

**Bachelor of Technology (Civil Engineering), KUK**  
**Semester – III (w.e.f. session 2016-17)**  
**SCHEME OF STUDIES/EXAMINATIONS**

S. N.	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Dur. of Exam (Hrs.)
			L	T	P	Hrs/Week	Theory	Sessional	Practical	Total	
1	AS-201N	Mathematics-III	3	1	0	4	75	25	0	100	3
2	CE-201N	Structural Analysis-I	3	1	0	4	75	25	0	100	3
3	CE-203N	Building Construction, Materials & Drawing	4	0	2	6	75	25	0	100	3
4	CE-205N	Fluid Mechanics-I	3	1	0	4	75	25	0	100	3
5	CE-207N	Surveying-I	3	1	0	4	75	25	0	100	3
6	CE-209N	Engineering Geology	3	1	0	4	75	25	0	100	3
7	CE-211N	Structural Mechanics-I Lab	0	0	2	2	0	40	60	100	3
8	CE-213N	Fluid Mechanics-I Lab	0	0	2	2	0	40	60	100	3
9	CE-215N	Surveying-I Lab	0	0	2	2	0	40	60	100	3
10	MPC-201N	Environmental Studies*	3	0	0	3	75*	25*	0	100*	3
		<b>Total</b>	<b>22</b>	<b>5</b>	<b>8</b>	<b>35</b>	<b>450</b>	<b>270</b>	<b>180</b>	<b>900</b>	

\*MPC-201N is a mandatory course and student has to get passing marks in order to qualify for the award of degree but its marks will not be added in the grand total.

**Bachelor of Technology (Civil Engineering), KUK**  
**Semester – IV (w.e.f. session 2016-17)**  
**SCHEME OF STUDIES/EXAMINATIONS**

S. N.	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Dur. of Exam (Hrs.)
			L	T	P	Hrs/Week	Theory	Sessional	Practical	Total	
1	HS-201N	Fundamentals of Management	3	1	0	4	75	25	0	100	3
2	CE-202N	Structural Analysis-II	3	1	0	4	75	25	0	100	3
3	CE-204N	Design of Steel Structures-I	3	0	2	5	75	25	0	100	3
4	CE-206N	Fluid Mechanics-II	3	2	0	5	75	25	0	100	3
5	CE-208N	Soil Mechanics	3	1	0	4	75	25	0	100	3
6	CE-210N	Surveying-II	3	1	0	4	75	25	0	100	3
7	CE-212N	Fluid Mechanics-II Lab	0	0	2	2	0	40	60	100	3
8	CE-214N	Soil Mechanics Lab	0	0	2	2	0	40	60	100	3
9	CE-216N	Surveying-II Lab	0	0	2	2	0	40	60	100	3
10	MPC-202N	Energy Studies*	3	0	0		75*	25*	0	100*	3
		<b>Total</b>	<b>21</b>	<b>6</b>	<b>8</b>	<b>35</b>	<b>450</b>	<b>270</b>	<b>180</b>	<b>900</b>	

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## CE-201N : STRUCTURAL ANALYSIS-I

L T P/D Total  
3 1 - 4

Theory: 75  
Sessional: 25  
Duration: 3 hrs.

### UNIT-I

#### **Analysis of stresses and strains:**

Analysis of simple states of stresses and strains, elastic constraints, bending stresses, theory of simple bending, flexure formula, combined stresses in beams, shear stresses, Mohr's circle, Principle stresses and strains, torsion in shafts and closed thin walled sections, stresses and strains in cylindrical shells and spheres under internal pressure.

#### **Theory of Columns:**

Slenderness ratio, end connections, short columns, Euler's critical buckling loads, eccentrically loaded short columns, cylinder columns subjected to axial and eccentric loading.

### UNIT-II

#### **Bending moment and shear force in determinate beams and frames:**

Definitions and sign conventions, axial force, shear force and bending moment diagrams.

#### **Three hinged arches:**

Horizontal thrust, shear force and bending moment diagrams.

### UNIT-III

#### **Deflections in beams:**

Introduction, slope and deflections in beams by differential equations, moment area method and conjugate beam method, unit load method, principle of virtual work, Maxwell's Law of Reciprocal Deflections, Williot's Mohr diagram.

