Shri Guru Gobind Singhji Institute of Engg. & Tech., Nanded – 431 606.
Department of Civil & Water Management Engineering
<u>**Teaching & Examination Scheme**</u>

S.Y. B. Tech. (Civil & Water Management Engineering)
(2010-11)

Semester-I

Course Code	Name of the Course	Lectures (per week)	Tutorials (per week)	Practical (per week)	Total Credits
	Engineering Mathematics-III	04	--	--	04
CW201	Strength of Materials	04	--	--	04
CW202	Fluid Mechanics-I	04	--	--	04
CW203	Surveying-I	04	--	--	04
CW204	Building Construction	04	--	--	04
CW205	Strength of Materials Laboratory	--	--	02 (Audit)	--
CW206	Fluid Mechanics-I Laboratory	--	--	02	01
CW207	Surveying-I Laboratory	--	--	02	01
CW208	Building Construction Laboratory	--	--	02	01
Sub Total		**20**	**--**	**08**	**23**

Semester-II

Course Code	Name of the Course	Lectures (per week)	Tutorials (per week)	Practical (per week)	Total Credits
	Engineering Mathematics-IV	04	--	--	04
CW209	Theory of Structures-I	04	--	--	04
CW210	Fluid Mechanics-II	04	--	--	04
CW211	Surveying-II	04	--	--	04
CW212	Building Planning and Drawing	04	--	--	04
CW213	Concrete Technology	03	--	--	03
CW214	Fluid Mechanics-II Laboratory	--	--	02	01
CW215	Surveying-II Laboratory	--	--	02	01
CW216	Building Planning and Drawing Laboratory	--	--	02 (Audit)	--
CW217	Concrete Technology Laboratory	--	--	02 (Audit)	--
	Communication Skill	--	--	02	01
Sub Total		**23**	**--**	**10**	**26**
Grand Total		**43**	**--**	**--**	**49**

CW201 STRENGTH OF MATERIALS (L: 04) Credits: 04
Preamble: It enables the student to understand various strength parameters of structural components.
1. Stress and Strain: Simple stresses and strains due to tension, compression, thermal effects and shear elastic constants: Stress – Strain diagrams for brittle and ductile materials: Strain Energy under gradual and impact loads. Thin cylindrical shells with flat ends under internal fluid pressure stresses, strains and changes in dimensions.

2. Theory of Simple Bending: Assumptions, Theory of pure bending, Distribution of bending stress: Composite and built up beam sections

3. Shear Stress Distribution: Shear stress distribution in various shapes of cross section of beams.

4. Deflection of Beams: Slope and deflection of simply supported beams and cantilevers: Double Integration technique: Macaulay's method: Moment area method.

5. Torsion of Circular Shafts: Theory of pure torsion: solid and hallow circular sections: Torsional shear stresses: Power transmission.

6. Compound Stress and Strain: Analysis of biaxial stress at a point: Principal planes: Principal stresses and strains: Mohr circle: Application to different case.

7. Columns: Long columns subject to eccentric and lateral loads: Column with initial curvature.

Reference Books:

1. Strength of Materials   by S. Rama Murtham, Dhanpat Rai and Sons
2. Solid Mechanics   by S.M. A. Kazimi, Tata McGraw Hill.
3. Mechanics of Materials   by E.P. Popov. SI version, Prentice Hall of India,
4. Elements of Strength of Materials by S.P. Timoshenko, Affllabed East – West Company.

CW202 FLUID MECHANICS – I   (L - 4) Credits: 04

Preamble: To make the students to understand basics of fluid mechanics. At the end of the course the students should be able to appreciate the basic principles and understand the various type of fluids, concepts of fluids in statics, fluid kinetics and fluid kinematics, flow of liquid through pipes. Basics of Engineering concepts must have bean made clear so that they will be able to use the knowledge for practical problems.

