignments/Tutorial: - Nil

Name of Course: **Diploma in Civil Engineering** Subject: **Professional Practices-II**
 Course code: **CE** Course Duration: 6 semester Course offered in Semester: **Fourth**
 Subject code: Question code: Marks : **50**

Teaching Scheme	Examination Scheme
Theory : Nil	Term Work (TW) - 25
Tutorial: Nil	Practical(PR) - 25
Practical: 3 sessional/practical classes/week	Total marks - 50
Credit :- 2	

Aim:

1. Development and evaluation of individual skills.
2. Enhancement in soft skills through innovation.
3. Development of professional approach.

Objective :-

Student will be able to:

- Acquire information from different sources.
- Prepare notes for given topic.
- Present given topic in a seminar.
- Interact with peers to share thoughts.
- Prepare a report on industrial visit, expert lecture

Pre-Requisite:-

1. Communication skill must be perfect.

Contents: Sessional /Practical classes (Professional Practices-II) 3 Hrs/week

Unit -1Structured industrial visits be arranged and report of the same should be submitted by the individual student, to form a part of the term work. The industrial visits may be arranged in the following areas / industries (Any three)

- i) Bridge under construction
- ii) Adarsh Gram
- iii) Railway station
- iv) Construction of basement/retaining wall/sump well

Unit -2Lectures by Professional / Industrial Expert / Student Seminars based on information search, expert lectures to be organized from any two of the following areas:

- i) Construction of Flyovers: Special Features
- ii) Ready Mix concrete
- iii) Safety in Construction
- iv) Latest Trends in Water proofing
- v) Software for drafting

Unit – 3Information search can be done through manufacturers, catalogue, internet, magazines; books etc. and submit a report.(any three) Following topics are suggested :

- i) Collection and reading of drawings of buildings from architect / Practicing engineers and listing of various features from the drawings.
- ii) Market survey for pumps, pipes and peripherals required for multi storied buildings

- iii) Non Conventional Energy Sources with focus on solar energy
- iv) Elevators installation and maintenance
- v) Any other suitable areas

Unit – 4 Seminar:

Seminar topic should be related to the subjects of fourth semester. Each student shall submit a report of at least 10 pages and deliver a seminar (Presentation time – 10 minutes)

Unit – 5 Mini Project / Activities (any one)

- a) Optimum design of concrete
- b) Preparing three dimensional model of residential building using CAD

Text Books:- Nil

Reference books :- Nil

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments/Tutorial :- Nil

Name of Course: **Diploma in Civil Engineering** Subject: **Civil Engineering lab II**
 Course code: **CE** Course Duration: 6 semester Subject offered in Semester: **Fourth**
 Subject code: Question Code: Marks: **100**

Teaching Scheme	Examination Scheme
Theory : NIL	Term work (TW) – 50
Tutorial: NIL	Practical (PR) - 50
Practical : 3	Total marks - 100
Credit :- 2	

Group-I Mix design of concrete by B.I.S-10262: 2009 – with and without admixture,

Group II Non Destructive test of concrete:

- Compressive strength of hardened concrete by Rebound Hammer Test
- Ultrasonic Pulse Velocity test to determine quality of concrete that is: (1) homogeneity of concrete, (2) change in concrete with time, (3) modulus of elasticity (4) presence of crack.
- Rebar locator
- Concrete core cutter test

Group III Test on bitumen:

- Determination of grade of bitumen sample
- Determination of softening point, flush point and fire point of a bitumen sample
- Determination of ductility of bitumen
- Determination of viscosity of bitumen
- Marshall stability test

Name of the Course : All Branches in Diploma in Engineering and Technology (Development of Life Skills - II)		
Course code : CE/ME/IE/EJ/DE/ET/EX/EE/EP/CO/IF/IS/ CO/CM/IF/CV/MH/FE/IU/CD/ED/EI		Semester : FOURTH
Duration: One Semester (16 hours)		Maximum Marks: 50
Teaching Scheme		Examination Scheme:
Theory: 01 hrs / week		Internal Sessional: 25
Tutorial: -- hrs / week		External Sessional : 25
Practical: 02 hrs / week		
UNITS	CONTENTS	Hours
Unit - 1	Interpersonal Relation Importance, Interpersonal conflicts, Resolution of conflicts, Developing effective interpersonal skills - communication and conversational skills, Human Relation Skills (People Skills)	5
Unit - 2	Problem Solving I) Steps in Problem Solving (Who? What? Where? When? Why? How? How much?) 1. Identify, understand and clarify the problem 2. Information gathering related to problem 3. Evaluate the evidence 4. Consider feasible options and their implications 5. Choose and implement the best alternative 6. Review II) Problem Solving Technique 1. Trial and Error, 2. Brain Storming 3. Thinking outside the Box	8
Unit - 3	Presentation Skills Concept, Purpose of effective presentations, Components of Effective Presentations : understanding the topic, selecting the right information, organising the process interestingly, Good attractive beginning, Summarising and concluding, adding impact to the ending, Use of audio-visual aids - OHP, LCD projector, White board, Non-verbal communication : Posture, Gestures, Eye-contact and facial expression, Voice and Language - Volume, pitch, Inflection, Speed, Pause, Pronunciation, Articulation, Language Handling questions - Respond, Answer, Check, Encourage, Return to presentation Evaluating the presentation - Before the presentation, During the presentation, After the presentation	8

Unit - 4	Looking for a Job Identifying different sources announcing Job vacancies, Skim, scan and read advertisements in detail, write efficacious CVs, write covering letters to accompany CVs, write Job Application Letters - in response to advertisements and self-applications	5
Unit - 5	Job Interviews Prepare for Interviews : Intelligently anticipating possible questions and framing appropriate answers, Do's and don'ts of an interview (both verbal and non-verbal), Group Discussion: Use of Non-verbal behaviour in Group Discussion, Appropriate use of language in group interaction, Do's and don'ts for a successful Group Discussion	10
Unit - 6	Non-verbal - graphic communication Non - verbal codes: A - Kinesics, B - Proxemics, C- Haptics, D - Vocalics, E- Physical appearance, F- Chronemics, G - Artifacts Aspects of Body Language	6
Unit - 7	Formal Written Skills: Memos, E-mails, Netiquettes, Business correspondence - Letter of enquiry, Letter of Placing Orders, Letter of Complaint	6
Total		48

Sessional Activities	
Unit - 1 Interperson al Relation	Case Studies: 1. from books 2. from real life situations 3. from students' experiences Group discussions on the above and step by step write of any one or more of these in the sessional copies
Unit - II Problem Solving	Case Studies: 1. from books 2. from real life situations 3. from students' experiences Group discussions on the above and step by step write of any one or more of these in the sessional copies
Unit - III Presentatio n Skills	Prepare a Presentation (with the help of a Powerpoint) on a Particular topic. The students may refer to the Sessional activity (sl. No. 8) of the Computer Fundamental syllabus of Semester 1. For engineering subject-oriented technical topics the co-operation of a subject teacher may be sought. Attach handout of PPT in the sessional copy
Unit - IV Looking for a job	Write an effective CV and covering letter for it. Write a Job Application letter in response to an advertisement and a Self Application Letter for a job.

Unit - V Job Interviews & Group Discussions	Write down the anticipated possible questions for personal interview (HR) along with their appropriate responses Face mock interviews. The co-operation of HR personnels of industries may be sought if possible Videos of Mock Group Discussions and Interviews may be shown
Unit - 7 Formal Written Skills	write a memo, write an effective official e-mail, write a letter of enquiry, letter of placing orders, letter of complaint

Name of the Course: **Diploma in Civil Engineering** Subject: **Building Services and Entrepreneurship Development** Course code: **CE** Course Duration: 6 semester
 Course offered in the Semester: **FIFTH**
 Subject code: Question code: Marks: 100

Teaching Scheme	Examination Scheme
Theory –3 lecture per week	Class Test(CT) - 20
Tutorial – Nil	Assessment, Assignment, Quiz - 10
Practical - Nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks – 100

Aim:-

1. Testing of proficiency of students in the field of Civil engineering

Objective:-

Students will be able to:

1. Plan and design various building services required in residential and commercial buildings.
2. Apply various methods of providing these services & its maintenance.

Pre-Requisite:-

1. Students should be perfect in their selected subject / topic / theme.

Unit no	Topic	Contact period	Marks
Part A: Building Services			
1	Plumbing	10	
2	Installation of Lifts	6	
3	Fire Protection	3	
4	Lighting and Ventilation	3	
Part B: Entrepreneurship Development			
1	Entrepreneurship, Creativity & Opportunities	3	
2	Information and Support Systems	3	
3	Market Assessment	2	
4	Business Finance & Accounts	3	
5	Business Plan & Project Report	3	
6	Enterprise Management and Modern Trends	2	

Contents: Theory (A: Building Services:) 3Hrs/week

Unit -1Plumbing

1.1 Elements of plumbing

Objectives of plumbing, purpose of plumbing, role of plumber, licensing of plumbers their functions, sewer Air, supply pipes, drainage & vent pipes application for obtaining supply connection.

1.2 Pipes joints & fittings

Introduction. Types of Pipe – G.I. Pipes, PVC Pipes, Copper pipes, C.I. Pipes, A.C. Pipes, prestressed concrete pipes, joints in pipes, method of fixing pipes such as G.I. fitting C.I. fitting.

1.3 Valves & Terminal Fittings

Types of valves & its purpose, sluice valve, reflux valve, scour valve, Air relief valve, pressure relief valve, gate valves, Bio-taps & stop valve self closing valve. Flush valve, mixing valve.

1.4 Sanitary fixture & Building drainage system

Building sanitary fittings – water closet, flushing appliances, urinals, washbasins, flushing cisterns, principles of building drainage, siphonic action, traps & its types, capacity & sizing of pipe, soil pipe, waste pipe, rain water pipe, system of plumbing, Installation of pipes, testing of pipes.

Unit 2: Installation of Lifts

2.1 Lift – Lift floor-Lift Landing-----Storey-----Nomenclature of Floors& Storeys-----Total Headroom---Lift Landing---Lift landing door---Lift car---Lift door---Call indicator---Lift suspension ropes---Lift guides---Lift well---Lift pit--- Lift well Enclosure--- Lift rated load—Lift rated Speed---- Lift contract Speed-----
- Lift machine--- Lift Overhead Beam (Definitions only).

Classification of Lift

Passenger lift---Goods Lift---Hospital Lift---Service Lift (Dumb waiter)---Firemans Lift.

2.2 Design Considerations

Number of Lifts & capacity: Occupated Load ,Quantity of service, Quality of Service, Car speed, Determination of handling capacity $[(H=300*Q*100/T*P)$ where $T=R_t/N]$ -Positioning of Lifts =Shape & Size of Lift car-Acess to Machine Room & Lift Pits—Safety Measures.

Unit 3 Fire Protection

3.1 General Cassification of Buildings Based on Occupancy criteria of Fire Resistance –Compustible Material ---Occupancy or use Group—Types of construction.

3.2 General Requirements of Fire Protection

Maximum Height---FAR---Open Spaces: additional Provisions for high rise buildings, Mixed Occupancy—Fire Wall, Fire Stop or enclosure of all openings—Automatic Fire Detection & Alarm system----Fixed fire fighting Installations/Requirements for A, B & Occupancy buildings :Wet Riser, Wet riser –cum—downcomer, Automatic Sprinkler installation, Static reservoir, Dry riser.

3.3 Exit Requirements

Types of Fire Exits---General Exit Requirement---Occupant Load---Capacity of Exits---Arrangement of exits: travel distance---Doorways---Corridors & Passageways---Internal Staircases---Fire Escapes or external Stairs—Roof exit---horizontal exits---Fire tower---Ramps.

Unit 4 Lighting andVentilation

4.1 Natural Ventilation

Wind action---Stact Effect---Cross Ventilation ----Position of openings----Size of openings----Control of openings: sashes, canopies, louvers---Humidity control: Wind scoop.

4.2 Mechanical Ventilation

Fans: Propeller & Centrifugal----Installation of Fans: local & Central---Systems of ventilation: exhaust, plenum (positive ventilation) & combined-----Filters: dry, wet, washing & electrostatic----Determining rate of ventilation ---Mechanical cooling (Heat –Pump circuit): refrigerant, copmpressor, condenser, pressure release valve, evaporator---refrigerator & Air cooler-----Ton of refrigeration—Simple Air conditioner: Propelling , filtering, washing, humidifying, cooling,dehumidifying, heating or re-heating—Building installation of air conditioners: central handling, local handling & induction system—control systems: sensors, control unit, servo---mechanisms.

4.3 Principles of Lighting

Aims of God Lighting –Planning the Brightness Pattern—Considering the Visual task, the immediate background of the task(central field & visual field)and the general surroundings(peripheral field)---Glare, direct, reflected & veiling—Recommended values of illumination level for homes, restaurants, cinemas, theatres, schools & colleges, hospitals, offices(values only).

4.4 Daylighting

Sources of light of a point inside a building, skylight, externally reflected light, internally reflected light, direct sunlight—working plane, Daylight factor.

4.5 Artificial lighting

Necessity of Artificial lighting—Selection of light sources &luminaries depending on general lighting, direct lighting, local lighting---Determination of luminous flax & number of lamps.Lighting Arrester.

Practical:

1. Practical on joining P.V.C. / G.I. Pipes & fittings/Models and writing report on the process
2. Practical based on sanitary fitting like, traps, wash basin & water closet fittings.
3. Prepare drawing for water supply. Layout plan for campus showing following details service pipe, communication pipe, consumer pipe, water meter, rain water pipes
4. Prepare drawing for drainage line plan for campus showing following details: Inspection chambers sewage pipes, traps, man holes.
5. Market survey for different materials available in market their trade names & rates used for water proofing, termite proofing and damp proofing treatment and writing report on the materials collected.

Part B: Entrepreneurship Development**Objective:-**

Students will be able to:

1. Identify entrepreneurship opportunity.
2. Acquire entrepreneurial values and attitude.
3. Use the information to prepare project report for business venture.
4. Develop awareness about enterprise management.

Contents: Theory (B: Entrepreneurship Development) Hrs/week**Unit -1 Entrepreneurship, Creativity & Opportunities**

- 1.1 Concept, Classification & Characteristics of Entrepreneur
- 1.2 Creativity and Risk taking.
 - 1.2.1 Concept of Creativity & Qualities of Creative person.
 - 1.2.2 Risk Situation, Types of risk & risk takers.
- 1.3 Business Reforms.
 - 1.3.1 Process of Liberalization.
 - 1.3.2 Reform Policies.
 - 1.3.3 Impact of Liberalization.
 - 1.3.4 Emerging high growth areas.
- 1.4 Business Idea Methods and techniques to generate business idea.
- 1.5 Transforming Ideas in to opportunities transformation involves Assessment of idea & Feasibility of opportunity
- 1.6 SWOT Analysis

Unit -2 Information and Support Systems

- 2.1 Information needed and their Sources Information related to project, Information related to support system, Information related to procedures and formalities
- 2.2 Support Systems
 1. Small Scale Business Planning, Requirements.
 2. Govt. & Institutional Agencies, Formalities
 3. Statutory Requirements and Agencies.