### UNIT-IV

#### **Analysis of statically determinate trusses:**

Introduction, various types, stability, analysis of plane trusses by method of joints and method of sections, analysis of space trusses using tension coefficient method.

**Paper Setter's Note:** 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

#### **Text Books**

- 1) Structural Analysis-I, Bhavikatti S.S., Vikas Pub. House, N. Delhi.
- 2) Strength of Materials, Dr. Sadhu Singh, Khanna Publishers
- 3) Fundamentals of Structural Analysis, M.K. Pant, S.K. Kataria & Sons, N. Delhi

#### **Reference Books**

- 1) Strength of Materials Part-I, S. Timoshenko, Affiliated East-West Press, New Delhi
- 2) Mechanics of Solids, Prasad, V. S. Gakgotia Pub., New Delhi.
- 3) Elementary Structural Analysis, Jain, A. K., Nem Chand & Bros, Roorkee.
- 4) Elementary Structural Analysis, Wibur & Nooris, McGraw Hill Book Co., New York.

# CE-203N : BUILDING CONSTRUCTION, MATERIALS & DRAWING

L T P/D Total  
4 - 2 6

Theory: 75  
Sessional: 25  
Duration: 3 hrs.

## UNIT-I

### **Masonry Construction:**

Introduction, various terms used, stone masonry-Dressing of stones, Classifications of stone masonry, safe permissible loads, Brick masonry-bonds in brick work, laying brick work, structural brick work-cavity and hollow walls, reinforced brick work, Defects in brick masonry, composite stone and brick masonry, glass block masonry.

### **Cavity and Partition Walls:**

Advantages, position of cavity, types of non-bearing partitions, constructional details and precautions, construction of masonry cavity wall.

### **Foundation:**

Functions, types of shallow foundations, sub-surface investigations, geophysical methods, general feature of shallow foundation, foundations in water logged areas, design of masonry wall foundation, introduction to deep foundations i.e. pile and pier foundations.

## UNIT-II

### **Damp-Proofing and Water-Proofing:**

Defects and causes of dampness, prevention of dampness, materials used, damp-proofing treatment in buildings, water proofing treatment of roofs including pitched roofs.

### **Roofs and Floors:**

Types of roofs, various terms used, roof trusses-king post truss, queen post truss etc.

Floor structures, ground, basement and upper floors, various types of floorings.

### **Doors and Windows:**

Locations, sizes, types of doors and windows, fixtures and fasteners for doors and windows.

## UNIT-III

### **Brick and Tiles:**

Classification of bricks, constituents of good brick earth, harmful ingredients, manufacturing of bricks, testing of bricks.

Tiles: Terra-cotta, manufacturing of tiles and terra-cotta, types of terra-cotta, uses of terra-cotta.

### **Limes, Cement and Mortars:**

Classification of lime, manufacturing, artificial hydraulic lime, pozzolona, testing of lime, storage of lime, cements composition, types of cement, manufacturing of ordinary Portland cement, testing of cement, special types of cement, storage of cement.

Mortars: Definition, proportions of lime and cement mortars, mortars for masonry and plastering.

## UNIT-IV

### **Stones:**

Classification, requirements of good structural stone, quarrying, blasting and sorting out of stones, dressing, sawing and polishing, prevention and seasoning of stone.

### **Timber:**

Classification of timber, structure of timber, seasoning of timber, defects in timber, fire proofing of timber, plywood, fiberboard, masonite and its manufacturing, important Indian timbers.

### **Paints and Varnishes:**

Basic constituents of paints, types of paints, painting of wood, constituents of varnishes, characteristics and types of varnishes.

## **DRAWINGS(For Practice Purpose only)**

### **Typical drawings of:**

Cavity Wall

Bonds in brick work

Grillage foundation

### **Preparation of building drawing mentioning its salient features including the following details:**

Ground floor plan

Two Sectional Elevations

Front and Side Elevations

Plan and Sectional Elevation of stair case, doors/ windows/ ventilators, floor and roof.

