

A. K. TECHNICAL UNIVERSITY LUCKNOW



SYLLABUS

of

B. Tech. Civil Engineering

STUDY & EVALUATION SCHEME
B. Tech. Civil Engineering
[Effective Form session 2014-15]

YEAR II, SEMESTER-III

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme			Subject Total	Credits	
			L	T	P	Sessional Assessment					ESE
						CT	TA	Total			
THEORY SUBJECT											
1	NAS-301/ NOE-031 to NOE-039	Engg Mathematics-III/ Science Based Elective	3	1	0	30	20	50	100	150	4
2	NCE-301	Fluid Mechanics	3	1	0	30	20	50	100	150	4
3	NCE-302	Building Materials & Construction	3	1	0	30	20	50	100	150	4
4	NME-302	Mechanics of Solids	3	1	0	30	20	50	100	150	4
5	NHU-301/ NHU-302	Industrial Psychology/ Industrial Sociology	2	0	0	15	10	25	50	75	2
6	NCE-303	Surveying-I	2	1	0	15	10	25	50	75	3
	AUC-001/ AUC-002	<i>Human Value & Professional Ethics/Cyber Security</i>	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING SUBJECTS											
7	NCE-351	Fluid Mechanics Lab.	0	0	3	10	10	20	30	50	1
8	NCE-352	Building Materials Lab	0	0	2	10	10	20	30	50	1
9	NCE-353	Surveying Lab	0	0	3	10	10	20	30	50	1
10	NCE-354	Building Planning & Drawing	0	0	2	10	10	20	30	50	1
11	NGP-301	NGP						50		50	
		TOTAL	18	5	10					1000	25

NOTE: Up to IV semesters – common to Mechanical and related branches (such as Production, Industrial, Manufacturing, Automobile, Aeronautical etc.).

Science Based Open Elective:

NOE031	Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm)
NOE032	Nano Sciences
NOE033	Laser Systems and Applications
NOE034	Space Sciences
NOE035	Polymer Science & Technology
NOE036	Nuclear Science
NOE037	Material Science
NOE038	Discrete Mathematics
NOE039	Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

STUDY & EVALUATION SCHEME
B. Tech. Civil Engineering
[Effective Form session 2014-15]

YEAR II, SEMESTER-IV

S. No.	Subject Code	Name of the Subject	Periods			Evaluation Scheme			Subject Total	Credits	
			L	T	P	Sessional Assessment		ESE			
						CT	TA				Total
THEORY SUBJECT											
1	NOE-041 to NOE-049/ NAS-401	Science Based Elective/ Engg Mathematics-III	3	1	0	30	20	50	100	150	4
2	NCE-401	Structural Analysis-I	3	1	0	30	20	50	100	150	4
3	NCE-402	Geo-informatics	3	1	0	30	20	50	100	150	4
4	NCE-403	Hydraulics & Hydraulic Machines	3	1	0	30	20	50	100	150	4
5	NHU-402/ NHU-401	Industrial Sociology/Industrial Psychology	2	0	0	15	10	25	50	75	2
6	NCE-404	Engineering Geology	2	1	0	15	10	25	50	75	3
	AUC-002/ AUC-001	<i>Cyber Security/Human Value & Professional Ethics</i>	2	0	0	15	10	25	50	75*	
PRACTICAL/DESIGN/DRAWING SUBJECT											
7	NCE-451	Structural Analysis Lab	0	0	3	10	10	20	30	50	1
8	NCE-452	Geo-informatics Lab	0	0	3	10	10	20	30	50	1
9	NCE-453	Hydraulics & Machine Lab	0	0	2	10	10	20	30	50	1
10	NCE-455	CBSNT Lab	0	0	2	10	10	20	30	50	1
11	NGP-401	NGP						50		50	
		TOTAL	18	5	10					1000	25
		Industrial Training-I of 4 weeks after IV semester or Minor fabrication project involving work for nearly 4 weeks , which will be evaluated in VII semester									

NOTE: Practical summer training-I of 4-weeks after IV –semester or Minor fabrication project will be evaluated in VII semester

Science Based Open Elective:

- NOE-041 Introduction to Soft Computing (Neural Network, Fuzzy Logic and Genetic Algorithm)
 NOE-042 Nano Sciences
 NOE-043 Laser Systems and Applications
 NoE-044 Space Sciences
 NOE-045 Polymer Science & Technology
 NOE-046 Nuclear Science
 NOE-047 Material Science
 NOE-048 Discrete Mathematics
 NOE-049 Applied Linear Algebra

*Human values & Professional Ethics /Cyber Security will be offered as a compulsory audit course for which passing marks are 30% in End Semester Examination and 40% in aggregate.