Unit -3 Market Assessment

- 3.1 Marketing –Concept and Importance
- 3.2 Market Identification, Survey Key components
- 3.3 Market Assessment

Unit -4 Business Finance & Accounts**Business Finance**

- 4.1 Cost of Project
 - 4.1.1 Sources of Finance
 - 4.1.2 Assessment of working capital
 - 4.1.3 Product costing
 - 4.1.4 Profitability
 - 4.1.5 Break Even Analysis
 - 4.1.6 Financial Ratios and Significance

Business Account

- 4.2 Accounting Principles, Methodology
 - 4.2.1 Book Keeping

4.2.2 Financial Statements

4.2.3 Concept of Audit,

Unit -5Business Plan & Project Report

5.1 Business plan steps involved from concept to commissioning: Activity Recourses, Time, cost

5.2 Project Report

1. Meaning and Importance

2. Components of project report/profile (**Give list**)

5.3 Project Appraisal

1. Meaning and definition

2. Technical, Economic feasibility

3. Cost benefit Analysis

Unit -6Enterprise Management and Modern Trends

6.1 Enterprise Management: -

1. Essential roles of Entrepreneur in managing enterprise

2. Product Cycle: Concept And Importance

3. Probable Causes Of Sickness

4. Quality Assurance - Importance of Quality, Importance of testing

6.2 E-Commerce Concept and process

6.3 Global Entrepreneur

Text Books:- Nil

Name of Authors	Titles of the Book	Editi on	Name of the Publisher
Building Services:			
S. Deolalikar	Plumbing Design &Practice		Tata M.C. Graw hill publishing company, New Delhi
Prof. S.M. Patil	Building services		Patil Publication &Goregaon, Mumbai
S.R. Mohan &Vivek Anand	Design &Practical Handbook on plumbing		Standard Publishing, New Delhi
SandeepMantri	A to Z of practical building and its		Mantri Institute of Development & research, Pune.
Bindra&Arora	Building Construction		Dhanpatrai publishing
Rangwala	Building Construction		Charotor publishing House Anand
	National Building Code – 1983		Bureau of Indian Standards, New Delhi
The Kolkata Municipal Corporation Building Rules, Latest edition , Tax N Law/other local bodies			
Rajeev Roy	Entrepreneurship		Oxford University Press
Michael Schaper and others	Entrepreneurship and small business		Wiley-India
E GordenK.Natrajan	Entrepreneurship Development		Himalaya Publishing. Mumbai
Preferred by Colombo plan staff college for Technicaleducation.	Entrepreneurship Development		Tata McGraw Hill Publishing co. ltd. New Delhi.
J.B.Patel D.G.Allampally	A Manual on How to Prepare a Project Report		EDI STUDY MATERIAL Ahmadabad (Near Village Bhat , Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 ,

			Gujrat,India P.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in/olpe@ediindia.org Website : http://www.ediindia.org
J.B.Patel S.S.Modi	A Manual on Business Opportunity Identification & Selection		
S.B.Sareen H. Anil Kumar	National directory of Entrepreneur Motivator & Resource Persons.		
Gautam Jain Debmuni Gupta	New Initiatives in Entrepreneurship Education & Training		
P.C.Jain	A Handbook of New Entrepreneurs		
D.N.Awasthi , Jose Sebeastian	Evaluation of Entrepreneurship Development Programmes		
V.G.Patel	The Seven Business Crisis & How to Beat Them.		
Poornima M. Charantimath	Entrepreneurship Development of Small Business Enterprises		Pearson Education, New Delhi
Entrepreneurship Development			McGraw Hill Publication
J.S. Saini B.S.Rathore	Entrepreneurship Theory and Practice		Wheeler Publisher New Delhi
	Entrepreneurship Development		TTTI, Bhopal / Chandigadh
2) Video Cassettes			
SUBJECT			SOURCE
Five success Stories of First Generation Entrepreneurs			EDI STUDY MATERIAL Ahmadabad (Near Village Bhat, Via Ahmadabad Airport & Indira Bridge), P.O. Bhat 382428 , Gujrat,India
Assessing Entrepreneurial			

Competencies		P.H. (079) 3969163, 3969153 E-mail : ediindia@sancharnet.in/olpe@ediindia.org Website : http://www.ediindia.org
Business Opportunity Selection and Guidance		
Planning for completion & Growth		
Problem solving-An Entrepreneur skill		

Glossary:

Industrial Terms:

Terms related to finance, materials, purchase, sales and taxes.

Components of Project Report:

1. Project Summary (One page summary of entire project)
2. Introduction (Promoters, Market Scope/ requirement)
3. Project Concept & Product (Details of product)
4. Promoters (Details of all Promoters- Qualifications, Experience, Financial strength)
5. Manufacturing Process & Technology
6. Plant & Machinery Required
7. Location & Infrastructure required
8. Manpower (Skilled, unskilled)
9. Raw materials, Consumables & Utilities
10. Working Capital Requirement (Assumptions, requirements)
11. Market (Survey, Demand & Supply)
12. Cost of Project, Source of Finance
13. Projected Profitability & Break Even Analysis
14. Conclusion.

Suggested list of assignment:

- 1 Assess yourself-are you an entrepreneur?
- 2 Prepare project report and study its feasibility.

Reference books:

- (1) National Building Code of India Group 4—Part viii---Building services/Bureau of Indian Standards.

Name of the Course: **Diploma in Civil Engineering** Subject: **Contracts and Accounts**
 Course code: **CE** Course Duration: 6 semester Course offered in the Semester: **FIFTH**
 Subject code: Question code: Marks: 50

Teaching Scheme	Examination Scheme
Theory – 2 lecture per week	Class Test(CT)-10
Tutorial – Nil	Assessment, Assignment, Quiz – 5
Practical - Nil	End Semester Exam(ESE) -35
Credit - 2	Total Marks – 50

Aim:-

1. Study of contracts, costing and budgeting of building constructions.

Objective:-The students shall be able to:

1. Differentiate between types of contract.
2. Prepare tender documents.
3. Draft tender notice for various types of construction
4. Prepare specification of an item of construction.
5. Calculate the value of a land and old buildings

Pre-Requisite:-

1. Student should know tentative rates of materials to be used.
2. Student should have knowledge of accounting.

Unit no	Topic	Contact period	Marks
1	Procedure of Execution of Work By P.W.D.	4	4
2	Contract	4	6
3	Tender & Tender Documents	4	6
4	Accounts in P.W.D.	3	3
5	Payments to Contractors	3	3
6	Specifications	5	4
7	Valuation	6	6
8	Arbitration	3	3

Contents: THEORY (CONTRACTS AND ACCOUNTS) 2 Hrs/week Marks

Unit-1 Procedure of Execution of Work By P.W.D.

- 1.1 Organization of P.W.D., functions of their personnel.
- 1.2 P.W.D. procedure of initiating the work, administrative Approval, technical sanction, budget provision.
- 1.3 Methods used in P.W.D. for carrying out works contract method and departmental method, rate list method, piece work method, Day's work method, department method (NMR and casual muster roll.)

Unit -2 Contract

- 2.1 Definition of contract, objects of contract, requirements of valid 'Contract'

- 2.2 Types of engineering contract - lump sum contract, item rate contract, percentage rate contract, cost plus percentage, cost Plus fixed fee, cost plus variable percentage and cost plus variable fee contract, labour contract, demolition contract, fee contract, Target contract, negotiated contract .
- 2.3 Class of contractor, Registration of contractor.
- 2.4 BOT PROJECT.

Unit – 3 Tender & Tender Documents

- 3.1 Definition of Tender, Necessity of Tender, Types-Local And Global.
- 3.2 Tender Notice, Points To Be Included While Drafting Tender Notice, Drafting Of Tender Notice.
- 3.3 Meaning of Terms: Earnest Money, Security Deposit, Validity Period, Right To Reject One or All Tenders, Corrigendum To Tender Notice And Its Necessity.
- 3.4 Tender Documents – List, Scheduled A, Schedule B, Schedule C.
- 3.5 Terms Related To Tender Documents – Contract Conditions, Time Limit, Time Extension, Penalty, Defective Material And Workmanship, Termination of Contract, Suspension Of Work, Subletting Of Contract, Extra Items, Escalation, Arbitration, Price Variation Clause, Defect Liability Period, Liquidated And Unliquidated Damages.
- 3.6 Filling the tender by contractor and points to be observed by him.
- 3.7 Procedure of submitting filled in tender document, procedure of opening tender , comparative statement , scrutiny of tenders, award of contract, acceptance letter and work order.
- 3.8 Unbalanced Tender, Ring Formation.

Unit – 4 Accounts in P.W.D.

- 4.1 Various Account Forms and their Uses, Measurement-books, Nominal Muster Roll, Imprest Cash, Indent, Invoice, Bills, Vouchers, Cash Book, Temporary Advance.

Unit – 5 Payments to Contractors

Mode of payment to the contractor, interim payment and its necessity, advance payment, secured advance, on account payment, final payment, first and final payment, retention money, reduced rate payment, petty advance, mobilization advance.

Unit – 6 Specifications

- 6.1 Necessity and importance of specifications of an items, points to be observed in framing specifications of an item, types of specification –brief and detailed, standard and manufacturers specification.
- 6.2 Preparing detailed specifications of items in civil engineering works. Standard specification book
- 6.3 Legal Aspects Of Specification.

Unit – 7 Valuations

- 7.1 Definition, necessity of valuation, Definitions – cost price, value, difference between them, characteristics of value, factors affecting value.
- 7.2 Types of value: - book value, scrap value, salvage, Value, speculative value, distress value, market value, monopoly value, sentimental value, factors affecting value .
- 7.3 Depreciation, obsolescence, sinking fund; Methods of calculation of depreciation – straight line method, Sinking fund method constant percentage method quantity survey method.
- 7.4 Computation of capitalized value, gross income, outgoing, net Income, years purchase. types of outgoing and their percentages.
- 7.5 Valuation of lands & buildings, factors affecting their valuation, Book value method, replacement value method and comparison method.
- Use of valuation tables .deferred value of land.
- 7.3 Fixation of rent as per PWD practice

Unit 8: Arbitration

- 8.1 Introduction
- 8.2 Procedure of Arbitration

Assignment:

Skills to be developed:

Intellectual skills:

1. Know the importance of specification in civil engineering works.
2. Draft tender notice and prepare tender documents.

3. Identify and use various account forms used in pwd

Motor skill:

1. Write the detailed specification.
2. Draft brief tender notice for construction of wbm road.
3. Prepare tender document for construction of a residential building.
4. Prepare valuation report for land and building.
5. Prepare tender document for a civil engineering work.

List of Assignments:

1. Collecting old set of tender document and writing a report on it
2. Collection of tender notices published in newspapers for various items of civil engineering works. (At least 5) write salient features of them.
3. Drafting a tender notice for construction of a civil engineering work (Residential building on which estimation and drawing have already been made in the previous semester)
4. Preparation of tender document for the building. (Detailed estimate prepared for residential building in Estimating and costing shall be used)
5. Collection of various account forms from PWD & writing report on it
6. Writing a report on store procedure and account producer of PWD. For it a Guest lecture of PWD official may be arranged.
7. Writing detailed specifications for one item from each of following:
 - A) Building construction system.
 - B) Irrigation engineering system.
 - C) Transportation engineering system.
 - D) Environment engineering system.

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
B.N. Datta	Estimating & costing in Civil engineering		UBS Publishers
M. Chakraborti	Estimating & costing, Specification and Valuation in Civil Engineering		M. Chakraborti , Calcutta
S.C. Rangwala	Estimating & costing		Charotar Publication
B.S. Patil	Civil Engineering Contracts and Accounts Vol I , II		Orient Longman
G. S. Birdie	ESTIMATING & COSTING		DhanpatRai and Sons
VIDEO CASSETTES / CDS: MSBTE CAI Package			

Reference books: - Nil

Suggested List of Laboratory Experiments: - Nil

Suggested List of Assignments/Tutorial: - Nil

Name of the Course: **Diploma in Civil Engineering** Subject: **Transportation Engineering II**
 Course code: **CE** Course Duration: 6 semester Course offered in the Semester: **FIFTH**
 Subject code: Question code: Marks: 100

Teaching Scheme	Examination Scheme
Theory – 3 Lecture per week	Class Test(CT)- 20
Tutorial – Nil	Assessment, Assignment, Quiz - 10
Practical - Nil	End Semester Exam(ESE) - 70
Overall Contact hour per week – 3 hour/week	Total Marks - 100
Credit - 3	

Aim:-

1. Study of surveying, designing and making of highway.

Objective:- Student should be able to:

1. Survey and investigation for location of new road.
2. Organize, supervise and co-ordinate construction activities of road.
3. Prepare & interpret the drawings related to the work.
4. Select & test materials on site and laboratory as per requirements.
5. Handle skilled workers and monitor quality control parameter related to work
6. Improve, maintain and repairs of existing roads.

Pre-Requisite :-

1. Student should be able to read and draw morphological nature of land.

Unit no	Topic	Contact period	Marks
1	Road Engineering	3	4
2	Investigation for Road Project	3	4
3	Geometric Design Of Highways	12	18
4	Construction of Roads Pavements and materials	12	16
5	Traffic Engineering	5	10
6	Hill Roads	3	6
7	Drainage of Roads	3	4
8	Maintenance and Repairs of Roads	3	4
9	Introduction to Airport Engineering	4	4

Contents: Theory (Transportation Engineering II) 3 Hrs/week Marks

Unit -1 Road Engineering :

- 1.1 Importance of road in India. Characteristics of road transport, Scope of highway Engineer
- 1.2 Classification of roads according to Nagpur plan (Location and function), and modified classification of road by third road development plan(1981-2001) Traffic and tonnage,
- 1.3 Classification of urban roads.
- 1.4 Road patterns

Unit -2 Investigation for Road Project

- 2.1 Reconnaissance survey, Preliminary survey and Location survey for a road project.
- 2.2 Detailed survey for cross drainage- L-section and C/S sections.
- 2.3 Fixing the alignment of road, factors affecting alignment of road.
- 2.4 Drawings required for road project- Key map, Index map, Preliminary survey plan and detailed location survey plan, L section and C/S sections cross drainage work, land acquisition plan, drawing of road intersections
- 2.5 Survey for availability of construction material, location plan of quarries.
- 2.6 Project Report
- 2.7 Highway project – steps involved in a new project and in a realignment project

Unit – 3 Geometric Design Of Highways

- 3.1 Camber- definition, purpose, types, IRC – specifications.

- 3.2 Kerbs, traffic separators or medians, road margin, carriage way, road formation, right of way
- 3.3 Design speed- IRC – specifications
- 3.4 Gradient – definition, types, IRC specification.
- 3.5 Sight distances– definition, types, IRC specification.
- 3.6 Curves–Necessity, types– horizontal, vertical and transition curves.
- 3.7 Widening of roads on curves.
- 3.8 Super Elevation – definition, formula for calculating super elevation, minimum and maximum values of super elevation, and methods of providing super elevation, design of super elevation
- 3.9 Sketching of standard C/S of national highway in embankment and cutting.
- 3.10 Simple problems on geometric design of road.

Unit – 4 Construction of Roads Pavements and materials

- 4.1 *Types of road materials and Tests* – soil, aggregates, bitumen, Cement Concrete. Test on soil sub grade- C.B.R. test, Test on Aggregate – Los Angeles abrasion, impact, and shape test. Tests on bitumen- Penetration, Ductility and Softening point test.
- 4.2 *Pavement* – objective of pavement, structure of pavement, function of pavement components, types of pavement.
- 4.3 *Construction of earthen road* – general terms used- borrows pits, spoil bank, lead and lift, balancing of earthwork. Construction procedure.
- 4.4 *Soil stabilized roads* – necessity, methods of soil stabilization, steps involved in constructing mechanically stabilized road
- 4.5 *Water bound macadam roads* – materials used, size and grading of aggregates and screening, construction procedure including precautions in rolling.
- 4.6 *Construction of bituminous roads* - Terms used– bitumen, asphalt, emulsion, cutback, tar, common grades adopted for construction.
Types of bituminous surface – prime coat, tack coat, seal coat, Surface dressing – procedure of construction, bituminous penetration macadam, and Bitumen/Tar carpets – procedure of construction.
- 4.7 *Cement concrete pavements*- Construction procedure and equipments, Construction joints, joint filler, joint sealer.

Unit – 5 Traffic Engineering

- 5.1 Traffic volume study
- 5.2 Traffic control devices- road signs, marking, Signals, Traffic island.
- 5.3 Highway intersection – a. at grade intersections (non channelized, channelized intersection and traffic rotaries) and b. grade separated or fly over intersections and interchange
- 5.4 Road accident. Building code IS:1904

Unit – 6 Hill Roads

- 6.1 Parts and functions of hill road components, types of curves, Hill road formation.
- 6.2 Land slides- causes and prevention.
- 6.3 Structures- drainage structures.

Unit – 7 Drainage of Roads

- 7.1 Surface drainage – side gutter, catch water drains, surface drainage.
- 7.2 Sub-surface drainage –Longitudinal drains and cross drains.

Unit – 8 Maintenance and Repairs of Roads

- 8.1 Necessity of maintenance of roads
- 8.2 Classification of maintenance operation – ordinary, routine and periodic maintenance.
- 8.3 Maintenance of W.B.M., bituminous and cement concrete roads.

Unit – 9 Introduction to Airport Engineering

- 9.1 Introduction & Role of civil engineer.
- 9.2 Terminology
- 9.3 Layout of airport & function of different units.
- 9.4 Airport Grading and Drainage

List of Assignments:

1. Road project for a road of minimum 0.5 km. length having at least one small cross drainage work.
 - 1.1 Site selection.
 - 1.2 Reconnaissance survey.
 - 1.3 Fixing the alignment.
 - 1.4 Detailed profile survey along the alignment and cross section of road and CD Work.
 - 1.5 Prepare computer generated drawing of longitudinal section and typical cross sections of the road in cutting and filling.
 - 1.6 Prepare computer generated drawing of proposed typical CD work/culvert. (Using CAD)
 - 1.7 Draw a layout plan of Airport.
2. Visit to a road under construction/constructed to study the construction of
 - (a) WBM road (b) flexible pavement (c) Rigid pavement roads for observing the type of construction and construction equipments.
3. Preparing drawings of detailed cross sections of
 - (a) Major district road (b) State Highway (c) National highway (d) Express Highway in cutting and banking showing details and dimensions with proper scale. (Any two)
4. Traffic volume study and its representation of an important road intersection in your city.
5. Visit to a W.B.M. and Bituminous road for observing the different types of defects in roads. Prepare a visit report. Which should consist of (a) List of various defects observed (b) Suggestions regarding the possible remedial measure.