**Paper Setter's Note:** 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

### **Text Books**

1. Building Construction and Material, Gurcharan Singh, Standard Book House
2. Building Construction, Dr. B.C.Punmia, Luxmi Publication
3. Building Construction, Sushil Kumar, Standard Pub., N. Delhi

### **Reference Books**

1. Building Material, Rangawala
2. Construction Engineering, Y.S. Sane
3. Building Construction, Gurcharan Singh, Standard Pub., N. Delhi.

## CE-205N : FLUID MECHANICS-I

L T P/D Total  
3 1 - 4

Theory: 75  
Sessional: 25  
Duration: 3 hrs.

### UNIT-I

#### **Introduction:**

Fluid properties, mass density, specific weight, specific volume and specific gravity, surface tension, capillarity, pressure inside a droplet and bubble due to surface tension, compressibility viscosity, Newtonian and Non-Newtonian fluids, real and ideal fluids.

#### **Kinematics of Fluid Flow:**

Steady & unsteady, uniform and non-uniform, laminar & turbulent flows, one, two & three dimensional. flows, stream lines, streak lines and path lines, continuity equation in differential form, rotation and circulation, elementary explanation of stream function and velocity potential, rotational and irrotational flows, graphical and experimental methods of drawing flownets.

### UNIT-II

#### **Fluid Statics:**

Pressure-density-height relationship, gauge and absolute pressure, simple differential and sensitive manometers, two liquid manometers, pressure on plane and curved surfaces, center of pressure, Buoyancy, stability of immersed and floating bodies, determination of metacentric height, fluid masses subjected to uniform acceleration, free and forced vortex.

### UNIT-III

#### **Dynamic of Fluid Flow:**

Euler's equation of motion along a streamline and its integration, limitation of Bernoulli's equation, Pitot tubes, venturimeter, Orificemeter, flow through orifices & mouth pieces, sharp crested weirs and notches, aeration of nappe.

### UNIT-IV

#### **Boundary layer analysis:**

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, turbulent boundary layer, laminar sub-layer, smooth and rough boundaries, local and average friction coefficient, separation and its control.

#### **Dimensional Analysis and Hydraulic Similitude:**

Dimensional analysis, Buckingham theorem, important dimensionless numbers and their significance, geometric, kinematic and dynamic similarity, model studies, physical modeling, similar and distorted models.

**Paper Setter's Note:** 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

#### **Text Books**

- 1) Hydraulic and Fluid Mechanics by P.N.Modi & S.M.Seth
- 2) Fluid Mechanics and Hydraulic Machines, Dr. R.K.Bansal, Luxmi Publication

#### **Reference Books**

- 1) Introduction to Fluid Mechanics by Robert W.Fox & Alan T.McDonald
- 2) Fluid Mechanics Through Problems by R.J.Garde
- 3) Engineering Fluid Mechanics by R.J.Garde & A.G.Mirajgaoker

L T P/D Total  
3 1 - 4

Theory: 75  
Sessional: 25  
Duration: 3 hrs.

### UNIT-I

#### **Fundamental Principles of Surveying:**

Definition, objects, classification, fundamental principles, methods of fixing stations.

#### **Measurement of distances:**

Direct measurement, instruments for measuring distance, instruments for making stations, chaining of line, errors in chaining, tape corrections examples.

#### **Compass and Chain Traversing:**

Methods of traversing, instruments for measurement of angles-prismatic and surveyor's compass, bearing of lines, local attraction, examples.

### UNIT-II

#### **Leveling:**

Definition of terms used in leveling, types of levels and staff, temporary adjustment of levels, principles of leveling, reduction of levels, booking of staff readings, examples

#### **Contours:**

Definition, representation of reliefs, horizontal equivalent, contour interval, characteristics of contours, methods of contouring, contour gradient, uses of contours maps.

#### **Plane Table Surveying:**

Plane table, methods of plane table surveying, radiation, intersection, traversing and resection, two point and three point problems.

### UNIT-III

#### **Theodolite and Theodolite Traversing:**

Theodolites, temporary adjustment of theodolite, measurement of angles, repetition and reiteration method, traverse surveying with theodolite, checks in traversing, adjustment of closed traverse, examples.

#### **Tacheometry:**

Uses of tacheometry, principle of tacheometric surveying, instruments used in tacheometry, systems of tacheometric surveying-stadia system fixed hair method, determination of tacheometric constants, tangential systems, examples.