1. Introduction: Definition of fluid, Properties of fluids, dimensions and units, continuum concept of system and control volume.

2. Fluid Statics: Pressure at a point, Pascal's law, Hydrostatic pressure on plane and curved surfaces, Absolute, Gauge, Atmospheric and vacuum pressures, pressures, Measurement of pressure by manometers and guages, Buoyancy, Centre of bouancy, Stability of floating bodies, Metacentre, Metacentric height and its determination.

3. Fluid Kinematic: Types of fluid flows, continuity equation for one , two and three dimensional flows, Velocity and acceleration, Velocity potential function and stream function, vortex flow, flownets , velocity measurements (pitot tube, current meter, hot wire, hot film anemometer, float techineques: laser doppler velocimetry)

4. Fluid Dynamics: Equation of motion, Euler's equation, Bernoulli's equation, and practical applications of Bernoulli's equation: Venturi meter, orifice meter, Pitot tube, Momentum equation. Fluid mass subjected to uniform laminar and radial acceleration. Free and forced vortex flow, Radial flow.

5. Measurement of Flow: Orifice, mouth piece, notches, weirs - Classification, Hydraulic coefficients, Determination of hydraulic coefficients, time required to empty a reservoir and tank with triangular/rectangular notch.

6. **Flow Through Pipes:** Minor losses, Head loss due to friction, Darcy–Weisbatch equation, H.G.L. and T.E.L., Pipes in parallel and series, Equivalent pipe siphon, Power transmission, Water hammer.
Laminar flow: Relation between shear and pressure gradient, Steady laminar flow through circular pipes, Hagens-Poiseuille law, Laminar flow through inclined pipes and between parallel plates, Flow through porous media, Laminar flow around spear.

Reference Books:

1. Hydraulics and Fluid Mechanics   by Modi and Seth
2. Fluid mechanics and Hydraulic Machines   by Dr. R. K. Bansal
3. Theory and Application of Fluid Mechanics   by Subramanya
4. Fluid Mechanics   by V.L. Streeter and E. Benjamin Wylle

CW203 SURVEYING – I (L: 04) Credits: 04

Preamble: The scope of this course is to introduce the concepts of surveying techniques. The objective of this course is to make the students understand the principles of surveying with reference to layout for different civil engineering works. They should be able to understand the use of surveying equipments for linear, angular measurements and also the determination of features of ground terrain.

1. Chain Surveying: Introduction to principle, Classification, Linear measurements. Ranging of a survey lines, Different methods, Chaining on plane and sloping grounds, Obstacles in chaining, Chain triangulation, Well conditional and ill conditional triangles, Survey stations, Survey lines, Offsets, Field books, Conventional signs – Procedure of plotting, Cross staff and Optical square.

2. Compass Surveying: True, Magnetic and Arbitrary meridian, Bearing, Designation of bearing, Reduced bearing, F.B. B.B., Magnetic dip and delineation. Construction of angles from bearings and bearings from angles, Chain and Compass traversing, Traversing method, load attraction and correction of bearings, Field work and plotting of compass traversing, graphical method of compass traverse adjustments, sources of error in compass surveying.

3.Theodolite Survey: Construction, Types, Vernier, Micrometer Theodolites, Temporary adjustments, Measurement of horizontal angles, Different methods, Deflection angles, Vertical angles and bearing of a line. Traversing with theodolite. Field work, Traverse computation, Latitudes and Departure's, Balancing of traverse. Different rules, Gale's Traverse table, Sources of errors, Permissible errors and degree of accuracy, Computation of traverse areas, permanent adjustments, Omitted measurements.

4. Levelling: Definition, Construction details of dumpy and modern tilting level. Sensitivity of bubble tube, B.M. and its type, Levelling staff, target staff, self reading staff, Temporary adjustments of level, Types of leveling operation, Simple levelling, Differential leveling, Fly leveling, Check levelling, Profile leveling and cross – sectional levelling. Plotting of profiles, Booking field observations, Calculation of reduced level – different methods, Arithmetic check, Fundamental lines and permanent adjustments of dumpy level, Contouring characteristics of contour lines and their methods of contouring, interpolation of contours.

