



**SGGSIE&T, Nanded**  
**Department of Civil and Water Management Engineering**

2006-07

**TEACHING AND EXAMINATION SCHEME**

**S.Y. B. Tech. (Civil & Water Management Engineering)**

Course Code.	Name of the Course	Total No. Credits	Lectures/week	Tutorial/week	Practical/week
<i>First Semester</i>					
MA211	Engineering Mathematics – III	04	04	--	--
WM201	Strength of Materials	05	04	--	02
WM202	Fluid Mechanics – I	05	04	--	02
WM203	Surveying – I	05	04	--	02
WM204	Building Construction.	04	04	--	02(Audit)
<b>Sub Total</b>		<b>23</b>	<b>20</b>		<b>08</b>
<b>Second Semester</b>					
MA212	Engineering Mathematics-IV	04	04	--	--
WM205	Theory of Structures –I	04	04	--	--
WM206	Fluid Mechanics – II	05	04	--	02
WM207	Surveying – II	05	04	--	02
WM208	Building Planning and Drawing	04	04	--	02(Audit)
WM209	Concrete Technology	05	04		02
<b>Sub Total</b>		<b>27</b>	<b>24</b>	--	<b>08</b>
<b>Grand Total</b>		<b>50</b>	<b>44</b>	--	<b>16</b>

The evaluation of subject matter (Theory) shall be Continuous and consist of Minor I (20 Marks), Minor II (20 Marks) and Major (60 Marks) Examinations as per the Academic Calendar of the Institute.

The evaluation of term work and practical shall be continuous as per the Academic Calendar of the Institute.

Practical Examination: It shall consist of oral/practical based on the syllabus.

## S.Y. B. Tech. (Civil & Water Management Engineering)

### Semester-I

#### MA211 ENGINEERING MATHAMATICS – III

- 1. Linear differential equation with constant coefficient:** Introduction to line a differential equation with constant coefficients, Definition of complementary function (C.F.). Solution of the equation  $f(D)y = O$ 
  - 1.1 Definition of particular integral (P.I.), method of finding P.I. by method of factors, partial fraction, short methods when  $X = e^{ax}$ ,  $\sin(ax + b)$ ,  $\cos(ax + b)$ ,  $x^m e^a u$  and  $x, u$  (Where  $u$  is a function of  $x$ )
  - 1.2 Particular integral by method of variation of parameter. Solution of the equation reducible to linear forms i.e. Cauchy's and Legendre's linear equations. Method of undetermined coefficients.
  - 1.3 Single total differential equations and simultaneous linear differential equation with constant coefficients.
  - 1.4 Applications to mechanical systems and equivalent electrical circuits, Deflection of beams and whirling of shafts.
- 2. Vector calculus:** Vector function, Derivation of a vector function with respect to a scalar and constant vector. Geometrical interpretation of velocity and acceleration, Tangential and normal accelerations of a point moving in a plane curve, radial and transverse acceleration of a particle moving in a plane curve.
  - 2.1 Gradient of a scalar function, divergence and curl of vector functions, Identities, Applications to geometrical problems and hydrodynamics problems.
  - 2.2 Line, surface and volume integrals Stoke's theorems in the plane Divergence theorem in the space.
- 3. Statistics and Probability:** Measures of dispersion: Range, Quartile deviation, mean deviation, standard deviation and coefficient of variation. Moments: Moments about mean, moments about the mean in terms of moments about any point, skewness and kurtosis. Regression, Coefficient of Regression, Regression lines. Probability distribution: Introduction, Binomial, Poisson and Normal distribution.

#### TEXT BOOKS:

1. A Text Book of Applied Mathematics Vol. I and II by P.N. Wartikar and J.N. Wartikar
2. Higher Engineering Mathematics by S.B. Grewal
3. Advanced Engineering Mathematics by Erwin Kreyszig.
4. Engineering Mathematics by M.L. Bhatia.