### UNIT-IV

#### **Curves:**

Classification of curves, elements of simple circular curve, location of tangent points-chain and tape methods, instrumental methods, examples of simple curves. Transition Curves-Length and types of transition curves, length of combined curve, examples. Vertical Curves: Necessity and types of vertical curves.

**Paper Setter's Note:** 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

#### **Text Books**

1. Surveying Vol.I & II by B.C.Punmia
2. Surveying Vol.I & II by S.K.Duggal, TMH Publication

#### **Reference Books**

1. Surveying Vol.I by T.P.Kanitkar

## CE-209N ENGINEERING GEOLOGY

L T P/D Total  
3 1 - 4

Theory: 75  
Sessional: 25  
Duration: 3 hrs.

### UNIT-I

#### **Introduction:**

Definition, object, scope and sub division of geology. The interior of the earth, crust, mantle and core. Importance of geology in Civil Engineering projects. Different branches of geology.

#### **Physical Geology:**

Origin of earth, external and internal geological forces causing changes, erosion of the surface of the earth. Geological work of ice, water and wind. Soil profile and its importance. Earth movement, earthquakes and volcanoes.

### UNIT-II

#### **Mineralogy and Petrology:**

Definition of mineral and rocks. Classification of minerals, physical and chemical properties of minerals. Classification of rocks. Mineral composition, Textures, structure and origin of Igneous, Sedimentary and Metamorphic rocks.

#### **Structural Geology and general stratigraphy of India:**

Elementary idea about outcrop, dip and strike, bedding plane, fold, fault, joint and unconformity. General principles of stratigraphy of India and their characteristics

### UNIT-III

#### **Geological Investigations:**

Preliminary geological investigations- Use of geological maps and interpretation of data, geological reports, hydrogeology, water table, springs and artesian well, ground water in engineering projects, artificial recharge of ground water. Elementary ideas of geological investigation, Remote sensing techniques for geological and hydrological survey and investigation.

#### **Geological conditions and stability of foundation sites and abutments:**

Geological condition and their influence on the selection, location, type and design of dams, reservoirs, tunnels, highways, bridges. Geological definitions and aspects of landslides and Hill-slope stability.

### UNIT-IV

#### **Improvement of foundation rocks:**

Precaution and treatment against faults, joints and ground water (electrical and seismic methods). Retaining walls and other treatments.

#### **Geology and environment of earth.**

Engineering geology and its case study, water table, geology as a subject, flood plane deposits, deltas, waterfalls, lakes etc. Earth environment, global warming and effect.

**Note:** The physical study of rock samples and minerals may be performed in the tutorials.

**Paper Setter's Note:** 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

#### **Text Books**

1. Engineering and General Geology by Prabin Singh
2. General & Engineering Geology by Dr. D.S.Arora

#### **Reference Books**

1. A Text Book of Geology by P.K. Mukherjee
2. Physical and General Geology by S.K.Garg
3. Introduction of Physical Geology by A.Holmes.

## CE-211N STRUCTURAL MECHANICS-I (P)

L T P/D Total  
- - 2 2

Viva-Voce - 60  
Sessional - 40  
Duration – 3 Hours

### LIST OF EXPERIMENTS

1. Verification of reciprocal theorem of deflection using a simply supported beam.
2. Verification of moment area theorem for slopes and deflections of the beam.
3. Deflections of a truss- horizontal deflection & vertical deflection of various joints of a pin- jointed truss.
4. Elastic displacements (vertical & horizontal) of curved members.
5. Experimental and analytical study of 3 hinged arch and influence line for horizontal thrust.
6. Experimental and analytical study of behavior of struts with various end conditions.
7. To determine elastic properties of a beam.
8. Uniaxial tension test for steel (plain & deformed bars)
9. Uniaxial compression test on concrete & bricks specimens.