5. Plane Table Surveying: Introduction, Accessories used in plane table survey, adjustments of plane table, Methods of plane tabling, Traversing, Two point and three point problems. Advantages and disadvantages of plane table survey

6. Contouring of Areas and Volumes: Planimeter–Theory and its use, Types of cross sections, Derivation of equations for areas of cross sections for level, Two level, Three level, side hill two level and multi level sections. Prismoidal and Trapezoidal formula, Prismoidal correction, volume of cut and fills, with special reference to road, canal, railway and reservoirs, Haulage, lift, lead and mass diagram for economic grade line, use of earth work tables.

Reference Books:

1. Surveying and Leveling   by   Prof. T. K. Kanitkar and Prof. S.V. Kulkarni
2. Surveying Vol. I and II   by   Dr. B.C. Punmia
3. Surveying and Leveling   by   N.N. Basak

CW204 BUILDING CONSTRUCTION (L: 04) Credits: 04

Preamble:

The course is designed with an objective of making the student aware of various components in a building and also make him conversant with the technical terminology, specifications, and methods used in building construction, so as to enable him to supervise simple construction projects. It is also expected to gain understanding of the concepts of green building, energy efficient and intelligent building.

a) Building Components:

Foundations: Loads on buildings, Types of shallow foundations and selection criteria, Empirical design of shallow foundations, Foundations in expansive soils (B.C. soil), raft foundations, Types of deep foundations, Timbering of trenches and dewatering of foundations.

Doors and Windows: Technical terms, Classification and suitability of doors, Types of doors-Framed and Panelled, Flush, Revolving and Collapsible door, Classification and suitability of windows, Fixed, Pivoted, Casement, Louvered window, Fixtures and fastenings for doors and windows.

Arches and Lintels: Technical terms, Types of arches, Lintels: Reinforced concrete lintels with chajja.

Flooring: Ground and upper floors, Timber floors, concrete floor (IPS), RCC floors, Types of wearing surfaces, modern types ceramic and vitrified tiles   .

Vertical Transportation: Staircases, Technical terms, Requirements of good stair, Classification of stairs, Planning of layout of staircase, Ramps, Elevators/lifts, Escalators.

Roofs and Roof Covering: Technical terms in sloping roofs, Types of pitched roofs, Lean to roof, Steel trusses, Roof coverings for pitched roof and their selection, Details of fixing of roof coverings, Flat or terrace roofs, Shell roofs, Domes.

Temporary Support Structures: Formwork/Form/Shuttering, Requirements, Loads on formwork, Shuttering for columns, beams, and slab, Slip formwork, Types and uses of shoring, underpinning, and scaffolding.

Building Finishes: Plastering: Objective, Mortar and Tools for plastering, Methods of plastering, Use of lath in plastering, Fibrous plaster boards, Types of pointing, White washing, Coloring, Distempering, materials and methods of applying POP and putty to internal and external surfaces, Wall cladding with aluminum sheets.

b) Building Services:

Plumbing and Sanitation: Plumbing services, general principles of drainage, pipes, traps, and sanitary fittings, drainage plans

Damp and Fire Proofing: Causes, and effects of dampness, Materials and methods of damp proofing, Important consideration in fire protection, Fire resistant materials, General measures of fire safety in buildings

Ventilation and Air-Conditioning: Definition and necessity, Functional requirements and systems of ventilation and air-conditioning, likely problems

Reference Books:
1. Building Construction   by   B.C. Punmia
2. Building Construction   by   S.P. Arora and S.P. Bindra
3. Building Construction   by   Sushil Kumar
4. National Building Code of India.   (SP 7)

CW205 STRENGTH OF MATERIALS LABORATORY (P: 02) Audit

Preamble: It enables the student to assimilate various tests meant for determination of strength of materials.