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Khanna & Justo	Highway Engineering		Khanna Publication
Transportation Engg	A.K. Upadhyay		Katson Books
L.R. Kadiyali	Traffic Engineering --		
N.L. Arora, S.P. Luthara	Transportation Engineering		I.P.H. New Delhi
Vazarani & Chandola	Transportation Engineering		Khanna Publication
Biridi & Ahuja	Road, Railway, Bridges		S.B.H. New Delhi
Kamala	Transportation Engineering		T.M.H. New Delhi
K.L. Bhanot & S.B. Sehgal	Highway Engineering & Airport		S. Chand & company
	IS / International Codes IRC 36 – 1970, IRC 16 – 1965, IRC 20 – 1966		

Suggested List of Laboratory Experiments :- Nil**Suggested List of Assignments/Tutorial: - Nil**

Name of the Course: **Diploma in Civil Engineering** Subject: **Design of RCC Structures**
 Course code: **CE** Course Duration: 6 semester Course offered in Semester: **FIFTH**
 Subject code: Question code: Marks : 100

Teaching Scheme	Examination Scheme
Theory : 4 Lectures per week	CT- 20
Tutorial: Nil	Attendance, Assignment & Quiz: 10
Practical : Nil	End Semester Exam(ESE) : 70
Credit :- 4	Total Marks: 100

Aim:-

1. Study of design of structure.

Objective:-

Students will be able to:

1. Analyze the section by LSM.
2. Select Proper materials and Calculate the design values for the materials.
3. Calculate the loads on structural components as per IS 875 (Part-I & II) provisions.
4. Read and interpret structural drawing.
5. Understand the basic principles of design of R.C.C. sections.
6. Use & Correlate the specifications of **IS 456-2000: code & SP-16**.
7. Draw and appreciate the proper reinforcement detailing of R.C. structural member and their connection using **SP-34 & IS 13920**.
8. Prepare the detailed drawing of structural elements with key plans and schedule of reinforcement
9. Design singly reinforced, Doubly reinforced and flanged section of beams, simply supported one way & two way slabs, cantilevers slab, axially loaded columns & footings by LSM.

MODULAR DIVISION OF THE SYLLABUS

UNIT	TOPICS	CONTACT PERIOD	MARKS
1	INTRODUCTION	04	6
2	Working Stress Method	04	4
3	Limit State Method	04	6
4	Analysis and Design of Singly Reinforced Sections (LSM)	08	6
5	Analysis and Design of Doubly Reinforced Sections (LSM)	06	8
6	Shear, Bond and Development Length (LSM)	07	8
7	Analysis and Design of T-Beam (LSM)	06	6
8	Design of lintel	04	6
9	Design of Slab (LSM)	08	8
10	Design of Axially Loaded Column and Footing (LSM)	08	8
11	Prestressed concrete	05	4
TOTAL:		64	70

DETAIL COURSE CONTENT

Unit1: Introduction

- 1.1 Aim of design, Concept of R.C.C., Necessity of steel as reinforcement and its position in a Simply Supported and continuous member.
- 1.2 Design- Functional Design & Structural Design.
Scope of a Structural Designer- Structural Planning, Calculation of loads, Analysis, Design & Detailing, Advantages of symmetrical planning over un-symmetrical planning
Loads: Dead load, Imposed load, Wind loads & other loads as per IS 875(Part-I to Part III)
Earthquake forces. – IS 1893- 2002(Part -1), Seismic zones, Combination of loads.
- 1.3 Methods of design-working stress method, limit state method – Introduction of IS 456 and SP-16
- 1.4 Detailing- introduction of SP-34 & IS13920 Necessity of IS 13920-1993

Unit2: Working stress method

- 2.1 Introduction
- 2.2 R.C. Sections, their behaviour, Grades of concrete & steel, permissible stresses,
- 2.3 Assumptions in W.S.M..
- 2.4 Equivalent bending stress distribution diagram & Moment of Resistance for singly reinforced rectangular section – balanced, under-reinforced & over-reinforced sections – numerical problems

Unit3: Limit State Method

- 3.1 Definition, types of limit states, partial safety factors for materials strength, characteristic strength, characteristic load, design load. Loading on structure as per I.S 875.
- 3.2 I.S. Specification regarding spacing of reinforcement in slab, cover to reinforcement in slab, beam column & footing, minimum reinforcement in slab, beam & column, lapping, anchoring effective span for beam, & slab.

Unit4: Analysis and Design of Singly Reinforced Sections (LSM)

- 4.1 Limit State of collapse (Flexure), Assumptions, stress- Strain relationship for concrete and steel, neutral axis, Stress block diagram and Strain diagram for singly reinforced section.
- 4.2 Concept of under- reinforced, over-reinforced and balanced section, neutral axis co-efficient, limiting value of moment of resistance and limiting percentage of steel required for balanced singly R.C. Section.
- 4.3 Simple numerical problems on determining design constants, moment of resistance and area of steel .

Unit5: Analysis and Design of Doubly Reinforced Sections (LSM)

- 5.1 General features, necessity of providing doubly reinforced section, reinforcement limitations.
- 5.2 Analysis of doubly reinforced section, strain diagram, stress diagram, depth of neutral axis, moment of resistance of this section.
- 5.3 Simple numerical problems on finding moment of resistance and design of beam sections.

Unit6: Shear, Bond and Development Length (LSM)

- 6.1 Nominal Shear stress in R.C. Section, design shear strength of concrete, Maximum shear stress, Design of shear reinforcement, Minimum shear reinforcement, forms of shear reinforcement.
- 6.2 Bond and types of bond, Bond Stress, check for bond stress, Development length in tension and compression, anchorage value for hooks 90° bend and 45° bend Standard Lapping of bars, check for development length.
- 6.3 Simple numerical problems on deciding whether shear reinforcement is required or not, check for adequacy of this section in shear. Design of shear reinforcement; Minimum shear reinforcement in beams; Determination of Development length required for tension reinforcement of cantilever beam and slab, check for development length.

Unit7: Analysis and Design of T-Beam (LSM)

- 7.1 General features, advantages, effective width of flange as per IS:456-2000 code provisions.
- 7.2 Analysis of singly reinforced T-Beam, strain diagram & stress diagram, depth of neutral axis, moment of resistance of T-beam section
- 7.3 Design of T-beam for moment and shear for Neutral axis within or up to flange bottom.
- 7.4 Simple numerical problems on deciding effective flange width (Problems only on finding moment of resistance of T-beam sections shall be asked in written examination.)

Unit8: Design of lintel

8.1 Design of lintel for flexure under triangular load only for brick work above it and for its self weight – typical problem solution.

8.2 Design of shear reinforcement for lintel – typical problem solution.

Unit9: Design of Slab (LSM)

9.1 Design of simply supported one-way slabs for flexure check for deflection control, and shear.

9.2 Design of one-way cantilever slabs and cantilevers chajjas for flexure check for deflection control and check for development length and shear.

9.3 Design of two-way simply supported slabs for flexure with corner free to lift.

9.4 Design of dog-legged staircase.

9.5 Simple numerical problems on design of one-way simply supported slabs cantilever slab & two-way simply supported slab

Unit10: Design of Axially Loaded Column and Footing (LSM)

10.1 Assumptions in limit state of collapse – compression

10.2 Definition and classification of columns, effective length of column. Specification for minimum reinforcement; cover, maximum reinforcement, number of bars in rectangular, square and circular sections, diameter and spacing of lateral ties.

10.3 Analysis and design of axially loaded short, square, rectangular and circular columns with lateral ties only; check for short column and check for minimum eccentricity may be applied.

10.4 Types of footing, Design of isolated square footing for flexure, and shear.

10.5 Simple numerical problems on the design of axially loaded short columns and isolated square footing. (Problems on design of footing shall be asked in written examination for moment and two way shear only.)

Unit11: Prestressed Concrete

11.1 Introduction to prestressed concrete.

11.2 Externally and internally prestressed member.

11.3 Advantages and disadvantages of prestressed concrete.

11.4 Methods of prestressing, pretensioning and posttensioning. Losses in prestressing.

11.5 Concept of prestressing – Stress concept, Load balancing concept

I.S. Codes:

1. IS 456:2000 - Plain and Reinforced concrete code of Practice.

2. SP16- Design Aids for reinforced concrete to IS 456.

3. I.S. 875 (Part 1-5) - 1987 code of practice of design loads for Buildings and structures.

Part 1 - Dead load

Part 2 - Imposed (live) load

Part 3 - Wind load

4. SP 24 - Explanatory Handbook on IS 456

5. IS 1343-1980 - Indian Standard code of (Reaffirmed 1990) Practice for Prestressed concrete.

6. SP34 : 1987 - Handbook on concrete reinforcement and Detailing.

7. IS 13920-1993 DUCTILE detailing of R. C. Building subjected to Seismic forces.

Term work as per AICTE

Term work shall consist of sketch book, design of R.C.C structural components.

Sketch book:

Sketch book consists of approximately ten plates from R.C.C. Design shall include important information of clauses of IS 456-2000 code. Typical sketches of components members/stress distribution &

strain distribution diagrams R.C.C. section/detailing of reinforcement in joints/members. Design of R.C.C.

structural components by LSM.

The students should make detailed simple design and drawing of reinforcement detailing on two full imperial size sheets finished in pencil on *any five* of the following R.C.C. component members of a two storied building with detailing of reinforcement (G+1) at the joints as per requirements & IS 13920

1. One-way simply supported slab.

2. Two-way simply supported slab.

3. Cantilever slab/chajja.

4. T-Beam.

5. Column and column footing.
6. Dog-legged staircase

Name of Authors	Titles of the Book	Edition	Name of the Publisher
N. Subramanian	Design of Reinforced Concrete Structure		Oxford University Press
Pillai and Menon	Design of RCC structure		Tata-Mcgrawhill
Sayal and Goyel	Design of RCC structure		
Punmia Jain Jain	Reinforced Concrete		
Verghese	Limit State method of RCC design Vol I & II		
A.K.Jain	Limit State method of design		
Nilam Sharma	Design of RCC structure		

Name of the Course: **Diploma In Civil Engineering** Subject: **Geotechnical Engineering II**
 Course code: **CE** Course Duration :6 semesters Course offered in the Semester: **FIFTH**
 Subject code: Question code: Marks : 50

Teaching Scheme	Examination Scheme
Theory - 2 Lectures per week	Class Test(CT)- 10
Tutorial - Nil	Attendance/Assignment/Quiz - 5
Practical - Nil	End Semester Exam(ESE) - 35
Credit – 2	Total Marks - 50

Aim:-

Study of different types of foundation and their practical applications and their suitability.

Objective:- Students will be able to:

1. Estimate the bearing capacity of different types of foundation.
2. Estimate the probable settlement of structures.
3. Know the different methods in use to improve the strength of foundation soil.

Pre-Requisite:-

- Student should be conversant with the topics covered in the curricula pursued in previous semester

Unit no	Topic	Contact period	Marks
1	Foundation – types and design criteria	2	5
2	Bearing Capacity of soil	8	10
3	Settlement of Shallow Foundations	6	8
4	Deep Foundations	8	6
5	Ground Improvement techniques	8	6

Content: Theory (Geotechnical Engineering II) 2 hours/week

Unit – 1 Foundation – types and design criteria

Unit -2 Bearing Capacity of soil

- 2.1 Concept of bearing capacity, ultimate bearing capacity, net ultimate bearing capacity, factor of safety, safe bearing capacity and allowable bearing pressure
- 2.2 Terzaghi's analysis and assumptions made and formula
- 2.3 Effect of water table on bearing capacity
- 2.4 Determination of bearing capacity for different foundation (isolated and strip foundation only on homogeneous soil deposits) as per IS code method
- 2.5 Field methods for determination of bearing capacity – Plate load test and standard penetration test. Test procedures as Per IS:1888& IS:2131
- 2.6 Typical values of bearing capacity from building code IS:1904
- 2.7 Basic concept of Soil-Structure interaction
- 2.8 Method of calculation of allowable bearing pressure and settlement criteria (no numerical problems) and permissible values (uniform and differential) of settlement as per relevant IS code

Unit3: Settlement of Shallow Foundations

3.1 Introduction

- 3.2 Steps involved in settlement computation –immediate settlement and consolidation settlement
- 3.3 Estimation of settlements for cohesionless soils
 - 3.3.1 Schmertmann's method
 - 3.3.2 Semi- empirical method of settlement analysis – a. plate load test b. static cone penetration test
- 3.4 Estimation of settlement for cohesive soils
 - 3.4.1 Thin clay layer sandwiched between thick sand layers – numerical problems
 - 3.4.2 Clay layer resting on cohesionless soil or rock – numerical problems

Unit 4: Deep Foundations

1. Pile foundation

- 4.1.0 Introduction, Pile Foundation: Definition & Suitability of pile foundations
- 4.1.1 Classification of Pile foundations –based on material used (timber piles, concrete piles, steel piles); based on method of installation- (driven piles, driven cast in situ piles, bored piles),

classification based on load transfer mechanism from pile to soil and functions(bearing piles, friction piles, sheet piles, fender piles, tension piles, under-reamed piles etc.)

4.1.2 Estimation of Load Capacity of Piles (to resist axial force only):

- Static formula – behaviour of piles in cohesive soil (driven piles and bored piles); piles in granular soil and (driven piles and bored piles); estimation of frictional resistance in cohesive soil – driven piles and bored piles; frictional resistance in cohesionless soil – driven piles and bored piles; estimation of end bearing – in cohesive soil and in cohesionless soil; Static Formula as per IS Code (numerical problems on single pile)
- pile capacity from in situ soil test (SPT)(numerical problems on single pile)
- Dynamic Formulae – dynamics of pile driving, ENR formula, Hilley's formula(numerical problems on single pile)
- Estimation of Load capacity from Load Test on Piles

4.1.3 Group Action in Piles - Spacing of piles; Piles group in sand and gravel; Pile groups in clay, group efficiency

2. Well foundations

4.2.0 Introduction

4.2.1 Classification - Open caissons, Box caissons & Pneumatic caisson; Different shapes of wells

4.2.2 Components of well foundation, physical characteristics – scour depth and grip length

4.2.3 Forces acting on well foundation

4.2.4 Construction of well foundations - Sinking of wells - Tilting and shifting of wells - Rectification of tilts and shifts

Unit5 Ground Improvement techniques

5.1 Introduction- need for ground improvement and classification of ground improvement techniques

5.2 Principles of ground improvement – for cohesive soil and cohesion less soil.

5.3 Ground treatment in cohesive soil – preloading, vertical drain, stone column, vibroflotation

5.4 Ground treatment in cohesionless soil – drop hammer, dynamic consolidation, vibrocompaction

5.5 other methods – a. Reinforced earth (Principle, Components, Advantages, Applications) b.

Geosynthetics(Types of Geosynthetics, Functions of Geosynthetics, Applications of Geosynthetics) c.

Ground water lowering d. Foundation grouting e. Ground improvement by blasting f. In - situ ground treatment for slopes g. Soil nailing

Name of the book	Author	Edition	Publisher
Soil mechanics and foundation engineering	VNS Murthy		Dhanpat Rai & Sons
Soil mechanics and foundation engineering	B C Punmia		
Soil mechanics and foundation engineering	B M Das		Thomson
Soil Mechanics and Foundation Engineering	P.P.Raj		Pearson

Reference books:

Name of the book	Author	Edition	Publisher
Soil Mechanics in Engineering Practice	Karl Terzaghi, Peck and Mesri		Jhon Wiley & Sons
Soil :Mechanics	Lambe and Whitman		Wiley Eastern Limited

Name of Course: **Diploma in Civil Engineering** Subject: **Geotechnical Engineering Lab**
 Course code: **CE** Course Duration: 6 semester Subject offered in Semester: **FIFTH**
 Subject code: Question code: Marks: 100

Teaching Scheme	Examination Scheme
Theory : NIL	Term work (TW) – 50
Tutorial: NIL	Practical (PR) - 50
Practical : 3	Total marks - 100
Credit :- 2	

Practical

Skills to be developed:

Intellectual Skills:

- Identify properties of soil.
- Interpret test results.
- Follow IS procedure of testing.

Motor Skills:

- Measure the quantities accurately.
- Handle the instruments carefully.

List of Practical (Any ten)

- Determination of water content of given soil sample by oven drying method as per IS Code.
- Determination of bulk unit weight dry unit weight of soil in field by core cutter method as per IS Code.
- Determination of bulk unit weight dry unit weight of soil in field by sand replacement method as per IS Code.
- Determination of Liquid limit & Plastic limit of given soil sample as per IS Code.
- Determination of grain size distribution of given soil sample by mechanical (sieve analysis) method as per IS Code.
- Determination of coefficient of permeability by constant head test
- Determination of coefficient of permeability by falling head test
- Practical (Live demo or Pre-recorded demo)
- Determination of shear strength of soil using direct shear test.
- Determination of shear strength of soil using Laboratory Vane shear test
- Determination of MDD & OMC by standard proctor test on given soil sample as per IS Code.
- Determination of CBR value of given soil sample.
- Determination of shear strength of soil using unconfined compressive strength.
- Determination of shear strength of soil using tri-axial shear test.