#### WM201 STRENGTH OF MATERIALS

- 1. Stress and Strain:** Simple stresses and strains due to tension, compression and shear elastic constants: thermal effects: 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. (10 hrs)
- 2. Shear Force and Bending Moment:** *In simple beams subjected to point loads, Moments, Uniformly distributed loads in simply supported, cantilever and overhang beams, Relation between shear force and bending moment, Drawing of Shear force and bending moment diagrams for simple beams loads and support conditions as described above* (08 hrs)
- 3. Theory of Simple Bending:** Assumptions, Theory of pure bending, Distribution of bending stress: Composite and built up beam sections (06 hrs)
- 4. Shear Stress Distribution:** Shear stress distribution in various shapes of cross section of beams (04 hrs)
- 5. Deflection of Beams:** Slope and deflection of simply supported beams and cantilevers: Double Integration technique: Macaulay's method: Moment area method (06 hrs)

**6. Torsion of Circular Shafts:** Theory of pure torsion: solid and hollow circular sections: Torsional shear stresses: Power transmission (04 hrs)

**7. Compound Stress and Strain:** Analysis of biaxial stress at a point: Principal planes: Principal stresses and strains: Mohr circle: Application to different case (04 hrs)

### TERM WORK

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

### LIST OF EXPERIMENTS

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.
11. At least three-computer program based on syllabus.

### TEXT 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, Affiliated East – West Company. |

### WM202 FLUID MECHANICS – I

**1. Introduction:** Definition of fluid, Properties of fluids, Viscosity, Compressibility, Bulk modulus of elasticity, Surface tension and capillarity (03 hrs)

**2. Fluid Statics:** Pressure at a point, Pascal's law, Hydrostatic pressure on plane and curved surfaces, Pressure diagram on dams, Gates, Absolute, Gauge, Atmospheric and vacuum pressures, pressures, Measurement of pressure by manometers and gauges, Buoyant equations Buoyance, Centre of buoyancy, Stability of floating bodies, Metacentre, Metacentric height and its determination. (07hrs)

**3. Fluid Kinematic:** Types of fluid flows: Steady, Unsteady, Uniform and non uniform, laminar and turbulent, Compressible and incompressible, rotational and irrotational, Rate of flows, continuity equation for one dimensional, Velocity and acceleration, Velocity potential function and stream function, vortex flow. (05 hrs)

**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 (05 hrs)

**5. Measurement of Flow:** Orifice Classification, Hydraulic coefficients, Determination of hydraulic coefficients, Large orifices, Discharge through submerged orifices (02 hrs)

**Mouth Piece:** Classifications, Internal and external mouthpieces, Convergent and divergent mouth pieces (02 hrs)

**Notches:** Classification, Discharge measurement in triangular and rectangular notch, Time required to empty a reservoir, Tank with triangular/rectangular notch (03 hrs)

**6. Weirs:** Classification, Discharge measurement over sharp crested, Broad crested, Narrow crested, Ogee and submerged weir (03 hrs)

**7. Flow Through Pipes:** Minor losses, Head loss due to friction, Darcy-Weisbach equation, H.G.L. and T.E.L., Pipes in parallel and series, Equivalent pipe siphon, Power transmission, Water hammer. (05 hrs)

**8. Laminar flow:** Relation between shear and pressure gradient, Steady laminar flow through circular pipes, Hagen-Poiseuille law, Laminar flow through inclined pipes and between parallel plates, Chute flow, Flow through porous media, Laminar flow around spear. (05 hrs.)

**TERM WORK**

Term work shall consist of the record of following laboratory experiments.

1. Verification of Bernoulli's equation.
2. Calibration of Venturimeter.
3. Determination of Hydraulic Coefficients for an orifice
4. Determination of coefficient of discharge for a mouth pieces
5. Calibration of rectangular / Triangular notch
6. Study of pressure measuring devices

**TEXT 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

**WM203 SURVEYING – I**

**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 traingulation, Well conditional and ill conditional triangles, Survey stations, Survey lines, Offsets, Field books, Conventional signs – Procedure of plotting, Cross staff and Optical square. (06 hrs)

**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. (08 hrs)

**3.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 levelling 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. (06 hrs)

**4. 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. (06 hrs)

**5. 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. (08 hrs)

**TERM WORK:**

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**

All practicals mentioned below shall be conducted during the term.

1. Locating objects from survey line, using various methods and instruments
2. Chain traingulation Survey
3. Chain and cress staff survey
4. Measuring bearings of traverse lines, calculation of included angles and check
5. Study of dumpy level and fly levelling, reduction of levels
6. Profile levelling and cross – sectional levelling practice

7. Measurement of areas by using planimeter
8. Solution of two point problem
9. Three computer programs based on a above syllabus

**LIST OF PROJECT DRAWINGS**

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.