TERM WORK: Term work shall consist of eight laboratory experiments to be conducted from the list given below.

1. Tension tests on mild steel to study stress – strain characteristics.

2. Bending test on timber / metal in a simply supported beam.

3. Torsion test on circular bars.

4. Impact test – Izod and Charpy.

5. Hardness test on steel brass and Aluminium.

6. Punching shear test on Hounsfield Tensiometer

7. Abrasion test on tiles.

8. Absorption and crushing test on bricks.

9. Absorption and transverse test on cement / mosaic floor tiles.

10. Strain measurements in beams using mechanical extensometer.

Reference Books:

1. Strength of Materials   by   S. Rama Murtham, Dhanpat Rai and Sons
2. Solid Mechanics   by   S.M. A. Kazimi, Tata McGraw Hill.
3. Mechanics of Materials   by   E.P. Popov. SI version, Prentice Hall of India,
4. Elements of Strength of Materials   by   S.P. Timoshenko, Affllabed East – West Company.

CW206 FLUID MECHANICS-I LABORATORY (P - 02) Credits: 01

Preamble: This laboratory work is aims at an experimental way of studying fluid flows, which deals with application of energy principle and momentum principle, friction in pipes, measurement and behaviour of open channel flows, impact of jet, pumps and their characteristics, hydraulic machines.

Competencies: At the end of the course students should be able to ;

1. Understand Energy principle and its application.
2. Understand momentum principle and its application.
3. Understand friction in pipes.
4. Understand pumps and their characteristics.
5. Understand hydraulic machines.

TERM WORK: Term work shall consist of the record of the following laboratory experiments. At least eight experiments are to be performed.

1. Determination of coefficient of Venturi flume
2. Calibration of standing wave flume
3. Friction in pipes.
4. Determination of Chezy's and Manning's constants
5. Impact of Jet.
6. Study of Hydraulic jump.
7. Study if Impact of jet.
8. Characteristics of Centrifugal pump.
9. Characteristics on Reciprocating pump.
10. Study of other Hydraulic machines.

Reference Books:

1. Hydraulics and Fluid Mechanics   by P.N. Modi and Seth
2. Fluid mechanics and Hydraulic Machines   by Dr. R. K. Bansal
3. Theory and Application of Fluid Mechanics   by K. Subramanya
4. Fluid Mechanics   by V.L. Streeter and E. Benjamin Wylle

CW207 SURVEYING – I LABORATORY (P: 02) Credit: 01

Preamble: To understand the following surveying exercises and to prepare survey field record book.

LIST OF PRATICALS:

1. Locating objects from survey line, using various methods and instruments

2. Measuring bearings of traverse lines, calculation of included angles and check

3. Study of dumpy level and fly levelling, reduction of levels

4. Profile levelling and cross – sectional levelling practice

5. Measurement of areas by using planimeter

6. Solution of two point problem

7. Measurement of horizontal and vertical angles using theodolite

8. Measurement of horizontal angle by method of repetition using theodolite

9. Measurement of magnetic bearing and deflection angle using theodolite

LIST OF PROJECT:

1. Chain and compass survey.

2. Profile and cross section levelling for road and its earth work computation

3. Block contouring project.

4. Plane table traversing.

Reference Books:

1. Surveying and Levelling Vol. I and II   by   Kanitkar T.P. and Kulkarni P.P.
2. Surveying and Levelling Vol. I and II   by   Dr. Punmia B.C.

CW208 BUILDING CONSTRUCTION LABORATORY (P: 02) Credit: 01

Preamble:
The set of practical and drawing assignment are designed to strengthen the conceptual understanding of the students regarding building components.