Name of Course: **Diploma in Civil Engineering** Subject: **Civil Engineering lab III**
 Course code: **CE** Course Duration: 6 semester Subject offered in Semester: **FIFTH**
 Subject code: Question code: Marks: 100

Teaching Scheme	Examination Scheme
Theory : NIL	Term work (TW) – 50
Tutorial: NIL	Practical (PR) - 50
Practical : 3	Total marks - 100
Credit :- 2	

Group-I: Mechanics of structure

Practical:

Skill to be developed:

Intellectual Skills:

1. Interpret the results.
2. Calculate design/ quantities of parameters.

Motor Skills:

1. Observe the phenomenon during testing of specimen.
2. Draw the graphs and diagrams.
3. Measure different parameters accurately
4. Adjust levels by operating valves

Group – A (Any Four)

1. Identify the components of universal testing machine.
2. Tension test on mild steel /tor steel or deformed bars .
3. Flexure test on floor tiles or roofing tiles.
4. Abrasion Test on flooring tiles.
5. Determination of coefficient of friction
6. Hardness of metal (mild steel and brass) – by Rockwell or Brinnel test

Group – B: Hydraulics (Any Six)

List of Practical:

1. Measurements of pressure and pressure head by Piezometer, U-tube manometer
2. Measurement of pressure difference by U-tube differential manometer. Study of bourdon's gauge
3. Verification of Bernoulli's theorem
4. Determination of coefficient of discharge for given rectangular or triangular notch.
5. Determination of coefficient of discharge for a given Venturimeter.
6. Demonstration and use of Pitot tube and current meter.
7. Determination of hydraulic coefficients for sharp edge orifice.
8. Study of a model of centrifugal and reciprocating pump.

Name of Course: **Diploma in Civil Engineering** Subject: **Application of CAD in Civil Engineering II**
 Course code: **CE** Course Duration: 6 semester Subject offered in Semester: **FIFTH**
 Subject code: Question code: Marks :75

Teaching Scheme	Examination Scheme
Theory : NIL	Term work (TW) – 35
Tutorial: NIL	Practical (PR) - 40
Practical : 3	Total marks - 75
Credit :- 2	

Aim:-

1. Development of computer based knowledge in surveying.

Objective:- - Students will be able to:

1. Use different CAD commands for drawing.
2. Prepare line plans with CAD software.
3. Prepare submission drawing/working drawing for the buildings with CAD software.
4. Prepare drawings of civil engineering structures.

Pre-Requisite:-

1. Student should know basic functions of AutoCAD

Unit no	Topic	Contact period	Marks
1	Building drawing in layers	21	10
2	RCC detailing I	15	8
3	RCC detailing II	12	7

Content: Sessional/Practical (Application of CAD in Civil Engineering II) 3 hour /week

Unit 1:Building drawing in layers

Note: single storeyed building shall comprise of two rooms, bath, WC, kitchen, front verandah with a provision of staircase and mumty for utilisation of roof space. Same plan used in subject 'Estimating and Costing' as well as 'Civil Engineering Drawing' and Application of CAD in Civil Engineering I is to be used.

- 1.1 Layer on/off
- 1.2 Formation of layer
- 1.3 Draw plumbing and sanitary layout in separate layer
- 1.4 Taking print for separate layer drawing

Unit 2:RCC detailing I

- 2.1 One way slab (plan and sectional elevation along the shorter span)
- 2.2 Two way slab (plan and sectional elevation along both span)
- 2.3 Half portion of three span continuous beam with at least two cross sections at center and end of span (with provision of crank and extra top bar)
- 2.4 Lintel and chajja for a window opening of 1.5 m clear span
- 2.5 Columns with pedestal and footing (plan and sectional elevation)
- 2.6 Taking print in A4 sheet

Unit 3:RCC detailing II

- 3.1 2.0 metre deep underground water reservoir having stepped masonry wall (plan & sectional elevation)
- 3.2 detailing of cantilever type RCC retaining wall without shear key of height 3.0 m
- 3.3 detailing of 3 pile cap with 400 mm diameter and 22 metre RCC pile

Name of Books	Name of the author	Edition	Name of the Publisher
Autodesk official training guide	Scott Onstott		Wiley-India
Autodesk official training guide	George Omura		Wiley-India
Reference Manual of AutoCAD			AutoDesk

Suggested List of Laboratory Experiments: - Nil

Suggested List of Assignments/Tutorial: - Nil

Name of Course: **Diploma in Civil Engineering** Subject: **Professional Practices III**
 Course code: **CE** Course Duration: 6 semester Subject offered in Semester: **FIFTH**
 Subject code: Question code: Marks: **50**

Teaching Scheme	Examination Scheme
Theory : NIL	Term work (TW) – 25
Tutorial: NIL	Practical (PR) – 25
Practical : 3	Total marks - 50
Credit :- 2	

Aim:-

Development of professional awareness in before and after sales and services.

Objective:-

Student will be able to:

- Acquire information from different sources.
- Prepare notes for given topic.
- Present given topic in a seminar.
- Interact with peers to share thoughts.
- Prepare a report on industrial visit, expert lecture

Pre-Requisite:-

Students should have complete knowledge of design and maintenance of the building.

Contents: Practical/Sessional (PROFESSIONAL PRACTICES III) 3 Hrs/week

Unit-1: Structured industrial visits shall be arranged and report of the same should be submitted by the individual student, to form a part of the term work.

Following are the suggested type of Industries/ Field visits (Any three visits)

- Irrigation project for observing components of dam and canal.
- Steel structure for study of its details.
- Residential apartment / public building to study plumbing & sanitary system.
- Hot mix plant

Unit -2:The Guest Lecture/s from field/industry experts, professionals to be arranged(2 Hrs duration), minimum 2 nos. from the following or alike topics. The brief report to be submitted on the guest lecture by each student as a part of term work.

- a) Construction of highway, material of construction, machinery used and manpower requirement .
- b) To set up a small scale industry.
- c) Planning and design of irrigation project.

Unit – 3Information Search, data collection and writing a report on the topic

- a) Collecting an estimate from P.W.D.
- b) Material specifications and rate of plumbing and sanitary fittings from market
- c) Collecting market rates for material and labour for building items.

Unit – 4The students should discuss in group of six to eight students and write a brief report on the same as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are -

- a. Recent trends in civil engineering as a service industry.
- b. Waterproofing and leakage prevention.
- c. Troubleshooting in plumbing system.
- d. Causes of failure of road.

Text Books:- Nil

Reference books :- Nil

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments/Tutorial :- Nil

Name of the Course: **Diploma in Civil Engineering** Subject: **Civil Engineering Project I**
 Course code: **CE** Course Duration : 6 semesters Subject offered in Semester: **Fifth**
 Subject code: Question code: Marks: **100**

Teaching Scheme	Examination Scheme
Theory : Nil	Term work (TW) – 50
Tutorial: NIL	Practical (PR) – 50
Practical :3	Total marks - 100
Credit :- 2	

Aim:-

1. Exposition of professional approach of students towards knowledge gain.

Objective:- Students will be able to:

1. Collect the information for a given project.
2. Apply principles, theorems and bye-laws in the project planning and design.
3. Interpret and analyze the data.
4. Develop professional abilities such as persuasion, confidence, and perseverance and communication skill.
5. Develop presentation skill.
6. Enhance creative thinking.

Pre-Requisite:-

1. Students should have entire knowledge of civil engineering.

Contents:- Practical/Sessional (Civil Engineering Project I) 3 Hrs/week

Project:

Skills to be developed:

Intellectual skills:

- 1) Decide and collect data for projects.
- 2) Read and interpret the drawing, data.
- 3) Design the components.
- 4) Apply the principles rules regulations and byelaws.

Motor skills:

- 1) Plan for different phases of a task.
- 2) Prepare drawings for project.
- 3) Use of computer for drawing, networking.
- 4) Work in a group for a given task.

Project:

Following is the list / areas of suggested civil engineering projects to be undertaken by a group of 4 to 6 students.

The project report shall be in the following format:

- Topic and objectives
- Collection of data, required survey work,
- Management and construction procedure
- Resources scheduling and networking
- Design details
- Required drawing set
- Utility to society if any
- Conclusion

CIVIL ENGINEERING PROJECTS:

1. Planning and design for residential apartment (G+2)

Note: building shall comprise of two flat per floor each containing two rooms, bath, WC, kitchen, front verandah with a provision of common staircase and mummy for utilization of roof space and overhead water tank (around 210 sq m. covered area for each building unit) Ground floor to be used for parking spaces.

Architecture planning, load calculation & design of all structural components, preparation of drawing sheet – a typical floor plan, roof plan with provision of drainage, sectional elevation including staircase, trench plan, front view, structural details – reinforcement of: floor slab (as a whole), critical beam, central column and corner column including footing, tie beam(tie beam layout plan and reinforcement detailing), stair with landing and estimate of different items of the building, calculation of FAR.

WBSCTE

Name of the Course: **Diploma in Civil Engineering** Subject: **Design of Steel Structure**
 Course code: **CE** Course Duration :6 semester Subject offered in Semester: **SIXTH**
 Subject code: Question code: Marks: 100

Teaching Scheme	Examination Scheme
Theory –4 lecture per week	Class Test(CT) - 20
Tutorial – Nil	Attendance, Assignment, Quiz - 10
Practical - Nil	End Semester Exam(ESE) - 70
Credit - 4	Total Marks - 100

Aim:-

1. Study of design and implementation steel structure used in building construction.

Objective:-Students will be able to:

1. Analyze the steel structure and its members for determining the forces acting in the member
2. Select proper material and sections from steel table
3. Calculate design values for members
4. Use IS 875 Part 1, 2 & 3 provisions for dead load, live load and wind load.
5. Design the tension member, compression member, beam, purlins and column bases and their connection.
6. **Use of IS 800 – 2007 for designing the member.**
7. Read and interpret the structural drawings
8. Prepare the detailed working drawing of steel roof truss, showing sections and connections.

Pre-Requisite:-

1. Student should understand the load bearing capacity of components of building.
2. Student should be perfect in building drawing and its reading process.

Unit No	Topic	Contact periods	Marks
1	Introduction	6	5
2	Plastic Analysis	12	10
3	Limit State Design	4	5
4	Design Of Tension Members by L.S.M	6	10
5	Design Of Compression Members by L.S.M	10	10
6	Column Bases by L.S.M	6	8
7	Design Of Connections And Detailing	12	12
8	Steel Roof Truss	8	10

Content: Theory (DESIGN OF STEEL STRUCTURES) 4 hours per week

Unit -1 Introduction

Advantages and disadvantages of steel as construction material. Types of sections ,Grades of steel(IS 2062) and strength characteristics; Use of steel table(SP6-Part1); Types of loads on steel structure and its I. S. code specification. Geometrical properties of gross and effective cross sections– Classification of Cross Sections as per IS:800-2007– Internal, external(outstands) and tapered elements of sections– Maximum Effective Slenderness Ratio of members – Necessity of Bracings and Expansion joints in Steel Structures .

Unit-2 Plastic Analysis

Plastic Analysis: Analysis of Steel Structures– Methods– Elastic, Plastic and Advanced method of analysis based on IS: 800-2007– Idealized Stress vs Strain curve– Problems. For Structural Steel– Requirements and Assumptions of Plastic method of analysis– Formation of Plastic hinges in Flexural

members– Plastic Moment of Resistance and Plastic Modulus of Sections– Shape Factors of rectangular / circular/ I / T-Sections– Collapse load.

Unit-3 Limit State Design

Basis for design– Classification of Limit States– Characteristic and Design Actions– Ultimate and Design Strengths– Partial Safety Factors for Loads and Materials– Factors Governing the Ultimate Strength: Stability, Fatigue and Plastic collapse– Serviceability

Unit-4 Design of Tension Members by L.S.M

Tension Members-effective length and Effective Sectional Area of tension members - Design Strength of Tension members against yielding of gross section requirements: Deflection limits, Vibration, Durability and Fire resistance, against rupture of critical section and due to block shear. Problems on determination of design strength of given members and designing tension members using rolled steel sections for given loads– Design of bolted and welded connections for tension members –Problems.

Unit-5 Design of Compression Members by L.S.M

Compression Members- Effective Length and Effective Sectional Area of Compression members – Design Stress and design strength– Buckling Class of cross sections– Imperfection factor– Stress reduction factor– Thickness of elements .Analysis and design of axially loaded column. Introduction to lacing and battening (No numerical problem on Lacing and Battening)

Unit-6 Column Bases by L.S.M

Slab base and Gusseted base – Code Provisions (IS:800-2007) – Minimum thickness and Effective Area of Base plate– Design of Slab base for axially loaded columns using bolts /welds. Introduction to Gusseted base(no numerical problems on gusseted Base).

Unit-7 Design Of Flexural Members For BM and SF by L.S.M

General- Effective span of Beams, Design strength of bending,(Flexure), Limiting deflection of beams –Design of laterally supported Simple beams for Bending moment and Shear force using single / double rolled steel sections (symmetrical cross sections only) – Problems.

Unit-8 Design Of Connections And Detailing

General- Types of connections– Bolted, Riveted and Welded connections– Rigid and Flexible connections– Components of connections– Basic requirements of connections- Clearance for holes– Minimum and Maximum spacing of fasteners– Minimum edge/ end distances– Requirements of Tacking fasteners. Bolted Connection– Types of bolts– Bearing type Bolts– Nominal and Design shear strengths of bolts– Reduction factors for Long joints, Large grip lengths, Thick packing plates– Nominal and Design bearing strengths of bolts– Reduction factors for over sized and slotted holes– Nominal and Design tensile strengths (tension capacity) of bolts-Simple problems. Welded Connection- Types of welds– Fillet welds– Minimum and maximum sizes– Effective length of weld- Fillet welds on inclined faces–Design strengths of shop/site welds– Butt welds– Effective throat thickness and effective length of butt weld- Simple problems.

Unit-9 Steel Roof Truss

Types of steel roof truss & its selection criteria. Calculation of panel point load for Dead load; Live load and wind load as per I.S. 875-1987 Analysis and Design of steel roof truss. Design of Angle purlin as per I. S. Arrangement of members at supports.

Text Book :

1. Dr. N. Subramanian “Steel Structures”, Oxford University Press.
2. K.S.Sai Ram “Design of Steel Structures” Pearson-Porling Kindersley Pvt Ltd
3. M.R.Shiyekar “Limit State Design in Structural Steel”, PHI Learning Pvt Ltd, 2011
4. **BIS code: IS 800: 2007**

MODEL QUESTION PAPER – 1

PART- A

Note: Answer any 20 Questions. – All Questions carry equal marks

1. Define the term “Shape factor”
2. What do you mean by “Collapse load”?
3. State any two advantages of limit state design with respect to steel structures.
4. Why expansion joints are to be provided in steel structures?
5. List the three different design strengths of a tie member.
6. What is the advantage of bolted connection?
7. Why lacings are provided in compression members?
8. How a slender compression member generally fails?
9. Why steel beams are provided with lateral supports?
10. Specify minimum thickness of web for a beam to avoid web buckling, as per IS:800 - 2007?
11. What is the effective length of a beam for torsional buckling under normal loading condition? When its ends are partially restrained against torsion but not restrained against warping?
12. Which member of a steel roof system is subjected to bi-axial bending?
13. When a flexural member is said to be under high shear?
14. Give two examples for members subjected to combined bending and tension.
15. What will be the reduced effective moment of a beam section when it is under tension?
16. List the different types of bolts?
17. What is meant by tacking fasteners?
18. Specify the value of minimum edge distance for a 20 mm dia bolt hole in case of hand flame cut edges.
19. Define “effective length of butt weld”.
20. What is the minimum thickness of steel member against corrosion-(a) accessible for painting & repairing (b) inaccessible for painting & repairing.

PART- B

Note :i) Answer all Questions choosing either division (A) or division (B) of each question.

ii) All divisions carry equal marks.

21. (A) i) What are the assumptions made in the plastic method of analysis?.

ii) Explain briefly the serviceability requirements of structural elements to be considered in the limit state design.

OR

(B) A simply supported steel beam of effective span 6 metres is subjected to a point load at 2 metres from the left support. The plastic moment of resistance of the section is 200kN.m. Find the collapse load by kinematical method.

22. (A) Design the tie member of a roof truss to carry an axial force of 200 kN, due to live and dead loads, using double angles, which are to be connected back to back on either side of 8mm thick gusset plates by 4 numbers 16mm dia bolts at each end.

OR

(B) Design the slab base and concrete pedestal for a steel column [ISMB350@52.4kg/m](#) carrying an axial design load of 1000 kN. The pedestal is of M20 grade concrete and the SBC of soil is 300kN/m². Yield strength of steel is 250 N/mm². Suggest suitable size of weld if $f_u=460$ N/mm².