## CE-213N FLUID MECHANICS-I(P)

L T P/D Total  
- - 2 2

Viva-voce: 60  
Sessionals: 40, Duration: 3 hours

### LIST OF EXPERIMENTS

- 1 To determine metacentric height of the ship model.
- 2 To verify the Bernoulli's theorem.
- 3 To determine coefficient of discharge for an Orificemeter.
- 4 To determine coefficient of discharge of a venturimeter.
- 5 To determine the various hydraulic coefficients of an Orifice ( $C_d$ ,  $C_c$ ,  $C_v$ ).
- 6 To determine coefficient of discharge for an Orifice under variable head.
- 7 To calibrate a given notch.
- 8 To determine coefficient of discharge for a mouth piece.
- 9 Drawing of a flownet by Viscous Analogy Model and Sand Box Model.
- 10 To study development of boundary layer over a flat plate.
- 11 To study velocity distribution in a rectangular open channel.
- 12 Velocity measurements by current meter, float, and double float (demonstration only)
- 13 Experiment on Vortex formation (demonstration only).

## CE-215N: SURVEYING-I (P)

L T P/D Total  
- - 2 2

Sessionals: 40 marks

Viva-voce: 60 marks

Duration: 3 hours

### LIST OF EXPERIMENTS

1. To plot a traverse of a given area by chain surveying & also locate offsets
2. To plot a traverse of a given area with the help of a compass and a chain.
3. To work out relative elevations of various points on the grounds by performing profile or by fly leveling
4. To plot a longitudinal section and cross section of given alignment.
5. To determine the difference in elevations of two points by reciprocal leveling.
6. To plot a contour map of given area.
7. To determine the position of station occupied by plane table using three point problem.
8. To determine the position of station occupied by plane table using two point problem.
9. Use of a tangent clinometer with plane table.

## CE-202N: STRUCTURAL ANALYSIS-II

L T P/D Total  
3 1 - 4

Theory: 75  
Sessionals: 25  
Duration: 3 hours

### UNIT-I

#### **Statically Indeterminate Structures:**

Introduction, Static and Kinematic Indeterminacies, Castigliano's theorems, Strain energy method, Analysis of frames with one or two redundant members using Castigliano's 2nd theorem.

### UNIT-II

#### **Slope deflection and moment Distribution Methods:**

Analysis of continuous beams & portal frames, Portal frames with inclined members.

### UNIT-III

#### **Column Analogy Method:**

Elastic centre, Properties of analogous column, Applications to beam & frames.

#### **Analysis of Two hinged Arches:**

Parabolic and circular Arches, Bending Moment Diagram for various loadings, Temperature effects, Rib shortening, Axial thrust and Radial Shear force diagrams.

### UNIT-IV

#### **Unsymmetrical Bending**

Introduction Centroidal principal axes of sections, Bending stresses in beam subjected to unsymmetrical bending, shear centre, shear centre for channel, Angles and Z sections.

#### **Cable and suspension Bridges:**

Introduction, uniformly loaded cables, Temperature stresses, three hinged stiffening Girder and two hinged stiffening Girder.

**Paper Setter's Note:** 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

#### **Text Books**

- 4) Structural Analysis-II, Bhavikatti S.S., Vikas Pub.House, N.Delhi.
- 5) Theory of Structures, S.Ramamrutham, DPR publishing Company
- 6) Theory of Structures, B.C.Punmia, Luxmi Publication

#### **Reference Books**

- 1) Statically Indeterminate Structures, C.K. Wang, McGraw Hill Book Co., New York.
- 2) Advanced Structural Analysis, A.K. Jain, Nem Chand & Bros., Roorkee.
- 3) Indeterminate Structures, R.L. Jindal, S. Chand & Co., New Delhi.
- 4) Theory of Structures, Vol. I, S.P. Gupta & G.S.Pandit, Tata McGraw Hill, New Delhi.

## CE-204N: DESIGN OF STEEL STRUCTURES-I

L T P/D Total  
3 - 2 5

Theory: 75  
Sessionals: 25  
Duration: 3 hours

### UNIT-I

#### **Introduction:**

Loads, structural steels and their specifications, structural elements, steel vs. concrete and timber, design specifications as per IS: 800, structural layout, strength and stiffness considerations, efficiency of cross-section, safety and serviceability considerations.

#### **Riveted/Bolted Connections:**

Riveting and bolting, their types, failure of riveted joint, efficiency of a joint, design of riveted joint, concentric riveted joints, advantages and disadvantages of bolted connections, stresses in bolts.

#### **Welded Connections:**

Types of welded joints, design of welded joint subjected to axial loads, welded joints subjected to eccentric loads, simple, semi-rigid and rigid connections.