NME-302: MECHANICS OF SOLIDS**L T P**
3 1 0**UNIT-I**

Compound stress and strains: Introduction, normal stress and strain, shear stress and strain, stresses on inclined sections, strain energy, impact loads and stresses, state of plane stress, principal stress and strain, maximum shear stress, Mohr's stress circle, three dimensional state of stress & strain, equilibrium equations, generalized Hook's law, theories of failure

8

UNIT –II

Stresses in Beams: Pure Bending, normal stresses in beams, shear stresses in beams due to transverse and axial loads, composite beams.

2

Deflection of Beams: Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams

4

Torsion: Torsion, combined bending & torsion of solid & hollow shafts, torsion of thin walled tubes

2

UNIT-III

Helical and Leaf Springs: Deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs.

4

Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules, struts with different end conditions, Euler's theory for pin ended columns, effect of end conditions on column buckling, Rankine Gordon formulae, examples of columns in mechanical equipments and machines.

4

UNIT-IV

Thin cylinders & spheres: Introduction, difference between thin walled and thick walled pressure vessels, Thin walled spheres and cylinders, hoop and axial stresses and strain, volumetric strain.

2

Thick cylinders:

Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, compound cylinders, stresses in rotating shaft and cylinders, stresses due to interference fits.

4

UNIT-V

Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression.

4

Unsymmetrical Bending: Properties of beam cross-section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis (for symmetry about both axis and about one axis) for I-section and channel section.

4

Books and References :

1. Mechanics of Materials by Hibbeler, Pearson.
2. Mechanics of Materials by Beer, Jhonston, DEwolf and Mazurek, TMH
3. Strength of Materials by Pytel and Singer, Harper Collins
4. Strength of Materials by Ryder, Macmillan.
5. Strength of Materials by Timoshenko and Y ungs, East West Press.
6. Introduction to Solid Mechanics by Shames, PHI

7. Strength of Materials by Nag and Chandra, Wiley India.
8. Strength of Materials by Nash (Sp Indian Edition), TMH
9. Strength of Materials by Jindal, Pearson Education
10. Strength of Material by Bhavikatti, Vikas Publishing.
11. Fundamentals of Solid Mechanics by Gambhir, PHI
12. Strength of Materials by Basavajaiah and Mahadevappa, University Press.

NCE 301 FLUID MECHANICS

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3 1 0

Unit - I

Fluid and continuum, Physical properties of fluids, Rheology of fluids.

Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

Unit - II

Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential.

Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance,

Unit - III

Potential Flow: source, sink, doublet and half-body.

Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturi meter and bend meter, Hot-wire anemometer and LDA, notches and weirs, momentum equation and its application to pipe bends.

Similarity Laws: geometric, kinematics and dynamic similarity, undistorted and distorted model studies.

Unit - IV

Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks.

Unit - V

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub-layer, separation and its control, Drag and lift, drag on a sphere, a two dimensional cylinder, and an aerofoil, Magnus effect.

Introduction to compressible flow

References :

1. Fox & Donald, "Introduction to Fluid Mechanics" John Wiley & Sons Pvt Ltd,

2. Cengel & Cimbala, "Fluid Mechanics" TMH, New Delhi.
3. White, F.M. "Fluid Mechanics" TMH, New Delhi.
4. Munson et al, "Fundamental of Fluid Mechanics" Wiley Newyork Ltd
5. Garde, R.J., " Fluid Mechanics", SciTech Publications Pvt. Ltd
6. I.H. Shames, "Mechanics of Fluids", McGraw Hill, Int. Student, Education



NCE 351 FLUID MECHANICS LAB

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Note: Ensure to conduct at least 10 experiments from the list:

1. To verify the momentum equation using the experimental set-up on impact of jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter and study the variation of the co-efficient of discharge with the Reynolds number.
4. To calibrate a Venturimeter and study the variation of the co-efficient of discharge with the Reynolds number.
5. To calibrate a bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
6. To draw a flow-net using Electrical Analogy Method.
7. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
8. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
9. To study the variation of friction factor, 'f' for turbulent flow in commercial pipes.
10. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.
11. To determine Meta-centric height of a given ship model.
12. To determine the head loss for a sudden enlargement
13. To determine the head loss for a sudden Contraction.