**TEXT BOOKS:**

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

**WM204 BUILDING CONSTRUCTION**

**1. Introduction:** Classification of structures – load bearing and framed, Hollow block construction (02 hrs)

**2. Foundations:** Empirical design of shallow foundations, Foundations in B.C. Soil raft foundations, Types of deep Pile foundation, Construction, foundations – Timbering of trenches and dewatering of foundations (06 hrs)

**3. Doors and Windows:** Types of doors – Battened, Ledged and Braced door, Flush door, Framed and Panelled, Revolving and Collapsible door, Classification of windows – Fixed, Pivoted, Casement Dormer, Clear Storey, Louvered (05 hrs)

**4. Lintels and Arches:** Lintels: Wooden, Stone, Brick, Reinforced lintels; Arch: Technical terms, Types, Materials of construction, Brick, Stone, Concrete arches, Flat arch, Semicircular arch. Segmental arch, Relieving arch, French arch (04 hrs)

**5. Flooring:** Ground and upper floors (Timber floors, concrete floor, RCC floors), Types of wearing surfaces, IFS, mosaic tiles, modern types ceramic/manufacturing of cement tiles (04 hrs)

**6. Stairs:** Technical terms, Requirements of good stair, Classification of stairs, Details of RCC Dog legged stair, Open stair, Planning of layout of staircase (03 hrs)

**7. Roof:** Technical terms in sloping roofs, Types of pitched roofs, Lean to roof, King Post roof, Queen Post roof, Steel trusses, Roof coverings for pitched roof, Details of fixing of roof coverings (05 hrs)

**8. Building Finishes:** Plastering: Objective, Mortar and Tools for plastering, Methods of plastering, Use of lath in plastering, Fibrous plaster boards, Color pigments for plaster Pointing: Objective, Mortar for pointing, Types of pointing, White washing, Coloring, Distempering (05 hrs)

**9. Shoring, Underpinning and Scaffolding:** Types and uses (05 hrs)

**TERM WORK:**

Term work shall consist of Introduction to Drawing methods

- a) Sheet 1: Measured drawing of a residential building.
- b) Sketches on quarter size drawing sheet as stated below  
Chapter I -VIII: 2 Sketches on each chapter
- c) One drawing of a building component to be prepared with the help of computer for hands-on-experience in using drawing package/software
- d) Practical on mark out of measured Drawing Building

**TEXT 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)                        |

## Semester-II

### MA212 ENGINEERING MATHEMATICS – IV

**1. Fourier Series:** Dirichlet condition, Fourier series, change of intervals, even and odd functions and half range expansions.

**2. Partial Differential Equation:** Formation of partial differential equation, methods to solution of the first order linear and nonlinear partial differential equations. Introduction to the method of separation of variable and solution of the first order partial differential equation. Vibration of string (one-dimensional wave equation), one and two-dimensional heat flow problems.

**3. Laplace Transform:** Introduction, definition, transformation of elementary functions, properties of Laplace transform. Transforms of derivatives and integrals, multiplication by  $t^n$  and division by  $t$ . Inverse Laplace transforms and convolution theorem. Application to differential equations and simultaneous linear differential equations with constant coefficients. Unit step function, Unit impulse function and periodic function.

**4. Function of a complex variable:** Introduction, limit, continuity and derivative of complex function  $f(z) = u + iv$

4.1 Analytical function, C-R equations in Cartesian and polar form. Harmonic equation and application to fluid flow problems, in heat flow problems.

4.2 Line integral in complex plane, simply and multiply connected regions, Theorem on multiply connected region, Cauchy's theorem, integral formula and its extension formula.

4.3 Series of complex terms, convergence of series, Taylor's and Laurent series.

4.4 Singular point, Residue, Cauchy's residue theorem and its application to evaluate real definite integral by contour integration having no poles, one poles on the real axis and having poles on the real axis by contour integration.

4.5 Conformal mapping: - Translation, magnification and rotation, inversion and reflection. Bilinear Transformation.

#### TEXT BOOKS:

- |                                                     |                                 |
|-----------------------------------------------------|---------------------------------|
| 1. A Text Book of Applied Mathematics Vol. I and II | by P.N. Wartikar, J.N. Wartikar |
| 2. Higher Engineering Mathematics                   | by Dr. S.B. Grewal.             |
| 3. Advanced Engineering Mathematics                 | by Erwin                        |
| 4. Engineering Mathematics                          | by M.L. Bhatia                  |

### WM205 THEORY OF STRUCTURES – I

**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 (04 hrs)

**2. Fixed Beams:** Analysis of fixed beams for shear force and bending moment: Effect of sinking of supports (04 hrs)

**3. Continuous Beams:** Clayperon's theorem of three moments: Analysis of continuous beam for shear force and bending moment: Effect of sinking of supports (06 hrs)