#### **Design of Tension Members:**

Introduction, types of tension members, net sectional areas, design of tension members, lug angles and splices.

### UNIT-II

#### **Design of Compression Members:**

Introduction, effective length and slenderness ratio, various types of sections used for columns, built up columns, necessity, design of built up columns, laced and battened columns including the design of lacing and battens, design of eccentrically loaded compression members.

#### **Column Bases and Footings:**

Introduction, types of column bases, design of slab base and gusseted base, design of gusseted base subjected to eccentrically loading, design of grillage foundations.

### UNIT-III

#### **Design of Beams:**

Introduction, types of sections, general design criteria for beams, design of laterally supported and unsupported beams, design of built up beams, web buckling, web crippling and diagonal buckling.

### UNIT-IV

#### **Gantry Girders:**

Introduction, various loads, specifications, design of gantry girder.

#### **Plate Girder:**

Introduction, elements of plate girder, design steps of a plate girder, necessity of stiffeners in plate girder, various types of stiffeners, web and flange splices (brief introduction), Curtailment of flange plates, design beam to column connections: Introduction, design of framed and seat connection.

#### **DRAWINGS (For Practice Purpose only)**

1. Structural drawings of various types of welded connections (simple and eccentric)
2. Beam to column connections (framed & seat connections)
3. Column bases- slab base, gusseted base and grillage foundation.
4. Plate girder.
5. Roof truss.

**Paper Setter's Note:** 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

#### **Text Books**

- 1) Design of steel structures, S.K.Duggal, TMH Pub., New Delhi
- 2) Design of steel structures, Dr.B.C.Punmia, Luxmi Publication
- 3) Design of steel structures-I, Dr. Ram Chandra, Scientific Publisher, Jodhpur

#### **Reference Books**

- 1) Design of steel structures, A.S.Arya & J.L.Ajmani, Nem chand & Bros., Roorkee.
- 2) Design of steel structures, M.Raghupati, TMH Pub., New Delhi.
- 3) Design of steel structures, S.M.A.Kazmi & S.K.Jindal, Prentice Hall, New Delhi.

### UNIT-I

#### **Laminar Flow:**

Navier Stoke's equation, Laminar flow between parallel plates, Couette flow, laminar flow through pipes-Hagen Poiseuille law, laminar flow around a sphere-Stokes'law.

#### **Flow through pipes:**

Types of flows-Reynold's experiment, shear stress on turbulent flow, boundary layer in pipes-Establishment of flow, velocity distribution for turbulent flow in smooth and rough pipes, resistance to flow of fluid in smooth and rough pipes, Stanton and Moody's diagram. Darcy's weisbach equation, other energy losses in pipes, loss due to sudden expansion, hydraulic gradient and total energy lines, pipes in series and in parallel, equivalent pipe, branched pipe, pipe networks, Hardy Cross method, water hammer.

### UNIT-II

#### **Drag and Lift:**

Types of drag, drag on a sphere, flat plate, cylinder and airfoil, development of lift on immersed bodies like circular cylinder and airfoil.

#### **Open Channel Flow:**

Type of flow in open channels, geometric parameters of channel section, uniform flow, most economical section (rectangular and trapezoidal), specific energy and critical depth, momentum in open channel, specific force, critical flow in rectangular channel, applications of specific energy and discharge diagrams to channel transition, metering flumes, hydraulic jump in rectangular channel, surges in open channels, positive and negative surges, gradually varied flow equation and its integration, surface profiles.

### UNIT-III

#### **Compressible flow:**

Basic relationship of thermodynamics continuity, momentum and energy equations, propagation of elastic waves due to compression of fluid, Mach number and its significance, subsonic and supersonic flows, propagation of elastic wave due to disturbance in fluid mach cone, stagnation pressure.

### UNIT-IV

#### **Pumps and Turbines:**

Reciprocating pumps, their types, work done by single and double acting pumps. Centrifugal pumps, components and parts and working, types, heads of a pump-statics and manometric heads,. Force executed by fluid jet on stationary and moving flat vanes, Turbines-classifications of turbines based on head and specific speed, component and working of Pelton wheel and Francis turbines, cavitation and setting of turbines.