23. (A) (i) Differentiate the behaviours of laterally supported and laterally un-supported beams.

(ii) When a beam section has to be designed for the combined effects of bending and shear?

OR

(B) Design a simply supported steel beam using suitable I-Section to carry an udl of 50 kN/m on an effective span of 5 m. The beam is not supported laterally. Yield strength of steel used is 300 MPa. Assume both flanges to be fully restrained against torsional rotation and warping at both ends.

24. (A) A steel column of effective length 4.0 metre is subjected to an axial compression of 600kN

. Select suitable rolled steel I section for the column by limit state method, taking f_y of steel as 340 MPa. Check for overall member strength is not necessary.

OR

(B) An ISLB400@569N/m is used as a laterally supported cantilever beam. The support section of the beam is subjected to a design shear force of 360kN. Determine the design bending strength of the section if f_y of steel is 300 MPa.

25. (A) (i) Explain different types of bolts.

(ii) Draw a neat sketch of beam to column seat angle connection using fillet welds.

OR

(B) A single angle tension member ISA 100x100x8 mm carries an axial force of 150kN. Find out the minimum overlapping length required, on a 10mm thick gusset plate, at its end if (i) 5mm size fillet welds of permissible design shear strength 150 N/mm² are used and (ii) 16mm dia bolts of design bolt value 50kN are used.

Name of the Course: **Diploma in CIVIL Engineering** Subject: **Construction & Disaster Management**
 Course code: **CE** Course Duration: 6 semester Subject offered in Semester: **SIXTH**
 Subject code: Question code: Marks:

Teaching Scheme	Examination Scheme
Theory –3 lecture per week	Class Test(CT) - 20
Tutorial – Nil	Attendance, Assignment, Quiz - 10
Practical - Nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks - 100

Unit no	Topic	Contact period	Marks
Part A. Construction management			
1	Introduction.	2	4
2	Contract Management	2	6
3	Construction organization	3	5
4	Resource Management	4	8
5	Infrastructure Management	2	4
6	Planning and scheduling techniques	8	10
7	Cost Management	6	8
8	Quality Management and Safety	4	5
Part B. Disaster management			
9.1	Introduction	3	4
9.2	Disaster Mitigation measures	6	6
9.3	Disaster Management	8	10

Content: theory (Management) 3 hour per week

Part A. CONSTRUCTION MANAGEMENT

Unit1:Introduction

Definition of Construction Management(CM) and its system; Benefits of CM; Roles, responsibilities and Risks of personnel involved in CM; Definition of Construction Industry and its trend; Various stages of a construction project.

Unit2: Contract Management

Definition of contract; Types of contract system; Components of contract documents; Floating of Tender; Steps involved in award of contract; Execution and Monitoring of contract documents.

Unit3: Construction organization

Organization Structure & types; Concept of hierarchy; Communication within the hierarchy; Payroll & Records.

Unit4: Resource Management

Definition – Need for resource management – Optimum utilization of resources- finance, materials, machinery, human resources – Resource planning – Resource levelling and its objectives

Unit5: Infrastructure Management

Explanation of site-layout; Approach road; Provision of water connection, electricity connection, establishing communication system, drainage system; Provision for site-office, workshop, warehouse, security room.

Unit6: Planning and scheduling techniques

Bar charts and linked Bar charts, Network analysis and Critical Path Method(CPM), PERT(Program Evaluation and Review Technique), Advantages and disadvantages of CPM & PERT.

Unit7: Cost Management

Control estimate. Direct cost, Indirect cost, Contingency, Cost-volume relationship.

Unit8: Quality Management and Safety

Importance of quality – Elements of quality – Quality assurance techniques (inspection, testing, sampling) Importance of safety – Causes of accidents – Role of various parties (designer / employer / worker) in safety management – Benefits – Approaches to improve safety in construction

Part B. DISASTER MANAGEMENT

Unit-9

9.1 Introduction – Disasters due to natural calamities such as Earthquake, Rain, Flood, Hurricane, Cyclones etc – Man made Disasters – Crisis due to fires, accidents, strikes etc – Loss of property and life.

9.2 Disaster Mitigation measures – Causes for major disasters – Risk Identification – Hazard Zones – Selection of sites for Industries and residential buildings – Minimum distances from Sea – Orientation of Buildings – Stability of Structures – Fire escapes in buildings – Cyclone shelters – Warning systems.

9.3 Disaster Management – Preparedness, Response, Recovery – Arrangements to be made in the industries / factories and buildings – Mobilization of Emergency Services - Search and Rescue operations – First Aids – Transportation of affected people – Hospital facilities – Fire fighting arrangements – Communication systems – Restoration of Power supply – Getting assistance of neighbors / Other organizations in Recovery and Rebuilding works – Financial commitments – Compensations to be paid – Insurances – Rehabilitation.

Reference Book : (for Construction Management)

Name of Books	Name of the author	Edition	Name of the Publisher
Construction project management –theory and practice	Kumar Neeraj Jha		Pearson
Construction Management	Sanga Reddy. S		Kumaran Publications, Coimbatore
Construction Management and Planning	Sengupta.B, &H.Guha		Tata McGraw Hill Publishing Company Ltd., New Delhi
Construction Engineering & Management	Seetharaman. S,		Umesh Publications
Project Planning and control with PERT and CPM	B C Punmia		Laxmi Publications
Computer Applications in Construction	Boyd.C. & Paulson Jr		Tata McGraw Hill Publishing company Ltd., New delhi.

(for Disaster Management)			
Name of Books	Name of the author	Edition	Name of the Publisher

WBSCTE

Name of the Course: **Diploma in Civil Engineering** Subject: **Environmental Engineering**
 Course code: **CE** Course Duration: 6 semesters Subject offered in Semester: **SIXTH**
 Subject code: Question code: Marks: 100

Teaching Scheme	Examination Scheme
Theory –4 lecture per week	Class Test(CT)- 20
Tutorial – Nil	Attendance, Assignment, Quiz - 10
Practical - Nil	End Semester Exam(ESE) - 70
Credit - 4	Total Marks - 100

Aim:-

1. Study of management of waste materials and their effects on environment.

Objective:-The students will be able to –

1. Estimate water demands
2. Analyse the quality of water
3. Suggest the treatment required by knowing the quality of water
4. Know the sewerage system.
5. Analyse the sewage
6. Suggest the waste water treatment
7. Suggest the treatment for industrial waste
8. Know the solid waste management

Pre-Requisite:-

1. Students should know pollutants and their effects on construction and environment.
2. Student should have knowledge of control of pollution.
3. Student should know the norms of pollution led by Govt.

Contents: Theory (**Environmental Engineering**), 4 Hrs per week

Unit	Topic	Contact period	Marks
Unit -1	ENVIRONMENTAL POLLUTION AND CONTROL 1.1 Introduction- Environment, Ecosystem, Environmental Pollution and its Types and sources, Causes of Pollution, Effects of Pollution - control of water pollution - soil pollution - sources of soil pollution - effects of soil pollution - control of soil pollution - noise pollution - sources of noise pollution - effects of noise pollution - control of noise pollution - air pollution - sources of air pollution - effects of air pollution on human beings, plants, animals, materials - air pollution control equipment - control devices for particulate contaminants 1.2 Environmental degradation - ozone layer depletion - green house effect - acid rain. 1.3 Existing laws related to Environmental Pollution.	03	02
Unit -2	PUBLIC WATER SUPPLY 2.1 Quantity of Water Demands of water - Domestic, Industrial, Commercial & Institutional, Public use, Losses and wastes, Fire demand; Factors affecting rate of Demand, Variations of water demands, Forecasting of population, Methods of forecasting of population, Design period for water supply scheme. Estimation of quantity of water supply required for a town or city. 2.2 Sources of Water Surface and Subsurface sources of water, Water conservation, Ground water recharging – Necessity Importance and	25	26

	<p>advantages.</p> <p>2.3 Intake Structures and Conveyance of water- Definition and types, Factors governing the location of an intake structure. Type of pipes used for conveyance of water, laying of pipes and pipe joints.</p> <p>2.4 Quality of Water Need for analysis of water, Characteristics of water- Physical, Chemical and Biological. Meaning and importance of parameters – Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, E coli index, MPN. Water quality standards as per B.I.S. code.</p> <p>2.5 Purification of Water Screening- Types of screens, Aeration- objects and methods of aeration, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, types of sedimentation tanks, Filtration-theory of filtration, classification of filters: slow sand filter, rapid sand filter, pressure filter, domestic filter, filter media, construction and working of slow sand filter and rapid sand filter, Disinfection: Objective, methods of disinfection, Chlorination- Application of chlorine, forms of chlorination, types of chlorination practices, residual chlorine and its importance, Flow diagram of water treatment plants,</p> <p>2.5.1 Miscellaneous water Treatments (Water softening, Defluoridation techniques), Low cost water Treatments: Necessity and importance in rural areas, Prevention of pollution of bores and bore wells.</p> <p>2.6 Methods of distribution of water- Gravity, pumping and combined system Service reservoirs – functions and types, Layouts of distribution of water- Dead end system, grid iron system, circular system, radial system - their suitability, advantages and disadvantages.</p>		
Unit – 3	<p>DOMESTIC SEWAGE</p> <p>3.1 Introduction Importance and necessity of sanitation, Necessity to treat domestic sewage, Recycling and Reuse of domestic waste Definitions- Sewage, sullage, types of sewage</p> <p>3.2 Building Sanitation and Plumbing Definitions of the terms related to Building Sanitation- Water pipe, Rain water pipe, Soil pipe, Sullage pipe, Vent pipe, Building Sanitary fittings- Water closet – Indian and European type, flushing cistern, wash basin, sinks, Urinals, Traps- types, qualities of good trap, Systems of plumbing – one pipe, two pipe, single stack, choice of system Principles regarding design of building drainage, layout plan for building sanitary fittings (drainage plan), inspection and junction chambers, their necessity, location, size and shape. Maintenance of sanitary units.</p> <p>3.3 Systems of Sewerage Types of Sewers, Systems of Sewerage, Design of sewers, self cleansing velocity and non scouring velocity, Laying, Testing and maintenance of sewers.</p> <p>3.4 Sewer Appurtenances Manholes and Drop Manhole-component parts, location, spacing, construction details, Sewer Inlets, Street Inlets, Flushing Tanks – manual and automatic</p>	22	28

	<p>3.5 <i>Analysis of Sewage</i> Characteristics of sewage – major parameters.</p> <p>3.6 <i>Treatment of Sewage</i> Objects of sewage treatment, General layout and flow diagram, Screening, Grit removal, Skimming, Sedimentation of sewage, Sludge digestion, Trickling filters, Activated sludge process, Disposal of sewage.</p> <p>3.6.1 <i>Miscellaneous treatments</i> - Septic tank (including design as per IS code), Oxidation pond, Oxidation ditch.</p>		
Unit – 4	<p>INDUSTRIAL WASTE</p> <p>4.1 Industrial Waste Water Characteristics of Industrial waste water from sugar, Dairy, Distillery, Textile, Paper and Pulp and Oil industry; and their suggestive treatments (only brief idea)</p>	02	02
Unit – 5	<p>SOLID WASTES FROM THE SOCIETY</p> <p>6.1 <i>Solid Waste Management Definitions</i> – Refuse, Rubbish, Garbage, Ashes, Constituents of solid wastes Sources of solid wastes, Collection of Solid Wastes. Methods of collection of solid wastes Methods of treatment and disposal of solid waste.</p> <p>6.2 Hazardous Wastes- Introduction, Types of hazardous wastes. Characteristics of hazardous wastes. Treatment and disposal of hazardous wastes.</p>	04	05
Unit – 6	<p>ENVIRONMENTAL SANITATION</p> <p>7.1 <i>Rural Sanitation</i> Necessity and importance, Rural sanitation- Types of Privies – Aqua privy and Bore Hole Latrine- construction and working, Composting (Nadep or Vermiculture)</p> <p>7.2 <i>Emerging Trends (only brief idea)</i> Sant Gadge Baba Swachhatha Abhiyan Low cost Latrines Jalswarajya Scheme</p>	05	05
Unit 7	<p>ENVIRONMENTAL IMPACT ASSESSMENT</p> <p>Environmental impact assessment (EIA) - methodology of EIA – organizing the job - performing the assessment - preparation of environmental impact statement (EIS) - review of EIS - environmental risk assessment – limitation of EIA.</p>	03	02
Unit - 8	<p>PLUMBING</p> <p>8.1 Sanitary Plumbing, Layout, Details of water supply arrangement for residential and public building Rainwater and sewage collection systems</p>	01	02
	Total	64	70

Suggested List of Assignments/Tutorial :-

- 1) Design of a combined sewer carrying sewage and run-off water.
- 2) Design of a septic tank with soak pit.
- 3) Layout of building sanitation with plumbing fixtures in a multistoried building.

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Santosh Garg	Environmental Engineering (Volume I & II)		Khanna Publishers

Kamla A. & Kanth Rao D. L.	Environmental Engineering		Tata McGraw Hill,
Birdie G. S. Birdie J. S.	Water Supply and Sanitary Engineering		Dhanpat Rai & Sons
Deolalikar S. G	Plumbing – Design and Practice		Tata McGraw Hill
Rao M. N. Rao H. V. N	Air Pollution		Tata McGraw Hill
H. M. Raghunath	Ground Water		New Age International
Rao&Dutta	Industrial Water Treatment		

Reference books :- Nil

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments/Tutorial :- Nil

Name of the Course: **Diploma in Civil Engineering** Subject: **Advanced Construction Techniques & Equipments (Elective)**

Course code: **CE** Course Duration: 6 semesters

Subject offered in Semester: **SIXTH** Subject code:

Question code: Marks: **100**

Teaching Scheme	Examination Scheme
Theory – 3 lecture per week	Class Test(CT)- 20
Tutorial – Nil	Attendance, Assignment, Quiz - 10
Practical - Nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks - 100

Aim:-

1. Study of advanced techniques and building materials.

Objective:-The students shall be able to:

1. Know the new materials of construction.
2. Understand various advanced methods of construction.
3. Select suitable construction equipments for execution of various constructions activities.

Pre-Requisite:-

1. Student should study current techniques and properties of building materials.
2. Student should think over the problems and the alternatives to it.

Unit no	Topic	Contact period	marks
1	Advanced Construction Materials	2	8
2	Advanced Concreting Methods	6	12
3	Advanced Construction Methods	8	14
4	Hoisting and Conveying Equipments	4	8
5	Earth Moving machinery	4	10
6	Concreting Equipments	4	10
7	Miscellaneous Equipments and Equipment management	4	6

Contents: THEORY (ADVANCED CONSTRUCTION TECHNIQUES & EQUIPMENTS (ELECTIVE)

3 Hrs/week

Unit -1 Advanced Construction Materials

1.1 FIBERS AND PLASTICS.

Types of fibers – Steel, Carbon, Glass fibers. Use of fibers as construction materials. Properties of fibers.

Types of Plastics – PVC, RPVC, HDPE, FRP, GRP etc. Colored plastic sheets. Use of plastic as construction Material.

1.2 Artificial Timber

Properties and uses of artificial timber. Types of artificial timber available in market, strength of artificial timber.

1.3 Miscellaneous materials

Properties and uses of acoustics materials, wall claddings, plaster boards, Micro-silica, artificial sand, bonding agents, adhesives etc.

Unit -2 Advanced Concreting Methods

2.1 Prestressed Concrete

Grades of Concrete and prestressing cables for prestressed concrete. Methods of pre-tensioning and post tensioning. Equipments and accessories for prestressing. Precautions during prestressing of members.

2.2 Under water Concreting

Underwater concreting for bridge piers and bored pile construction. Tremy method of under water concreting. Procedure and equipments required for tremy method. Properties, workability and water cement ratio of the concrete required.

2.3 Ready Mix concrete

Necessity and use of Ready Mix Concrete. Production and equipments for RMC. Ready Mix Concrete plant. Conveying of RMC. Transit mixers- working and time of transportation. Workability and water cement ratio for RMC. Strength of RMC.

2.4 Tremi Concreting method

Definition, application of vacuum dewatering concreting. Equipments used in tremi concreting. Procedure of vacuum dewatering concreting (Tremix).

2.5 Special Concretes

Properties, uses and procedure of Roller compacted concrete. Properties and uses of High Impact Resisting concrete. Properties, uses and constituents of Steel fiber reinforced concrete. Percentage of steel fibers in SFRC. Effect of size, aspect ratio and percentage of steel fibers on strength of concrete.

2.6 Shortcrete and Guniting

Introduction of shortcrete/guniting, techniques behind shortcreting, methods of shortcreting and its practical uses.

2.7 Introduction to the concept of green concrete and mass concrete

Unit – 3 **Advanced Construction Methods.**

Unit-3: Formwork

Steel Formwork, H frames, Steel plates, Steel props, Telescopic props, Girders or trestles. Tubular formwork.

Slip formwork- meaning, use of slip formwork. Process of concreting with slip forms.