The students would perform following set of practical and drawing assignments

1. Measured drawing of a residential building

2. Drawing building component in AutoCAD
   To have hands-on-experience in using 2-D feature of the drawing software

3. About 15 free hand proportionate sketches of various building components on quarter size drawing sheet
   It is expected that the students should be able to draw various components free hand which would enable him to draw working drawing on site during supervising any construction activity

4. Assignments on topics of Modern Concepts in Building Design

Reference Books:

1. Building Construction   by   B.C. Punmia
2. Building Construction   by   S.P. Arora and S.P. Bindra
3. Building Construction   by   Sushil Kumar
4. AutoCAD User's Manual

CW209 THEORY OF STRUCTURES – I (L: 04) Credits: 04

Preamble: It enables the student to understand various structural analysis principles.

1. Strain Energy: Resilience of beams in bending: Deflection of beams from strain Energy, Castigliano's theorem and its application to beams and pin jointed trusses

2. Fixed Beams: Analysis of fixed beams for shear force and bending moment: Effect of sinking of supports

3. Continuous Beams: Clayperon's theorem of three moments: Analysis of continuous beam for shear force and bending moment: Effect of sinking of supports

4. Moving Loads: Maximum bending moment, and shear force diagram for simply supported spans transversed by single point load: two concentrated loads and uniformly distributed loads: Enveloping parabola, Equivalent uniformly distributed load

5. Influence Lines: Influence lines for reaction, shear force and bending moment in a simply supported beam: Influence lines for force in member of statically determinate trusses

6. Three Hinged Arches: Action of an arch, Eddys theorem, Determination of horizontal thrust, Bending moment, Normal thrust and radial shear for parabolic and segmental arches, Influence lines, Temperature effects.

7. Three Hinged Suspension Bridges: Forces in loaded cables and hanging chains, Length of cables, different support conditions, Simple suspension bridge with three hinged stiffening girder, Bending moment and shear force diagrams, Influence line for bending moment and shear force.

Reference Books:

1. Theory of Structures   by   S. Ramamurthum, Dhanpat Rai and Sons New, Delhi.
2. Theory of Structures   by   S.P. Timoshenko and Young, McGraw Hill publication.
3. Theory of Structures   by   Vazirani and Ratwani, Khanna Publication.

CW210 FLUID MECHANICS – II (L - 4) Credits: 04

Preamble: To make the students to understand basics of fluid mechanics. At the end of the course the students should be able to appreciate the basic principles and understand the concept of flows in open channels, non-uniform flows, boundary layer theory, dimensional analysis and similarity, various types of pumps. Basics of Engineering concepts must have bean made clear so that they will be able to use the knowledge for practical problems.

1. Flow in Open Channel: Uniform flow, Chezy's and Manning's equation, Velocity distribution, hydraulically efficient section, Specific energy, Specific force, Critical, Subcritical and supercritical flows
NonUniform Flow: Energy equation for gradually varied flow, Types of channel slopes, water surface profiles, hydraulic jump, Channel Transitions, Venturi flume and standing wave flume

2. Flow Through Pipe: Turbulent flow through pipes, Prandl's theory, velocity distribution equation for smooth and rough pipe, Mean velocity variation, Friction factor, three reservoir problems, Pipe network analysis by Hardy Cross method, Water hammer, Rigid and elastic water column theories, function and types of surge tanks

3. Boundary Layer Theory: Concept of boundary layer theory, Thickness of boundary layer, separation of boundary layer, Forces on immersed body in flowing fluid, types of drag, pressure distribution about bluff and stream line body.

4. Dimensional Analysis and Similarity: Dimensions of various physical quantities, Buckingham's–phi theorem. Types of similarities and distorted models, non-dimensional numbers and their significance

5. Centrifugal Pump: Types, Construction and principle of similarity, pump Characteristics and specific speed under various operation, Conditions of self-priming, selection of pumps under various conditions, Installation and operation of pumps

6. Reciprocating Pumps: Types, Work done, Effect of acceleration and frictional resistance, slip separation in suction and delivery pipes, Air vessel and its function, Multi-cylinder pumps.