**Paper Setter's Note:** 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

#### **Text Books**

1. Hydraulic and Fluid Mechanics by P.N.Modi & S.M.Seth
2. Fluid Mechanics and Hydraulic Machines,Dr. R.K.Bansal, Luxmi Publication

#### **Reference Books**

1. Flow in Open Channels by S.Subraminayam
2. Introduction to Fluid Mechanics by Robert N.Fox & Alan T.Macnold

**UNIT-I**

**Soil Formation and Composition**

Introduction, soil and rock, Soil Mechanics and Foundation Engineering, origin of soils, weathering, soil formation, major soil deposits of India, particle size, particle shape, interparticle forces, soil structure, principal clay minerals.

**Basic Soil Properties**

Introduction, three phase system, weight-volume relationships, soil grain properties, soil aggregate properties, grain size analysis, sieve analysis, sedimentation analysis, grain size distribution curves, consistency of soils, consistency limits and their determination, activity of clays, relative density of sands.

**Classification of soils**

Purpose of classification, classification on the basis of grain size, classification on the basis of plasticity, plasticity chart, Indian Standard Classification System.

**Permeability of Soils**

Introduction, Darcy's law and its validity, discharge velocity and seepage velocity, factors affecting permeability, laboratory determination of coefficient of permeability, determination of field permeability, permeability of stratified deposits.

**UNIT-II**

**Effective Stress Concept**

Principle of effective stress, effective stress under hydrostatic conditions, capillary rise in soils, effective stress in the zone of capillary rise, effective stress under steady state hydro-dynamic conditions, seepage force, quick condition, critical hydraulic gradient, two dimensional flow, Laplace's equation, properties and utilities of flownet, graphical method of construction of flownets, piping, protective filter.

**Compaction**

Introduction, role of moisture and compactive effect in compaction, laboratory determination of optimum moisture content, moisture density relationship, compaction in field, compaction of cohesionless soils, moderately cohesive soils and clays, field control of compaction.

**UNIT-III**

**Vertical Stress below Applied Loads**

Introduction, Boussinesq's equation, vertical stress distribution diagrams, vertical stress beneath loaded areas, Newmark's influence chart, approximate stress distribution methods for loaded areas, Westergaard's analysis, contact pressure.

**Compressibility and Consolidation**

Introduction, components of total settlement, consolidation process, one-dimensional consolidation test, typical void ratio-pressure relationships for sands and clays, normally consolidated and over consolidated clays, Casagrande's graphical method of estimating pre-consolidation pressure, Terzaghi's theory of one-dimensional primary consolidation, determination of coefficients of consolidation, consolidation settlement, Construction period settlement, secondary consolidation.

**UNIT-IV**

**Shear Strength**

Introduction, Mohr stress circle, Mohr-Coulomb failure-criterion, relationship between principal stresses at failure, shear tests, direct shear test, unconfined compression test, triaxial compression tests, drainage conditions and strength parameters, Vane shear test, shear strength characteristics of sands, normally consolidated clays, over-consolidated clays and partially saturated soils, sensitivity and thixotropy.

**Earth Pressure**

Introduction, earth pressure at rest, Rankine's active & passive states of plastic equilibrium, Rankine's earth pressure theory, Coulomb's earth pressure theory, Culmann's graphical construction, Rebhann's construction.

**Paper Setter's Note:** 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

**Text Books**

1. Soil Mechanics and Foundation Engineering by Dr. K.R.Arora
2. Soil Mechanics and Foundations, Dr.B.C.Punmia, Luxmi Publication
3. Basic and Applied Soil Mechanics by Gopal Ranjan, ASR Rao, New Age International(P)Ltd. Pub.N.Delhi

**Reference Books**

1. Soil Engg. in Theory and Practice, Vol .I, Fundamentals and General Principles by Alam Singh, CBS Pub.,N.Delhi.
2. Engg.Properties of Soils by S.K.Gulati, Tata-Mcgraw Hill,N.Delhi.
3. Geotechnical Engg. by P.Purshotam Raj,Tata Mcgraw Hill.
4. Principles of Geotechnical Engineering by B.M.Das,PWS KENT, Boston.