3.2 Construction of Multistoried Buildings

Use of lifts, belt conveyors, Pumped concrete, Equipments and machinery required for construction of Multistoried Buildings. Precautions and safety measures.

3.3 Prefabricated Construction

Meaning of prefabrication and precast. Methods of prefabrication- plant prefabrication and site prefabrication. Linear members, rigid frames, roofing and flooring members, R.C. Doors and windows, wall panels, Jointing of structural members.

3.4 Soil Reinforcing techniques

Necessity of soil reinforcing, Use of wire mesh and geo-synthetics. Strengthening of embankments, slope stabilization in cutting and embankments by soil reinforcing techniques.

Unit – 4 Hoisting and Conveying Equipments

4.1 Hoisting Equipments

Principle and working of Tower cranes, Crawler cranes, Truck mounted cranes, gantry cranes, Mast cranes, Derricks.

4.2 Conveying Equipments

Working of belt conveyors. Types of belts and conveying mechanism. Capacity and use of dumpers, tractors and trucks.

Unit – 5 Earth Moving machinery

5.1 Excavation Equipments

Use, Working and output of bulldozers, scrapers, graders, and power shovels, JCB, draglines.

5.2 Compacting Equipments

Use of rollers, Roller types- Plain rollers, Sheep footed rollers, Vibratory rollers, pneumatic rollers. Rammers- use and working.

Unit – 6 Concreting Equipments

6.1 Concrete Mixers

Types of concrete mixers. Weigh batching equipments, Equipments for transportation of concrete- trollies, lifts. Transit mixers, Concrete vibrator- Needle vibrators, Screed vibrators.

Automatic concrete plants – layout, process and working.

6.2 Stone Crushers

Types of stone crushers, capacities and working. Equipments for production of artificial sand.

Unit – 7 Miscellaneous Equipments and Equipment management

7.1 Miscellaneous Equipments

Pile driving equipment, Pile hammers, selection of hammers. Working of hot mix bitumen plant, Bitumen paver. Grouting equipments, Floor polishing machine.

7.2 Equipment Management

Standard equipment, Special equipment, Selection of equipment, Owning and operating cost of construction equipment. Economic life of construction equipment, Preventive maintenance of equipment, Break down maintenance of equipments.

Practical:

Skills to be developed:

Intellectual Skills:

1. know the new materials of construction.
2. get acquainted with advanced methods of construction.
3. Select suitable construction equipments for execution of various constructions activities.

List of Practical:

1. Collect Specifications/ properties of at least five advanced materials of construction and write the report on the same.
2. Writing report on Tremie method of concreting for piles/ Bridge piers.
3. Finding effect of size of fibers and aspect ratio (l/d ratio) of steel fibers on the strength of steel fiber reinforced concrete.
4. Finding effect of percentage of steel fibers on the strength of steel fiber reinforced concrete.
5. Writing a report on method of preparation and conveyance of ready mix concrete.
6. Writing a report on working and output of any three earth moving machinery.
7. Observing at site/ Video/ LCD demonstration of bitumen paver and writing report of the process and equipments observed.
8. Preparing a detailed account of types, numbers and drawings of steel formwork required for a two-storied framed structured residential building.

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
R. Chudly	Construction Technology Vol. I to IV		ELBS- Longman Group
Sarkar and Saraswati	Construction Technology		Oxford University Press
R.L. Peurifoy	Construction Planning equipment and methods		McGraw-Hill Co. Ltd.
S. Seetharaman	Construction Engineering and management		Umesh Publication, New Delhi.
B. Sengupta and Guha	Construction management and Planning		Tata McGraw Hill
M. L. Gambhir	Concrete Technology(Third Edition)		Tata McGraw Hill
R. C. Smith	Materials of construction		McGraw-Hill Co. Ltd
TTTI Madras	Building Technology and valuation		TTTI Madras

R. Satyanarayana and S. C. Saxena	Construction Planning and Equipment		Standard Publication New Delhi TTTI Chandigarh
	Civil Engineering materials		TTTI Chandigarh
S. C. Rangawala	Construction of structures and Management of Works		Charotar Publication

Reference books :-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
	Practical Civil Engineering Handbook		Khanna Publication

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments/Tutorial :- Nil

Name of the Course: **Diploma in Civil Engineering** Subject: **Architectural Practices & Interior Design** (Elective)

Course code: **CE** Course Duration: 6 semesters Subject offered in Semester: **SIXTH**

Subject code: Question code: Marks: 100

Teaching Scheme	Examination Scheme
Theory –3 lecture per week	Class Test(CT)- 20
Tutorial – Nil	Attendance, Assignment, Quiz - 10
Practical - Nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks - 100

Aim:-

1. Study of architectural practices.

Objective:-

Student will be able to:

1. Use the basic architecture principles for working drawings.
2. Prepare working drawings of buildings.
3. Design landscape for a institutional / commercial campus.
4. Use the basic principles of interior design for drawing interior plans.
5. Prepare innovative sketch plans for presentation to customer as per requirements.
6. Design interior for a commercial buildings or Flats.

Pre-Requisite:-

1. Student should be perfect in engineering drawing.
2. Student should study the requirements in building construction.

Unit no	Topic	Contact period	Marks
Contents : Theory (Section A – Architectural Practice)			
1	Architectural Design:	2	5
2	Building Aesthetics:	2	5
3	Design of Projects	8	20
4	Landscaping	4	10
Contents : Theory (Section B – Interior Design)			
1	Elements and principles of design	3	5
2	Anthropometrics Data	1	5
3	Interior Materials:	2	4
4	Interior of Residential building	7	17
5	Interior of small commercial building	3	4
Total		48	70

Contents : Theory (Section A – Architectural Practice) 3Hrs/week

Unit -1 Architectural Design:

- 1.1 Review of principles of Architecture.
- 1.2 Site selection, climatic conditions, sun control, orientation, of building & site.
- 1.3 Building by laws & its applications.

Unit -2 Building Aesthetics:

- 2.1 Feeling for aesthetics and utility, composition, unity, mass, composition, order, expression, proportion, scale, accentuation & rhythm, contrast, balance, pattern.
- 2.2 Character of Building.

Unit – 3 Design of Projects:

1. A case study of residential building
2. A case study of public / commercial building.
3. Aspect of working drawing – plan, elevation section

Unit – 4 Landscaping:

- 4.1 Soft and Hard landscaping.
- 4.2 Basic Principle of landscaping.
- 4.3 Assessment of land.
- 4.4 Design procedure.
- 4.5 A case study of land scape for public/ commercial building campus.

Contents : Theory (Section – B: Interior Design) Hrs/week Marks

Unit 1 - Elements and principles of design.

- 1.1 Elements such as form, texture, light, colour, effect of light on colour and texture, space organization of space in design, space pattern.
- 1.2 Importance of colour as art element. Various colourscheme.

Unit 2- Anthropometrics Data:

- 2.1 Relation of human measurement to furniture and movement and to circulation patterns.

Unit-3- Interior Materials:

- 3.1 Different interior materials, paneling, partitions, finishing, materials, furniture.
- 3.2 False ceiling, flooring, paints.

Unit 4- Interior of Residential building:

- 4.1 Use of space, circulation, standard size of furniture.
- 4.2 Plans and elevation of interior with furniture for living space, dining space, kitchen, bed room, guest room etc.

Unit 5- Interior of small commercial building:

- 7.1 Planning of interior for small commercial units such as offices, consulting chambers, shops etc.
- 7.2 Furniture details such as executive table, architectures table etc. used in commercial units.

Term Work: (Any Four)

8. Prepare working drawing – plans, elevation sections, considering thickness of plastering with micro level details and with scale 1:50 of a given submission drawing.
9. Prepare innovative plans, elevations, sections, considering the thickness of plastering with micro details and working drawings for residential building with scale 1:50 special details of components (Minimum 3 components such as kitchen otta details, compound wall gate, grill, front door, windows, staircase etc.) with scale 1:20 / 1:15 with respect to No. 1
10. Design a landscape for any existing public building campus
11. Prepare interior plan for 2 BHK residential bungalow / flat.
12. Prepare interior plan of any one commercial unit such as office, bank, restaurant, shop etc.
13. Prepare a report of market survey for different materials required for interiors

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
M. G. Shah, C.M. Kale / S.Y. Patiki	Building construction		Tata McGraw Hill
Joseph De Chiara, Julins Panch, martin Zelnik	Time saver standard for interior design & space planning		MC Graw Hill
Albert O. Halse	The use of colours in interiors		McGraw Hill
Bousmaha Baiche & Nicholes Walliman Nwtert			Architects Black Well Science

1. IS/International codes – National building codes.**2. Journals / Periodicals:**

1. Inside out side
2. A + D Journal on architecture.
3. Indian Architects and builders.
4. Design & Interiors.

3. Software:

1. Auto CAD
2. 3 D Max.
- 3 D Home

Name of the Course: **Diploma in Civil Engineering** Subject: **Maintenance & Rehabilitation Of Structure (Elective)**

Course code: **CE** Course Duration: 6 semester Subject offered in Semester: **SIXTH**

Subject code: Question code: Marks: 100

Teaching Scheme	Examination Scheme
Theory –3 lecture per week	Class Test(CT)- 20
Tutorial – Nil	Attendance, Assignment, Quiz - 10
Practical - Nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks - 100

Aim:-

1. Study of building maintenance.

Objective:-

Student will be able to

1. Distinguish between different types of causes of damage.
2. Decide the appropriate technique according to failure.
3. Identify causes of failure of masonry building & its retrofitting.
4. List causes of failure of R.C.C. building, its retrofitting.
5. Find the strength, age of building & maintenance of life lines.
6. Prepare estimates & tenders for structure damage due to hazards.

Pre-Requisite :-

S.No

1. Student should have entire knowledge of building constructed.
- 2 Student should be perfect in reading the building drawing.

Unit no	Topic	Contact period	Marks
1	Introduction	3	6
2	Causes & detection of damages:	2	8
3	Materials for repairs:	2	6
4	Masonry walls:	3	7
5	Repairs to foundation:	3	7
6	Water proofing:	2	3
7	Concept of repairs & strengthening of RCC structures:	2	3
8	Damage due to fire:	2	3
9	Advanced Damage detection techniques:	3	5
10	Strengthening methods	4	9
11	Evaluation of strength, economic & age of building:	2	5
12	Maintenance of life lines:	2	5
13	Estimates and tendering	2	3

Contents: Theory (MAINTENANCE & REHABILITATION OF STRUCTURE (ELECTIVE)) 3 Hrs/week

Unit -1 Introduction

- 1.1 Necessity, operation, maintenance & repairs of structures
- 1.2 Classification of maintenance,
- 1.3 Rehabilitation (restoration), strengthening, retrofitting.

1.4 Methodical approach to repairs, inspection-annual, emergency, special, repairs- minor, special and renovation.

Unit -2 Causes & detection of damages:

- 2.1 Causes of damages, damages due to earthquakes, fire hazards, flood hazards, dilapidation,
- 2.2 List of basic equipments for investigation.

Unit – 3 Materials for repairs:

- 3.1 Epoxy resin, epoxy mortar, gypsum cement mortar, quick setting cement mortar,
- 3.2 Shot-creting
- 3.3 Mechanical anchors.

Unit -4 Masonry walls:

- 4.1 Damp walls, causes effects, remedies, eradication of efflorescence
- 4.2 cracks in walls, remedial & preventive measures bond between old & new brick work, reinforced brickwork.

Unit -5 Repairs to foundation:

- 5.1 Remedies, types & processes of settlement, foundation sinking
- 5.2 Examination of existing foundation, strengthening of foundation.

Unit -6 Water proofing:

- 6.1 Leaking Basements & roofs

Unit -7 Concept of repairs & strengthening of RCC structures:

- 7.1 Concept of repairs of RCC structures
- 7.2 Physical examination of common defects,
- 7.3 Structural repairs & strengthening repairs by new developments.

Unit -8 Damage due to fire:

- 8.1 Fire resistance, effects of temp. of RCC,
- 8.2 Repairs to RCC structures damaged due to fire.

Unit -9 Advanced Damage detection techniques:

- 9.1 Advanced damage detection techniques, non destructivetesting.

Unit -10 Strengthening methods:

- 10.1 Cantilevers, beams, slabs, walls, columns, foundation.

Unit -11Evaluation of strength, economic & age of building:

- 11.1 Determination of approx. age of a building.
- 11.2 Determination of strength of structural member of old building.
- 11.3 Finding cost in use of a existing building.

Unit -12 Maintenance of life lines:

- 12.1 Maintenance of electric supply, water supply leaking pipe, joints and sewerage systems, closed drains, sewers.
- 12.2 Maintenance of roads, road berms, side drain maintenance of bridges, culverts causeways

Unit -13 Estimates and tendering:

- 13.1 Estimates of annual repairs, special repairs and maintenance work.
- 13.2 Preparation of tender

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
P.K. Guha	Maintenance and Repairs of Buildings		New Central book

			Agencies
Nayak B. S	Maintenance Engineering For Civil Engineers		Khanna Publication
Hutchin SonBD	Maintenance and Repairs of Buildings		Newnes – Butterworth
Ransom W. H.	Building Failures – Diagnosis and Avoidance		E and F. N. Span.
	Building repairing handbook (?)		CPWD
	SP-25 building cracks and repairs		BIS

Reference books: - Nil

Suggested List of Laboratory Experiments: - Nil

Suggested List of Assignments/Tutorial:-

- Inspection of any historical building which has limitations for alternation, finding damages, classifying minor & special repairs, decide suitable method of retrofitting, estimating cost of retrofitting.
- Finding the approximate. strength of structural members in a existing building like beams, columns, slabs, calculating additional reinforcement & necessary improvement in section, estimating cost of strengthening.
- Prepare estimate of retrofitting of plumbing of a building.
- Determine approximate age and economics of an old house.
- Determine load carrying capacity of a slab, beam, column by using rebound hammer

Name of the Course: **Diploma in Civil Engineering** Subject: **Micro Irrigation(Elective)**
 Course code: **CE** Course Duration :6Semester Subject offered in the semester: **SIXTH**
 Subject code: Question code: Maximum Marks: 100

Teaching Scheme	Examination Scheme
Theory –3 lectures per week	Class Test(CT)- 20
Tutorial – nil	Attendance, Assignment, Quiz - 10
Practical - nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks - 100

Aim:-

1. Study of water conservation and micro irrigation.

Objective:-

1. The student will be able to:
2. Find out consumptive use of water.
3. Suggest suitable micro irrigation system for a farm.
4. Give Layout of micro irrigation system.
5. Design micro irrigation system.
6. Supervise functioning of micro irrigation system.
7. Maintain micro irrigation system

Pre-Requisite:-

1. Student should be perfect on hydrological pressures.
2. Students should know the morphological study of land used.

Unit no	Topic	Contact period	Marks
1	Introduction:	2	4
2	Soil- Plant-Water-Relation	6	14
3	Methods of Micro Irrigation	4	6
4	Design of Sprinkler Irrigation System:	8	18
5	Design of Drip Irrigation System	8	18
6	Fertigation And Filtrations	4	10

Contents: Theory (MICRO IRRIGATION) 3 Hrs/week

Unit -1Introduction:

- 1.1 Definition of micro irrigation
- 1.2 Necessity of micro irrigation,
- 1.3 Advantages of micro irrigation system,
- 1.4 Difficulties in micro irrigation.
- 1.5 Comparison between micro irrigation and other methods of irrigation.

Unit -2 Soil- Plant-Water-Relation:

- 2.1 Soil moisture relation, Hygroscopic water, Field capacity, water, Gravitational water, Field capacity, Permanent wilting point, Available moisture, Readily available, moisture, Soil moisture deficiency, Equivalent moisture.
- 2.2 Definition of irrigation frequency. Estimating depth and frequency of irrigation on the basis of soil moisture regime, concept, Simple problems.
- 2.3 Optimum utilization of irrigation water, Definition of irrigation efficiencies.

- 2.4 Evapotranspiration and/or Consumptive use of water, Methods of finding evapotranspiration by Pan Evaporimeter and Modified Penman method. (No Problems)
- 2.5 Water audit, Concept of water audit, Necessity of water audit, Benefits of water audit,

Unit – 3 Methods of Micro Irrigation:

- 3.1 Sprinkler and Drip irrigation.
- 3.2 Benefits and limitations of sprinkler and drip irrigation systems.
- 3.3 Comparison between sprinkler irrigation and drip irrigation system.
- 3.4 Layout of sprinkler irrigation system and drip irrigation system.

Unit – 4 Design of Sprinkler Irrigation System:

- 4.1 Design of main, sub-main, lateral and sprinkler.
- 4.2 Types of sprinklers and selection
- 4.3 Design and selection of micro sprinkler Irrigation systems.