7. Modern Pumps: Drilling and flow estimation, Deep submersible pumps, Monoblock pumps, Jet pumps, Air lift pumps, turbine pumps,Selection of pumps and other hydraulic machineries.

Reference Books:

2. Fluid Mechanics   by Som & Biswas, ISBN, 0-07-463371-6.
3. Theory and Applications of Fluid Mechanics   by K. Subramanya
4. Fluid Mechanics   by V.L. Streeter and E. Benjamin Wylie
5. Fluid Mechanics   by Robert A. Granger

CW211 SURVEYING – II (L: 04) Credits: 04

Preamble: The scope of this course is to introduce the concepts of geodetic and photographic surveying techniques. The objective of this course is to make the students understand the principles of Tacheometry, Trignometrical Levelling.

1. Tacheometry: Tacheometer. The leveling staff and stedia rod, principle of fixed hair method, Theory and derivation of formula for analytic lens, Tangential and stedia fixed and movable hair methods of Tacheometry, Horizontal and inclined sights, Vertical and normal staff, Errors, Tacheometric contouring.

2. Trignometrical Levelling: Single plane and double plane methods

3. Curves: Horizontal curves: Types simple; Reverse, Transition curve, Degree and radius of Curves, Geometry of simple curve, Compound curve. Method of setting out a simple curve and compound curve, by linear and angular methods. Vertical curves; Types – summit curve, sag curve, Method of setting it by tangent connection and chord gradient method. Transition curves: relation between length to radial acceleration, super elevation, Centrifugal ratio. Derivation of equation for ideal transition curve. Cubic parabola, Spiral and leminiscate as transition curve for road and railway curve.

4. Geodetic Surveying: Introduction, principles, triangulation, classification, selection of stations, station marks, towers, signals, phase correction, measurement of angles, satellite station, correction to base line measurement and extension of base

5. Triangulation Adjustment: Theory of errors, laws of weight, probable error, station adjustment, figure adjustment, triangle adjustment, various methods

6. Aerial Photogrammetry: Definitions, terms of vertical and tilted photogrammety determination of ground co-ordinates from photo co-ordinates of ground points, determination of height of ground object, relief distance, parallax, plotting by radial line, flight planning, number of photograph.

Reference Books:

1. Surveying and Levelling Vol. I and II   by   Kanitkar T.P. and Kulkarni P.P.
2. Surveying and Levelling Vol. I and II   by   Dr. Punmia B.C.
3. Surveying and Levelling   by   Basak N.N.

CW212 BUILDING PLANNING AND DRAWING (L: 04) Credits: 04

Preamble: The scope of this course is to introduce the concepts of building planning and drawing with emphasis on architectural planning. The objective of this course is to make the students understand the principles of architectural planning with reference to residential and public buildings. They should be able to understand the role of different agencies involved in a building project. They should be able to plan simple residential and public buildings with different requirements and prepare the line plans and detailed drawings for the same.

1. Introduction to Architecture and Building Planning: Sequence of activities in a building project, Functions and role of various agencies: Owner, Architect, Civil Engineer, Structural Engineer, Contractor. Building bye laws of municipal councils and corporations – scope and purpose.

2. Principles of Architectural Planning for Buildings: Orientation, aspect, prospect, grouping, circulation, functional relations of different units, roominess, flexibility, privacy, space utilization, sanitation, ventilation, strength and stability of structures, planning of living area, sleeping area, service area, circulations. Planning of residential buildings

3. Preparation of Submission and Working Drawing: Line plans and working drawings and submission plans to sanctioning authorities, checklist for planning a building project, site plan, utilities and services, legal documents budget restrictions

4. General Principles of Planning of Public Buildings: Educational institutes, markets, banks, hospitals, post offices, community centers, offices, canteens, hostels

5. Perspective Drawing: Principles of perspective drawing, parallel and oblique perspective.

6. Acoustics and Sound Insulation: Characteristics and behavior of sound reflection reverberation of sound - Absorption of sound – Acoustical defects. Acoustical design of halls, sound insulation.