## CE-210N :SURVEYING -II

L T P/D Total  
3 1 - 4

Theory: 75  
Sessionals: 25  
Duration: 3 hours

### UNIT-I

#### **Trigonometrical Levelling:**

Introduction, height and distances-base of the object accessible, base of object inaccessible, geodetical observation, refraction and curvature, axis signal correction, difference in elevation between two points.

#### **Triangulation:**

Triangulation systems, classification, strength of figure, selection of triangulation stations, grade of triangulation, field work of triangulation, triangulation computations, introduction to E.D.M. instruments.

### UNIT-II

#### **Survey Adjustment and Treatment of Observations:**

Types of errors, definition of weight of an observation, most probable values, law of accidental errors, law of weights, determination of probable error (different cases with examples) principle of least squares, adjustment of triangulation figures by method of least squares.

### UNIT-III

#### **Astronomy:**

Definitions of astronomical terms, star at elongation, star at prime vertical star at horizon, star at culmination, celestial coordinate systems, Napier's rule of circular parts, various time systems: sidereal, apparent, solar and mean solar time, equation of time-its cause.

#### **Total station:**

Working principle and survey with total station.

### UNIT-IV

#### **Elements of Photogrammetry:**

Introduction: types of photographs, types of aerial photographs, aerial camera and height displacements in vertical photographs, stereoscopic vision and stereoscopies, height determination from parallax measurement, flight planning,

#### **Introduction of remote sensing and its systems:**

Concept of G.I.S and G.P.S. -Basic Components, data input, storage & output.

**Paper Setter's Note:** 8 questions of 15 marks each distributed in four sections are to be set taking two from each unit. The candidate is required to attempt five questions in all, taking at least one from each of the four sections.

#### **Text Books**

1. Surveying Vol.II by B.C.Punmia
2. Surveying Vol. II by S.K.Duggal, TMH Publication

#### **Reference Books**

3. Surveying Vol.II by T.P.Kanitkar
4. Higher Surveying by A M Chandra

## CE-212N: FLUID MECHANICS-II (P)

L T P/D Total  
- - 2 2

Sessionals: 40 mark  
Viva-voce: 60 marks  
Duration: 3 hrs.

- 1 To determine the coefficient of drag by Stoke's law for spherical bodies.
- 2 To study the phenomenon of cavitation in pipe flow.
- 3 To determine the critical Reynold's number for flow through commercial pipes.
- 4 To determine the coefficient of discharge for flow over a broad crested weir.
- 5 To study the characteristics of a hydraulic jump on a horizontal floor and sloping glacis including friction blocks.
- 6 To study the scouring phenomenon around a bridge pier model.
- 7 To study the scouring phenomenon for flow past a spur.
- 8 To determine the characteristics of a centrifugal pump.
- 9 To study the momentum characteristics of a given jet.
- 10 To determine head loss due to various pipe fittings.

## CE-214N: SOIL MECHANICS (P)

L T P/D Total

- - 2 2

Sessional: 40

Viva-voce: 60

Duration: 3 hrs.

1. Visual Soil Classification and water content determination.
2. Determination of specific gravity of soil solids.
3. Grain size analysis-sieve analysis.
4. Liquid limit and plastic limit determination.
5. Field density by:  
Sand replacement method  
Core cutter method
6. Proctor's compaction test.
7. Coefficient of permeability of soils.
8. Unconfined compressive strength test.
9. Direct shear test on granular soil sample.
10. Unconsolidated undrained (UU) triaxial shear test of fine grained soil sample.

## CE-216N: SURVEYING-II(P)

L T P/D Total

- - 2 2

Sessionals: 40

Viva-voce: 60

Duration: 3 hrs.

1. To study the functions of various parts of theodolite.
2. To carry out permanent adjustments of a transit theodolite.
3. To measure horizontal and vertical angles using a theodolite.
4. To determine the constants of a given tacheometer.
5. To determine the horizontal distance & elevations of a given traverse with the help of a tacheometer.
6. To set out simple curves by offsets from tangents.
7. To set out curves by offsets from chords produced.
8. To set out simple curves by offsets from long chords.
9. To set out simple curves by Rankine's method of tangential deflection angles.
10. To measure the length of base line in triangulation survey.
11. Triangulation with total station.