**4. Moving Loads:** Maximum bending moment, and shear force diagram for simply supported spans transversely by single point load: two concentrated loads and uniformly distributed loads: Enveloping parabola, Equivalent uniformly distributed load (05 hrs)

**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 (06 hrs)

**6. Columns:** Long columns subject to eccentric and lateral loads: Column with initial curvature (03 hrs)

**7. 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. (06 hrs)

**8. 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. (06 hrs)

**TEXT BOOKS:**

1. Theory of Structures by S. Ramamurtham, 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.

**WM206 FLUID MECHANICS – II**

**1. Flow in Open Channel:** Uniform flow, Chezy's and Manning's equation, Velocity distribution, Economic section, Specific energy, Specific force, Critical, Subcritical and supercritical flows (05 hrs)

**2. 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 (06hrs)

**3. Flow Through Pipe:** Turbulent flow through pipes, Prandl's theory, velocity distribution equation for smooth and rough pipe, Mean velocity variation, Friction factor, Pipe network analysis by Hardy Cross, method, Water hammer, Rigid and elastic water column theories, Function and types of surge tanks (04hrs)

**4. 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. (05 hrs)

**5. Dimensional Analysis and Similarity:** Dimensions of various physical quantities, Rayleigh's method, Buckingham's-phi theorem. Types of similarities and distorted models, non-dimensional numbers and their significance (04 hrs)

**6. Centrifugal Pump:** Types, Construction and principle of similarity, Efficiency, Characteristics and specific speed under various operation, Conditions of self-priming, Single, Multistage propeller and booster pumps selection, Installation and operation of pumps (04 hrs)

**7. 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. (04 hrs)

**8. Modern Pumps:** Bore wells, Drilling and flow estimation, Deep submersible pumps, Monoblock pumps, Jet pumps, Air pumps, Selection of pumps and other hydraulic machineries. (04 hrs)

**TERM WORK:**

Term work shall consist of the record of the following laboratory experiments. At least seven experiments are to be performed.

1. Determination of coefficient of Venturi flume
2. Calibration of standing wave flume
3. Determination of Chezy's and Manning's constants
4. Verification of momentum equation for Broad crested weir
5. Study of Hydraulic jump
6. Trial on Turbine
7. Trial on Centrifugal pump
8. Trial on Reciprocating pump
9. Study of other Hydraulic machines.

**TEXT BOOKS:**

- |                                               |                                        |
|-----------------------------------------------|----------------------------------------|
| 1. Hydraulics and Fluid Mechanics             | by Modi and Seth                       |
| 2. Fluid Mechanics and Hydraulic Machines     | by Dr. R. K. Bansal                    |
| 3. Fluid Mechanics and Hydraulic Machines     | by Arora                               |
| 4. Fluid Mechanics and Hydraulic Machines     | by Ramamurtham                         |
| 5. Fluid Mechanics                            | by B.S. Massey                         |
| 6. Theory and Applications of Fluid Mechanics | by Subramanya                          |
| 7. Fluid Mechanics                            | by V.L. Streeter and E. Benjamin Wylie |
| 8. Fluid Mechanics                            | by Robert A. Granger                   |

## WM207 SURVEYING – II

**1. 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. (10 hrs)

**2. Tacheometry:** Tacheometer. The leveling staff and stadia rod, principle of fixed hair method, Theory and derivation of formula for analytic lens, Tangential and stadia fixed and movable hair methods of Tacheometry, Horizontal and inclined sights, Vertical and normal staff, Errors, Tacheometric contouring. (08 hrs)

**3. Trigonometrical Levelling:** Single plane and double plane methods (04 hrs)

**4. 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 lemniscate as transition curve for road and railway curve. (12 hrs)

**5. Hydrographic Surveying:** Introduction, soundings, methods of locating soundings, horizontal and vertical control, methods of observations, sextants, ranges, plotting of soundings . (06 hrs)

### TERM WORK:

1. Study of construction of Theodolite, determination of least count
2. Measurement of horizontal and vertical angles by simple method, face left and face right observations
3. Measurement of horizontal angle by method of repetition
4. Measurement of magnetic bearing, deflection angle and direct angle with theodolite
5. Determination of tacheometric constants for theodolite
6. Determination of horizontal distance and RL of points by tacheometric observations, with horizontal and inclined line of sight and vertical staff
7. Setting out a simple circular curve by offsets from chord produced
8. Setting out a simple circular curve by deflection angle method
9. Setting out transition curve by deflection angle
10. Three computer program based on the above syllabus
11. Project and set of drawings on theodolite traverse survey and tacheometric contouring