7. Modern Concepts in Building Design:

a) Energy Efficiency in Buildings: Introduction to various aspects of energy efficient building design against conventional practices. Energy efficiency in buildings including, sizing and design of passive architectural concepts and cost effectiveness.

b) Concept of Intelligent Building: Use of leading-edge design and technology for development of intelligent facilities from business and environmental considerations. Introduction to the latest IT tools used in designing and implementing intelligent controls considering the needs of occupants, environment, energy usage, and cost effectiveness.

c) Green Building Concepts: Evaluation of sustainable/green buildings based on different rating systems. Introduction to the LEED rating system and energy conservation building codes (ECBC) compliance.

Reference Books:

1. Building Drawing with Integrated   by   Shah M.G., Kale C.M. and Patki S.Y.,
   Approach for Built Environment
2. Building Planning   by   Sane Y.S.
3. Building Construction   by   Sushil Kumar

CW213 CONCRETE TECHNOLOGY (L: 03) Credits: 03

Preamble: To understand the construction material testing procedures and to acquire ability related to mix design of concrete.

1. Introduction: Role of building materials in construction**,** Classification, Properties, grades, advantages and Disadvantageous of Concrete, need of quality control of concrete.

2. Cement: Basic properties of cement compounds, Manufacturing Process, Hydration of cement, Physical Chemical properties and Types of cement, structure of cement paste and Testing of cement.

3. Aggregates: Role of aggregates**,** Classification, Properties of Aggregates (Strength, Particle shape and texture, Specific gravity, Bulk density, Voids, Porosity and Absorption, Bulking of sand, Deleterious substances, Fineness modulus, Maximum size of aggregates, Grading and surfaces area, Gap graded aggregates, Grading limits and Testing of aggregates.

4. Water: Effect of quality of mixing water on concrete properties, water for curing of concrete.

5. Admixtures: Definition, need, types of admixtures Retarders, accelerators, plasticizers, super plasticizers, air entraining agents.

6. Fresh Concrete: Manufacturing process of Concrete, Workability: Measurement, factors affecting workability, effect of time and temperature on workability, requirements of workability, Segregation and bleeding and harshness. Testing of fresh concrete.

7. Hardened Concrete: Strength of concrete, Types, Factors influencing strength, Stress-Strain characteristics of concrete, Shrinkage and temperature effects, Creep, Permeability and Durability of concrete. Destructive and Nondestructive testing of hardened concrete - Rebound hammer test, ultrasonic pulse velocity test
8. Special Concrete: Lightweight concrete, High-density concrete, Fly ash concrete, Ferro cement, Fiber reinforced concrete, Polymer concrete, Ready mixed concrete, Pumped concrete.

9. **Concrete mix design**: Variables in concrete mix design, Concept of mix design, variables in proportion, and statistical quality control of concrete, common terms, Different methods of concrete mix design, Trial and error, ACI method and IS code method.

Reference Books:
1) Concrete Technology by M. L. Gambhir; McGraw Hill Publishing Co. 2nd Edition
2) Properties of concrete by A.M. Neville, ELBS Publication, 3rd Edition
3) Concrete Technology by M.S. Shetty

CW214 FLUID MECHANICS-II LABORATORY (P-02) Credits: 01

Preamble: This laboratory work is aims at an experimental way of studying fluid flows, which deals with Bernoulli's theorem, Reynolds number, application of energy principle, forces on immersed bodies, hydraulic coefficients and also study of pressure measuring devices.

Competencies: At the end of the course students should be able to ;

1. Understand Bernoulli's theorem
2. Understand Reynolds number
3. Understand application of energy principle
4. Understand buoyancy and metacentre
5. Understand hydraulic coefficients
6. Understand the pressure measuring devices.