Unit- 5 Design of Drip Irrigation System:

- 5.1 Design of main, Submain, Lateral and Drippers
- 5.2 Types of drippers and selection
- 5.3 Design and selection of micro jet
- 5.4 Selection of Pumps
- 5.5 Installation and maintenance of drip irrigation system

Unit – 6 Fertigation and Filtrations:

- 6.1 Advantage and limitations of Fertigation
- 6.2 Methods for Fertilizer injection
- 6.3 Filtration – Particle size, Selection of filter, Filtration methods, Methods of cleaning filters.
- 6.4 Filters and their types.

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
A.M.Michael	Irrigation Theory and Practice		Vikas Publisher House, New Delhi.
	Sprinkler Irrigation		WALMI Aurangabad
	Drip Irrigation		WALMI Aurangabad
Dr.M.S.Mane, B.L.Ayare Dr.S.S.Magar	Principle of Drip Irrigation		Jain Brothers New Delhi
R.K.Sivanappan	Sprinkler Irrigation		Oxford & I B Publishing New Delhi.

Video Cassettes and CDs:

1. Estimation of reference crop.
2. Evapotranspiration by Modified Penman Method including analysis of weather data - WALMI Aurangabad.

Reference books :- Nil

Suggested List of Laboratory Experiments:- Nil

Suggested List of Assignments/Tutorial:-

Assignments:

1. Report writing on visit to farm with sprinkler irrigation system and preparing layout plan and neat-labeled sketches.
2. Report writing on visit to farm with drip irrigation system and preparing layout plan and neat-labeled sketches.
3. Design of sprinkler irrigation system for given farm with cost estimation.
4. Design of drip irrigation system for a given fruit garden farm with cost estimation.

Name of the Course: **Diploma in Civil Engineering** Subject: **Watershed Management(Elective)**
 Course code: **CE** Course Duration: 6 semesters Subject offered in the semester: **SIXTH**
 Subject code: Question code: Marks: 100

Teaching Scheme	Examination Scheme
Theory - 3	Class Test(CT)- 20
Tutorial – nil	Attendance, Assignment, Quiz - 10
Practical - nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks - 100

Aim:

1. Study of watershed management.

Objective: - The students will be able to:

1. Apply integrated approach to watershed.
2. Apply techniques of soil and water conservation in watershed management.
3. Use rainwater-harvesting techniques.
4. Identify water harvesting structure
5. Use peoples participation in local watershed management and development.

Pre-Requisite:-

1. Student should study the sources of water and its limitations.
2. Students should study the traditional methods of water management.

Unit no	Topic	Contact period	Marks
1	Introduction:	6	8
2	Soil and Water Conservation	8	20
3	Water Harvesting:	8	18
4	Water Harvesting Structures:	5	14
5	Socio Economic Aspects:	5	10

Contents: Theory (WATERSHED MANAGEMENT (ELECTIVE)) -3 Hrs/week Marks

Unit -1Introduction:

- 1.1 Definition of watershed, concept of watershed, definition of watershed management, need of watershed management, Sustainable Development, Natural resource Management
- 1.2 Characteristics of watershed, objectives of watershed management, benefits of watershed development
- 1.3 Causes and effects of degradation of watershed
- 1.4 Integrated multi-disciplinary approach for watershed management, steps in watershed management.
- 1.5 Ill effects of urbanisation on watershed management

Unit -2 Soil and Water Conservation:

- 2.1 Soil erosion- definition of erosion, problems of erosion, types of soil erosion.
- 2.2 Land classification for watershed management
- 2.3 Soil conservation, need of soil conservation, soil conservation technology.
- 2.4 Engineering measures for erosion control such as contour cultivation, contour bunding, graded bunding, bench terracing, trenching, construction of grade stabilisation structure, retention or detention reservoirs, agronomical measures (names only)
- 2.5 Contour bunds, design of contour bunds, drainage of excessive water to protect contour bunds, maintenance of contour bund.

- 2.6 Graded bunding, design of graded bunding, alignment and construction, maintenance, advantages and limitations of graded bunding.
- 2.7 Bench terracing, types, design.
- 2.8 Grassed waterways, shape, planning, construction and vegetation, maintenance, diversion drains.
- 2.9 Control of gullies and their reclamation for various land Use

Unit – 3 Water Harvesting:

- 3.1 Definition, need of rainwater harvesting, advantages of rainwater harvesting,. Techniques of rainwater harvesting- roof water harvesting and surface water harvesting (definition)
- 3.2 Traditional methods of rainwater harvesting in deccan plateau-cheruva, kohli tank, phad, kere, the ramtek model and bhandaras (short description with neat sketch).
- 3.3 Roof water harvesting- techniques as storage and ground water recharge, components- catchment, coarse mesh, gutters, conduits, first flushing, filters, storage facilities, recharge structures, Recharge structures – pit, trench, dug well, hand pump, recharge well, lateral shaft with borehole, percolation pit with borehole. Types of filters
- 3.4 Reuse of domestic water

Unit – 4 Water Harvesting Structures:

- 4.1 Types of watershed structures- such as small weir, banchara, K.T. weir, percolation tank, jalbandh, farm pond and check dam.
- 4.2 Details of watershed structure with neat sketch.

Unit – 5 Socio Economic Aspects:

- 5.1 People's awareness, participation and response.
- 5.2 State and integrated approach.
- 5.3 Sustainable society for economical upliftment.
- 5.4 Economics.

Assignment/Term work should contain Mini project on any one of the following:

1. Rain Water Harvesting of a building.
2. Integrated water resource management of small area (e.g. college campus, small village etc.)
3. Preparation of complete water shed management plan for small area identified from toposheet
4. Case study of watershed management plan.

Text Books:-

Name of Authors	Titles of the Book	Edition	Name of the Publisher
V. V.Dhruvanarayana G. Sastry, U. S. Patnaik	Watershed management		Indian Council for Agricultural Research, KrishiAnusandhan Bhawan, Pusa, New Delhi
J. V. S. Murty	Watershed management in India		Wiley Estern Ltd
Raj Vir Singh	Watershed planning and management		Yash publishing House
Field manual on watershed management			Central Research Institute For Dry Land Agriculture, Hydrabad
E. M. Tideman	Watershed management		Omega Scientific Publications, New Delhi
N. D. Mani	Watershed management		Saujanya Books, 165-E, Kamla Nagar, Delhi-110007
Robert J. Reimold	Watershed management: practice, policies and coordination		BOSS International US ISBN0070522995

Reference books: - Nil

Suggested List of Laboratory Experiments: - Nil

Suggested List of Assignments/Tutorial: - Nil

Name of the Course: **Diploma in Civil Engineering** Subject: **WATER RESOURCES MANAGEMENT (Elective)**

Course code: **CE** Course Duration: 6 semesters Subject offered in the semester: **SIXTH**

Subject code: Question code: Marks: 100

Teaching Scheme	Examination Scheme
Theory - 3	Class Test(CT)- 20
Tutorial – nil	Attendance, Assignment, Quiz - 10
Practical - nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks - 100

OBJECTIVES:

- On completion of the course, the student will be familiar with:
- To understand water resource potential in India and need for water resource management .
- To understand the components of hydrological cycle and hydrograph.
- To understand the occurrence of ground water and ground water exploration methods.
- To understand the ground water basin management concept.
- To study the classification of rivers and river training works.
- To know the different types of storage works and dam structures.
- To understand the distribution system of canals and management of canal irrigation.
- To understand the concept of water shed management including GIS approach.
- To study the types of detention basins and reclamation of water logged lands.

Unit no	Topic	Contact period	Marks
1	Introduction & Hydrology	6	10
2	Ground water and its management	10	15
3	River training works and storage works	10	15
4	Distribution works and management of canal irrigation	12	18
5	Watershed management, water harvesting and recycling	10	12

Contents: Theory (WATER RESOURCES MANAGEMENT (Elective)) -3 Hrs/week Marks

Unit 1

1.1 INTRODUCTION

Water resources – world water inventory - Importance of water resources - Necessity for conservation and development of water resources – water resources of India - water resources management -purpose - factors involved in water resources management.

1.2 HYDROLOGY

Introduction – Definition -Application of Hydrology in engineering -Hydrological cycle - Precipitation – forms of Precipitation -measurements of rain fall - Rain gauge - types of rain gauges – raingauge network – mean rainfall over a drainage basin – methods -Radar and Satellite Measurements of rainfall - runoff - Estimation of runoff - losses – Hydrograph – Unit Hydrograph - uses

Unit 2

2.1 GROUND WATER

Ground water resources- zones of Ground water-Aquifer - types- terms used –porosity, permeability, yield, specific yield, specific retention, coefficient of storage, specific capacity – Darcy's law- measurement of yield of well -pumping test- recuperation test-ground water exploration –geo physical methods -Electrical resistivity method – seismic resistivity method- logs.

2.2 MANAGEMENT OF GROUND WATER

Concept of basin management - Ground water basin investigations -data collection and field work - mining yield - perennial yield - salt balance- basin management by conjunctive use - artificial recharge of Groundwater - recharge methods.

Unit 3

3.1 RIVERS AND RIVER TRAINING WORKS

Classification of river - Major rivers in India and Tamil Nadu – Interlinking of rivers in India and its importance – flood - flood forecasting -flood control in India. River training - objectives of river training -classification of river training - methods of river training – levees -guide banks – spurs – types - artificial cut-offs – launching apron -pitching of banks - pitched islands - miscellaneous methods.

3.2 STORAGE WORKS

Surface storage - purpose of surface storage – tanks – types – tankweirs – tank outlet – reservoirs – types - storage capacity of reservoir -methods of determination of storage capacity of reservoir – reservoirlosses – dams - classification of dams - selection of dam site – Earthdams – types - methods of construction- causes of failure of earth dam -remedial measures – spillway - types - spillway crest gates-types -sluiceway - types.

Unit 4

4.1 DISTRIBUTION WORKS

Irrigation Canal - Typical cross section of canal - components of canalsection - classification of canal - alignment of canal - canal head works –types - components of diversion head works - cross drainage works –types - canal losses - lining of canal – necessity - types of lining.

4.2 MANAGEMENT OF CANAL IRRIGATION

Canal irrigation system - Need for canal irrigation management -objectives of canal irrigation management - methods of improving canalirrigation management - cropping pattern - need for crop rotation – cropwater requirement - water delivery system - irrigation scheduling -frequency of irrigation - optimum use of irrigation water – irrigationefficiencies - conservation of water on the field - farmer's participation -irrigation manager.

Unit 5

5.1 WATER SHED MANAGEMENT

Water shed - classification of water sheds - integrated approach forwater shed management - role of remote sensing and GIS in water shedmanagement - soil and water conservation – Necessity - soil erosion –causes - effects – remedial measures against erosion - contour bunding- strip cropping - bench terracing – check dams - vegetated water way –afforestation - crop residue - land drainage - surface drains - sub surface drains.

5.2 WATER HARVESTING AND RECYCLING

water harvesting - runoff collection - onsite detention basin - ponds -types - Seepage control – methods -evaporation control - Recycling ofharvested water - waste water recharge for reuse – methods – waterlogging - remedial measures - soil reclamation

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Santhosh Kumar Garg	Hydrology and water resources engineering		Khannapublishers,Delhi.
G.L.Asawa	Irrigation and Water Resources Engineering		New age international(p) ltd.publishers, New Delhi.
David Keith Todd	Ground water Hydrology		John wiley &sons,Singapore
Dilip Kumar Majumdar	Irrigation water management - Principles and Practice		PHI Pvt.Ltd.NewDelhi-1.
Madan Mohan Das&Mimi Das Saikia	Irrigation and water power Engineering		PHI learning pvt. Ltd., NewDelhi-1

Name of the Course: **Diploma in Civil Engineering** Subject: **EARTHQUAKE ENGINEERING (Elective)**

Course code: **CE** Course Duration: 6 semesters Subject offered in the semester: **SIXTH**

Subject code: Question code: Marks: 100

Teaching Scheme	Examination Scheme
Theory - 3	Class Test(CT)- 20
Tutorial – nil	Attendance, Assignment, Quiz - 10
Practical - nil	End Semester Exam(ESE) - 70
Credit - 3	Total Marks - 100

OBJECTIVES:

On completion of the course, the student will be able:

- To know the causes and consequences of earthquakes;
- To understand the magnitude and effects of earthquakes on structures;
- To understand the behaviour of various types of buildings during earthquakes;
- To know about the design concepts of earthquake resisting buildings;
- To know the methods of evaluation and retrofitting of damaged structures.

Unit no	Topic	Contact period	Marks
1	INTRODUCTION TO EARTH QUAKE	7	10
2	SEISMIC EFFECTS ON STRUCTURES	10	16
3	BEHAVIOUR OF STRUCTURES DURING EARTHQUAKES	14	20
4	CONCEPTS OF DESIGN OF EARTHQUAKE RESISTING BUILDINGS	9	12
5	RETROFITTING OF BUILDINGS	8	12

Contents: Theory (EARTHQUAKE ENGINEERING (Elective)) -3 Hrs/week Marks

Unit 1 INTRODUCTION TO EARTH QUAKE

Objective of earthquake engineering - Engineering Seismology – Structure of the earth - Temperatures and Pressures with respect to depth -Plate Tectonics - Evolution of Indian Sub-Continent- Seismotectonics of India - Severe earthquakes in Indian sub-continent - Causes of earthquake- Definition of terms : Fault line, Active Fault, Focus or Hypo centre, Epicentre, Epicentre distance, Focal depth, Peak ground acceleration, Foreshocks, Aftershocks, Aseismic, Ioseismal, Seismic gap- Ground shaking - Seismic waves -Body waves - P-waves and S-waves - Surface waves - Reyleigh and Love waves – Earthquake Intensity - Earthquake size - Magnitude - Wave magnitude, Duration magnitude, Moment magnitude - Energy released - Classification of Earthquake based on magnitude- Consequences of earthquake – Ground motion, Ground rupture, Liquefaction, Landslides, Fire, Tsunamis, etc-Seismic Zoning Map of India (2002) - Earthquake frequency - Prediction of Earthquake risk -Measurement of Earthquake - Instruments used – Various scales - Richter's Magnitude Scale .

Unit 2 SEISMIC EFFECTS ON STRUCTURES

Nature of ground motion - Effects of source, path and site – Ground shaking effect on structures - Effects of Amplitude, Duration and Distance of Earth quake - Damage potential of earthquakes -Effects of Inertia forces, Seismic load, Deformations in structures, Horizontal and Vertical shaking of structures, Transfer of inertia forces from top to bottom- Effects of Soil - Influence of ground condition on earthquake motion -Causes for Seismic damages in buildings: Soft storey failure, Floating columns, Plan irregularity, Vertical irregularity, Lack of confinement of concrete, Long cantilevers with heavy dead loads, Insufficient shear reinforcements in columns, Poor quality construction, Poor quality materials, Corrosion of reinforcement, Pounding of adjacent buildings – Short column effect - Effects of size and shape of buildings – Horizontal and vertical layout of buildings - Effect of shifting of filler wall locations from floor to floor, non uniform rigidity distribution - Ductility and flexibility of buildings.

Unit 3 BEHAVIOUR OF STRUCTURES DURING EARTHQUAKES

Characteristics of buildings affecting their behavior - Symmetry, regularity, stiffness, flexibility, strength, time period, damping, ductility, materials and method of construction - Ductile, Brittle and Fatigue fractures - Behavior of structures on sloped ground - Behaviour of Structures with load bearing walls – Brick / Stone /Mud masonry - Large inertia forces due to heavyweight, Very low tensile / shear strengths and brittleness of walls, Stress concentration at corners of openings, Unsymmetrical openings, Poor mortars, Free standing masonry walls, Wall enclosures without roof –Cracks in load bearing walls due to flexure and shear caused by earthquake – Improvements in the behavior of reinforced masonry structures - Behaviour of RCC Structures – Framed / Shear wall / Dual structures - Shear failure of columns - Types of damages in beams - Functions of stirrups in seismic beams - Outward bulging of concrete and buckling of compression reinforcement of beams - Effect of joints on the ductile behaviour of RCC / Steel members -Behaviour of Steel structures - Types of joints, Joint collapse, Joint ductility -Behaviour of Non-Structural elements in buildings during earthquakes - Behaviour of brittle elements - Behaviour of structural members under cyclic loading - Soil characteristics and its impact on various types of structures during earth quake – Twisting of buildings

Unit 4 CONCEPTS OF DESIGN OF EARTHQUAKE RESISTING BUILDINGS

Earthquake proof building - Earthquake resisting building – Acceptable damages to building elements under minor and frequent earth quakes, moderate and occasional earthquakes, and strong but rare earthquakes - General requirements of structures for earthquake resistance and structural safety - Concepts of ductility, deformability and damageability - Concept of base isolation - Ductile performance of structures - Reinforcement detailing for ductility of RC structures -Flexible building elements - Special requirements for RC columns and beams to resist earthquake - Confining steel in columns – Special confining reinforcement for Short columns - Maximum spacing of ties and minimum lapping length of main bars in columns – Ductile detailing of RC buildings - Joints of framed structures –Reinforcements in Beam Column Joints - Providing Shear walls –Arrangement of shear walls - Boundary elements of shear walls –Reinforcements for shear walls - Advantages of shear walls in stilt floors of RC buildings - Earthquake resistant features for masonry buildings - Protection of openings in masonry walls - Masonry bond -Horizontal bands or Ring beams at plinth / lintel / roof

levels in masonry- Horizontal / Vertical reinforcements in masonry walls - Framing of thin load bearing walls – Reinforcement for hollow block masonry – Reduction of earthquake effects - Base isolation technique - Types - Seismic dampers- Types of Dampers: Viscous, Friction, Yielding dampers – Seismic-vibration control.