### TEXT 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.                      |

## WM208 BUILDING PLANNING AND DRAWING

**1. Owner, Architect, Contractor and Bye Laws:** Relative functions and role of owner, Architect, structural engineer and contractor, Building bye – laws of municipal councils and corporations. (04 hrs)

**2. Principles of Planning:** Orientation, aspect, prospect, grouping, 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. (08 hrs)

**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 . (05 hrs)

**4. General Principles of Planning of Public Buildings:** Educational institutes, markets, banks, hospitals, post offices, community centers, offices, hostels, cinema theatres, factories and different types of farm houses. (08 hrs)

**5. Perspective Drawing:** General principles of perspective drawing, parallel and oblique perspective. (05 hrs)

**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. (05 hrs)

**7. Ventilation and Air-Conditioning:** Functional requirements of ventilation system, systems of ventilation, essentials of ventilation, essentials of comfort air conditioning. (05hrs)

**TERM WORK:** It shall consist of following drawings:

1. Residential Building (1Sheet)
2. Public Building (2 Sheets)
3. Line Plans on Graph-Papers: 2 Plans for Residential and 4 Plans for Public Building
4. Two-Point Perspective Drawing for a Residential Building.

**TEXT BOOKS:**

1. Building Drawing with Integrated Approach for Built Environment by Shah M.G., Kale C.M. and Patki S.Y., 4<sup>th</sup> Edition, TMH Pub., New Delhi
2. Building Construction by Punmia B.C.
3. Building Construction by Arora and Bindra
4. Building Planning by Sane Y.S.

## **WM209 CONCRETE TECHNOLOGY**

**1. Introduction:** Classification: Properties: Grades: Advantages and Disadvantageous of Concrete: Concept of quality concrete. (01 hr.)

**2.Cement:** Basic properties of cement compounds: Manufacturing Process Hydration of cement: Physical properties of Portland cement: Chemical Properties: Types of cement. (05 hrs.)

**3.Aggregates:** Classification, Characteristics, and Properties of Aggregates: Strength, Toughness, Hardness, Practical shape and texture, Specific gravity, Bulk density, Voids, Porosity and Absorption, Bulking of sand: Deleterious substances: Alkali – aggregate reaction, Finess modulus: Maximum size of aggregates: Grading and surfaces area: Gap graded aggregates: Grading limits. (08 hrs)

**4. Water** Quality of mixing water, curing water. (02 hrs)

**5. Fresh Concrete** Quality of mixing water, impurities in water and its effect. (01 hrs)

**6. Admixtures:** Retreads, accelerators, plasticizers, super plasticizers, air entraining agents. (01 hrs)

**7. Manufacturing process of Concrete:** Workability: Measurement, factors affecting workability, effect of time and temperature on workability, requirements of workability, Segregation and bleeding: Ready mixed concrete : Pumped concrete. (07 hrs)

**8. Properties of Hardened Concrete:** Strength of concrete, Types, Factors influencing strength, Stress-Strain characteristics of concrete, Shrinkage and temperature effects, Creep, Permeability and Durability of concrete, Nondestructive testing of concrete- Rebound hammer test, ultrasonic pulse velocity test (08 hrs)

**9. Special Concrete:** Lightweight concrete, High-density concrete, Ferrocement, Fiber reinforced concrete, Polymer concrete. (04 hrs)

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. (08 hrs)

**TERM WORK:**

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

**1. Tests on Cement:**

Fineness , Standard Consistency, Setting time, Compressive strength , Soundness test (Min. four)

**2. Tests on Coarse Aggregate:**

Bulk density ,Specific gravity,Finesses modulus, Aggregate impact value, Flakiness Index, Elongation Index, Aggregate Abrasion value Crushing value (Min. four)

**4.Workability:**

Slump, Vee – Bee,Compaction factor , Flow test for fresh concrete (Min. Three)

**5.Tests on Hardened Concrete:**

Split tensile strength, Modulus of rupture, Young’s modulus, Compressive strength, Non destructive tests (Rebound hammer and Ultrasonic pulse velocity test) . (Min. Four)

**TEXT BOOKS:**

- 1) Concrete Technology by M.L. Gambhir; Mc Graw Hill Publishing Co. 2<sup>nd</sup> Edition
- 2) Properties of concrete by A.M. Neville, ELBS Publication, 3<sup>rd</sup> Edition
- 3) Concrete Technology by M.S. Shetty