TERM WORK: Term work shall consist of the record of following laboratory experiments.

1. Verification of Bernoulli's equation.

2. Laminar flow by Reynolds Experiment.

3. Discharge measurement by Pitot static tube.

4. Calibration of Venturimeter.

5. Determination of metacentric height

6. Determination of Hydraulic Coefficients for an orifice.

7. Calibration of rectangular / Triangular notch.

8. Study of pressure measuring devices.

Reference Books:

1. Fluid Mechanics   by Som & Biswas, ISBN, 0-07-463371-6.
2. Theory and Applications of Fluid Mechanics   by K. Subramanya
3. Fluid Mechanics   by V.L. Streeter and E. Benjamin Wylie
4. Fluid Mechanics   by Robert A. Granger

CW215 SURVEYING – II LABORATORY (P: 02) Credit: 01

Preamble: To understand the following surveying exercises and to prepare survey field record book.

The term work shall consist of field record book containing field exercises and a set of drawings of surveying projects mentioned below.

LIST OF PRATICALS:

1. Determination of tacheometric constants for theodolite

2. Determination of horizontal distance and RL of points by tacheometric observations with horizontal and inclined line of sight.

3. Setting out a simple circular curve by offsets from chord produced

4. Setting out a simple circular curve by deflection angle method

5. Setting out transition curve by deflection angle

6. Layout of a building on ground.

7. To carry out triangulation of a given area.

8. To compute the adjusted co ordinates of triangulation station.

LIST OF PROJECTS:

1. Theodolite traverse survey

2. Tacheometric contouring

Reference Books:

1. Surveying and Levelling Vol. I and II   by   Kanitkar T.P. and Kulkarni P.P.
2. Surveying and Levelling Vol. I and II   by   Dr. Punmia B.C.

CW216 BUILDING PLANNING AND DRAWING LABORATORY (P: 02) Audit

Preamble: The scope of this laboratory course is to introduce the concepts of building planning and drawing with emphasis on architectural planning. The objective of this course is to make the students understand and practice the principles of architectural planning with reference to residential and public buildings. They should be able to plan simple residential and public buildings with different requirements and prepare the line plans and detailed drawings for the same.

TERM WORK: It shall consist of following drawings:

I Planning of residential buildings: Preparation of line plans on graph papers for residential buildings – two assignments on graph papers.

II Planning of public buildings: Preparation of line plans on graph papers for residential buildings – four assignments on graph papers.

III Building drawing:

1. Detailed drawing for one residential building on full imperial drawing sheet.
2. Detailed drawing for one Public building on full imperial drawing sheets.

IV Perspective Drawing: Concepts and method of drawing for two point perspective view. One assignment on full imperial drawing sheet to understand and practice the principles of perspective drawing.

Reference Books:

1. Building Drawing with Integrated   by   Shah M.G., Kale C.M. and Patki S.Y.
   Approach for Built Environment
2. Building Planning   by   Sane Y.S.

CW217 CONCRETE TECHNOLOGY LABORATORY (P: 02) Audit

Preamble: To assimilate the practices for carrying out mini field projects.

Term work shall consist of a journal based on the following practicals.

1. Tests on Cement:
Fineness, Standard Consistency, Setting time, Compressive strength, Soundness test

2. Tests on Aggregates:
Bulking of sand, Bulk density, Specific gravity, Finesses modulus, Aggregate crushing and impact values, Flakiness Index, Elongation Index.

3. Tests on Concrete:
Workability**:** Slump, Compaction factor, Vee –Bee, Compressive strength, Non destructive tests

Reference Books:

4) Concrete Technology by M. L. Gambhir; McGraw Hill Publishing Co. 2nd Edition
5) Properties of Concrete by A.M. Neville, ELBS Publication, 3rd Edition
6) Concrete Technology by M.S. Shetty