Unit 5 RETROFITTING OF BUILDINGS

Evaluation, Repair, Restoration and Seismic Strengthening of Buildings: Assessment of structural and nonstructural damages caused by earthquakes, major and minor damages, Feasibility study for retrofitting –Structural level retrofitting method and Member level retrofitting method- Repair materials: Shotcrete, Epoxy resins, Epoxy mortar, Gypsum Cement mortar, Quick setting mortars, Mechanical Anchors -Techniques to restore original strength: Repair of minor and medium cracks, repair of major cracks , crushed concrete and fractured /excessively yielded / buckled reinforcement - Seismic strengthening techniques: Modification of roofs or floors, Insertion of new slab, Stiffening existing slab, Anchoring the slab to supporting walls / beams -Inserting new walls - Strengthening existing walls: Grouting, Use of wire mesh, Connecting the walls, Pre stressing, Providing buttress - Strengthening of RC members: Reinforced concrete rings around existing columns, Jacketing the existing weak beams, Welding new steel to the old steel and replacing the cover, Pre stressing of old beams - Introduction of additional load bearing elements in the structure - Strengthening of Foundations : Improving drainage, Providing apron, Adding RC strips with keys – Strengthening of soft or weak stories of Existing buildings - Bracing of roof truss frames, Anchoring of roof trusses to supporting walls .

Name of Authors	Titles of the Book	Edition	Name of the Publisher
Pankaj Agarwal and Manish Shrikhande	Earthquake Resistant Design of Structures	2010	PHI Learning Pvt Ltd
The Associated Cement Companies Ltd	Guidelines for Earthquake Resistant Non Engineered Construction		
IS: 1893 (Part 1) - 2002	Criteria for Earthquake Resistant Design of Structures - General Provisions and Buildings		
IS:13920-1993.	Code of practice for ductile detailing of RC structures subjected to Seismic forces		
C.V.R.Murty	Earthquake Tips		IIT, Kanpur, Sponsored by BMTPC, New Delhi.
by Robert W.Day	Geotechnical Earthquake Engineering Hand Book		McGRAW – HILL
Shunzo Okamoto	Introduction to Earthquake Engineering		University of TokyoPress
IS:13935 - 2002	Repair and Seismic strengthening of buildingsGuidelines		

Dr Kamalesh Kumar	Basic Geotechnical Earthquake Engineering		New Age International Publications, New Delhi, 2009
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EARTHQUAKE ENGINEERING (ELECTIVE THEORY II)

MODEL QUESTION PAPER - 1

Time : 3 Hrs Max Marks : 75

PART- A

Marks 15 x 1 = 15

Note : Answer any 15 Questions. – All Questions carry equal marks

- 1 Define the term “Epi centre”
- 2 Name any one of the severe earth quake of India
- 3 When Tsunami is generated due to earth quake ?
- 4 Name the different types of seismic waves
- 5 Define “inertia force” on structures due to earth quake
- 6 What is meant by “soft storey” ?
- 7 Whether the building as a whole is to be ductile or brittle for good seismic performance ?
- 8 List any two effects on a masonry wall due to a minor earth quake
- 9 What do you mean by stress concentration ?
- 10 What is the reason for twisting of buildings ?
- 11 Why buildings on slopes are more vulnerable to earth quakes ?
- 12 When a masonry wall is called reinforced masonry ?
- 13 What type of damages are expected during moderate and occasional earthquakes ?
- 14 Specify the requirement of a shear wall
- 15 Define “base isolation”
- 16 What are the different types of Dampers ?
- 17 What do you mean by retrofitting of buildings ?
- 18 What are the materials used for filling the cracks in masonry walls ?
- 19 How a damaged RC column could be repaired ?
- 20 Mention any two methods recommended for strengthening the old masonry structures

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PART- B

Marks 5 x 12 = 60

Note : i) Answer all Questions choosing either division (A) or division (B) of each question.

ii) All divisions carry equal marks.

21 (A) i) Explain briefly the structure of the earth, with a neat sketch

ii) Explain in detail how the earthquakes are being measured

(OR)

(B) i) Write short notes on Plate Tectonics

ii) How earth quakes are classified based on their magnitude ?

22 (A) Explain in detail with necessary sketches the effect of ground shaking on different types of structures

(OR)

(B) How Architectural features affect buildings during earthquakes ? Explain with neat sketches

23 (A) List out the various characteristics of buildings which affect their behavior during earthquakes and explain how they affect

. (OR)

(B) Write short notes on:

(i) “joint collapse” in steel structures, (ii) “flexural cracks in load bearing walls” and

(iii) “effect of cyclic loading”

24 (A) Explain in detail the special requirements for RC columns and beams to resist the effect of earthquakes

(OR)

(B) (i) How shear walls are to be arranged in a building with stilt floor ?

(ii) How the vibration of building elements due to earthquake can be controlled ?

25 (A) (i) Write a note on “stiffening of slabs”

(ii) Explain any one method of strengthening of foundation

. (OR)

(B) (i) Explain how a soft storey of an existing multi-storey building can be strengthened

(ii) What is the necessity of bracing of roof truss frames ?

Name of the Course: **Diploma In Civil Engineering** Subject: **CIVIL ENGINEERING PROJECT II**
 Course code: **CE** Course Duration: 6 semester Subject offered in Semester :**SIXTH**
 Subject code: Question code: Marks : 100

Teaching Scheme	Examination Scheme
Theory : Nil	Term Work(TW)50
Tutorial: Nil	Practical(PR) 50
Practical : 3	Total 100
Credit :- 2	

Aim:-

1. Exposition of professional approach of students towards knowledge gain.

Objective:-Students will be able to:

1. Collect the information for a given project.
2. Apply principles, theorems and bye-laws in the project planning and design.
3. Interpret and analyze the data.
4. Develop professional abilities such as persuasion, confidence, and perseverance and communication skill.
5. Develop presentation skill.
6. Enhance creative thinking.

Pre-Requisite:-

1. Students should have entire knowledge of civil engineering.

Contents:- CIVIL ENGINEERING PROJECT II 3 Hrs/week

Project:

Skills to be developed:

Intellectual skills:

- 1) Decide and collect data for projects.
- 2) Read and interpret the drawing, data.
- 3) Design the components.
- 4) Apply the principles rules regulations and byelaws.

Motor skills:

- 1) Plan for different phases of a task.
- 2) Prepare drawings for project.
- 3) Use of computer for drawing, networking.
- 4) Work in a group for a given task.

The project report shall be in the following format:

- Topic and objectives
- Collection of data, required survey work,
- Management and construction procedure
- Resources scheduling and networking
- Design details
- Required drawing set
- Utility to society if any
- Conclusion

CIVIL ENGINEERING PROJECT:

Arrange 4 building units (already developed in the "CIVIL ENGINEERING PROJECT I") in a 2200 sq. m of vacant land adjacent to the 12 m wide road including placing of essential service unit like deep tube-well, pump house, underground reservoir, four 1BHK security quarter, internal bituminous road over WBM, surface drain network and boundary wall with main gate

Name of the Course: **Diploma in Civil Engineering** Subject: **Civil Engineering Lab-IV**
 Course code: **CE** Course Duration: 6 semester Subject offered in Semester :**SIXTH**
 Subject code: Question code: Marks : 100

Teaching Scheme	Examination Scheme
Theory : Nil	Term Work(TW) 50
Tutorial: Nil	Practical(PR) 50
Practical : 3	Total 100
Credit :- 2	

List of Practical:

Water Supply Engineering:

- 1) To determine fluoride concentration in given water sample
- 2) To determine the turbidity of the given sample of water.
- 3) To determine residual chlorine in a given sample of water.
- 4) To determine suspended solids, dissolved solids, and total solids of water sample
- 5) To determine the dissolved oxygen in a sample of water.
- 6) To determine the optimum dose of coagulant in the given sample by jar test.
- 7) To determine arsenic concentration (semi-quantitative) in given water sample.
- 8) To determine hardness of water.

Sanitary Engineering:

- 1) To determine the dissolved Oxygen in a sample of waste water.
- 2) To determine B.O.D. of given sample of waste water.
- 3) To determine C.O.D. of given sample of waste water.
- 4) To determine suspended solids, dissolved solids and total solids of waste water sample.
- 5) To determine various pollutant levels in the atmosphere using Digital Air Volume Sampler.
- 6) Energy generation plants from Gobar Gas.

Name of the Course: **Diploma in Civil Engineering** Subject: **Field Surveying Practice II**
 Course Code: **CE** Course Duration: 6 semester Subject offered in Semester :**SIXTH**
 Subject code: Question code: Marks : 100

Teaching Scheme	Examination Scheme
Theory : Nil	Term Work(TW) 50
Tutorial: Nil	Practical(PR) 50
Practical : 3	Total 100
Credit :- 2	

Practical:

Skills to be developed:

Intellectual skill:

- 1) Identify the components of plane table, theodolite, and advanced survey instruments.
- 2) Know the working principles of these survey instruments.
- 3) Finding the horizontal and vertical distances.
- 4) Identifying errors in setting out curve and tabulating elements of a curve.

Motor Skills:

- 1) Taking and recording the observation in the field book.
- 2) Preparing drawings, maps etc. with the observed data.
- 3) Setting out curve for the given alignment.
- 4) Use Micro optic theodolite, EDM for finding different parameters.

Instructions:-

- 1) Group size for survey practical work should be maximum 15 students. (May be compromised depending on instrument condition and other local condition of the polytechnic)
- 2) Each student from a group should handle the instrument independently to understand the Function of different components and use of the instrument.
- 3) Drawing, plotting should be considered as part of practical. A student from a group should know the basic philosophy of raw data collection, data handling, calculation required for plotting and drawing.
- 4) 3-4 full day per project is required for carrying out project work.

List Of Projects:

- 1) Theodolite traverse Survey for a closed traverse of 5-6 sides for a small area. Computation by Gale's traverse table. Plotting the traverse with details on A1 size imperial drawing sheet.
- 2) Setting out simple circular curve by Rankine's method of Deflection angles (both one theodolite and two theodolite methods) for a given problem supplied by the concerned teachers and plotting the details of curve on A-1 size imperial drawing sheet
- 3) Layout of the building (building plan used in drawing or estimation subject may also be used)
- 4) Determination of the height of institution building with the help of theodolite

Name of the Course : **Diploma In Civil Engineering** Subject: **Professional Practices-IV**
 Course code: **CE** Course Duration: 6 semester Subject offered in Semester : **SIXTH**
 Subject code: Question code: Marks :50

Teaching Scheme	Examination Scheme
Theory : Nil	Term Work(TW) 25
Tutorial: Nil	Practical(PR) 25
Practical : 3	Total 50
Credit :- 2	

Aim :-

1. Development of professional awareness in before and after sales and services construction sector.

Objective :-

Student will be able to:

Acquire information from different sources.

Prepare notes for given topic.

Present given topic in a seminar.

Interact with peers to share thoughts.

Prepare a report on industrial visit, expert lecture.

Pre-Requisite :-

1. Students should have complete knowledge of design of construction.
2. Students should know all the govt norms related to construction industry.

Contents : PROFESSIONAL PRACTICES-IV 3Hrs/week

Unit -1 Structured industrial visits shall be arranged and report of the same should be submitted by the individual student, to form a part of the term work. (**minimum 3 visits**). Following are the suggested type of Industries/ Fields -

- i) Visit to RCC framed structure building for details of reinforcement.
- ii) Visit to water /sewage treatment plant.
- iii) Visit to works carried out under watershed development/micro irrigation scheme.
- iv) Visit to any structure undergoing rehabilitation/retrofitting.

Unit -2The Guest Lecture/s from field/industry experts, professionals to be arranged (2Hrs duration), minimum 2 nos. from the following or alike topics. The briefreport to be submitted on the guest lecture by each student as a part of Term work.

- a) HRD and civil engineering projects.
- b) Project planning and execution of civil engineering projects.
- c) PWD system of accounts
- d) Contract Management
- e) RCC design and detailing

Unit – 3Information Search ,data collection and writing a report on the topic

- a) Collection of data for valuation of old building

- b) Collection of details of BOT project under execution.
- c) Collection of Data and case study of failure of RCC structure.
- d) Collection of information on any topic from journal available in library.

Unit – 4 The students should discuss in group of six to eight students and write a brief report on the same as a part of term work. The topic of group discussions may be selected by the faculty members. Some of the suggested topics are -

Role of civil engineer in disaster management.

Scope of out sourcing of civil engineering services.

Pollution control.

Unit – 5 Seminar Presentation

The students should select a topic for **Seminar** based on recent developments in civil engineering field, emerging technology etc.

Text Books:- Nil

Reference books :- Nil

Suggested List of Laboratory Experiments :- Nil

Suggested List of Assignments/Tutorial :- Nil

Name of the Course: **Diploma In Civil Engineering** Subject: **Rural Engineering**
 Course code: **CE** Course Duration: 6 semester Subject offered in Semester : **SIXTH**
 Subject code: Question code: Marks :50

Teaching Scheme	Examination Scheme
Theory : Nil	Term Work(TW) 25
Tutorial: Nil	Practical(PR) 25
Practical : 3	Total 50
Credit :- 2	

Aim:-

1. Study of socio-economical effects of rural area on construction industry.

Objective:-

1. The students will be able to:
2. Use knowledge for solving the problems of rural population.
3. Render their services for the various development schemes of state / central Govt.
4. Prepare modified plan for existing farmer's house with due suggestions.
5. Provide support services as a Civil Engineer for rural population..
6. Provide guidance to start cottage industries related to Civil Engineering.
7. Inspire the villagers for using non conventional energy appliances.
8. Provide services for developing and propagating the programmes of water shade management.

Pre-Requisite:-

1. Student should study socio economical culture of proposed rural area.
2. Students should know all the norms of construction led by Govt.

Contents:- RURAL ENGINEERING 3Hrs/week

Practical:

Term work shall consist of reports on any six of the following assignments:

- 1.1 Socio Economic survey of village, to identify, the needs of village people
- 1.2 Visit to the Structures built under water shade management program (**at least two structure**)

1. Gabian structure
2. Underground Bandhara
3. Kolhapur type weir
4. Cement Plug, Contour Bunding
5. Rain Water Harvesting

Prepare neat labeled sketches and report on the above visits.

2. Visit to a farmer's house
 - 2.1 Profile of a farmer for case study
 - 2.2 Measured drawing of existing farmers house
 - 2.3 Preparation of modified plan with due suggestions with respect to water supply, sanitations, cattle shade, fodder shade, court yard, composting yard, bio/Gobar Gas plant.
3. Report writing on the following with neat labeled sketches (**Minimum one**)
 - 3.1 Sprinkler Irrigation System, with capacity calculation, head and discharge calculation, power calculation for pump, pressure calculation for pipe.
 - 3.2. Drip Irrigation System with capacity calculation, head and discharge calculation, Power calculation for pump, pressure calculation for pipe
 - 3.3 Layout of Lift Irrigation, with capacity calculation, head and discharge calculation, power calculation for pump, pressure and dia. Calculation for pipe.
4. Report writing on **any one** of the cottage industries related to civil engineering regarding demand, utility, advantages, effect on rural economy etc.
 - Brick Manufacturing

- Cement Block manufacturing
- Cement concrete pole for fencing
- Roof tiles / decorative Terracotta tiles manufacturing.
- Stone Crusher.

5. Collecting information regarding schemes declared by State / Central Govt. in which **Civil Engineer has effective participation (at least one)**

- (i) Indira AwasYojna
- (ii) WalmikiAwasYojna
- (iii) SwajalDharaYojna
- (iv) Jawahar Well Yojna
- (vi) Village / Farm Tank.

6. Collecting information regarding use of non-conventional energy source like- Solar energy, Bio/Gobar Gas plant, wind mill,

7. A Study report on **any one**

- Basic Study of electrical installation for house wiring, its components, different types of wires and its uses, need of fuse and its material used, need of earthing and its use.
- Identification of electrical motor pump set, its electrical connection, fault finding and its remedies.

8. A Study report on

Concept of Community Polytechnic in India regarding their role in upliftment of rural population, their area of working, such as manpower development, transfer of technology, technical support services, information dissemination, community services. A visit to nearest Community Polytechnic shall be arranged. A visit report shall be prepared covering all aspect.

Text Books: - Nil

Reference books: - Nil

Suggested List of Laboratory Experiments: - Nil

Suggested List of Assignments/Tutorial: - Nil