NCE 302 Building Materials & Construction

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Unit-1

Classification of building materials,

building materials and their performance, economics of the building materials.

Stones, Requirement of good building stone, characteristics of building stones and their testing. Common building stones. Methods of preservation of stones.

Bricks: Manufacturing process of clay bricks, classification of clay bricks. Properties of clay bricks, testing methods for clay bricks
. Problems of efflorescence & lime bursting in bricks & tiles.

Gypsum: properties of gypsum plaster, building products made of gypsum and their uses.

Lime: Manufacture of lime, classification of limes, properties of lime.

Cement: Raw materials used, Process of Manufacturing, Chemical composition, compounds formed and their effect on strength, Types of cement, Testing of cement properties, Uses of cement

Cement Concrete: Constituent materials and their properties, Grades of concrete, Factors affecting strength, Properties of concrete at fresh and hardened stage, Testing of concrete, Methods of Curing of concrete.

Pozzolona: Chemical composition and requirements for uses, Natural and Artificial flyash, Surkhi (burnt clay pozzolona), rice husk and ash pozzolona, properties and specifications for use in construction.

Timber: Classification and identification of timber, Fundamental Engineering Properties of timber, Defects in timber, Factors affecting strength of timber, Methods of seasoning and preservation of timber. Wood based products.

Asphalt, Bitumen and Tar: Terminology, specifications and uses, Bituminous materials.

Unit – II

Chemistry of Plastics manufacturing process, classification, advantages of plastics, Mechanical properties and use of plastic in construction.

Paints and varnishes and distempers, Common constituents, types and desirable properties, Cement paints.

Ferrous metals, Desirable characteristics of reinforcing steel. Principles of cold working. Reinforcing telemechanical and physical properties chemical composition. Brief discussion on properties and uses of Aluminum and lead.

Glass: Ingredients, properties types and use in construction.

Insulating Materials: Thermal and sound insulating material, desirable properties and types of insulating materials.

Unit – III

Component of building, area considerations, Construction Principle and Methods for layout, Damp proofing, antitermite treatment in buildings, Vertical circulation means: staircases and their types, design and construction.

Different types of floors, and flooring materials (Ground floor and upper floors).

Bricks and stone masonry construction. Cavity wall hollow block construction.

Unit- IV

Doors, Windows and Ventilations, Construction details, types of doors and windows and their relative advantages & disadvantages. Types of roof and roof treatments, Lintels and Chhajja, Functionalefficiency of Buildings.

Unit-V

Natural Ventilation, Water Supply and Sanitary fittings (Plumbing), Electricity.

Heating Ventilation & Air conditioning, Mechanical Lifts and Escalators, Fire Fighting, Acoustics.

Plastering different types, pointing, Distempering, Colour washing, Painting etc.

Principles & Methods of building maintenance

References

1. SK Duggal: Building Materials, New Age International
2. P. C. Varghese: Building Materials, PHI

- 3.P.C.Varghese:BuildingConstruction,PHI
- 4.B.C.Funmia:ATextBookofBuildingConstruction,LuxmiPublications,Delhi.
- 5.O.H.Koenisberger:“Manualoftropicalhousingandbuilding”OrientLongman
- 6.S.P.Aroraatal.,“ATextBookofBuildingConstruction-DhanpatRai&Sons,

NCE-352 BUILDING MATERIALSLAB

LTP Testing of various properties of following as per BIS specifications
003

I.Cement

- 1.Normal Consistency of cement.
- 2.Initial & final setting time of cement
- 3.Compressive strength of cement
- 4.Finenessofcementbyair permeability and Le-chatalier’s apparatus.
- 5.Soundness of cement.
- 6.Tensilestrength

II.Coarse Aggregate

- 1.Crushing value of aggregate
- 2.Impactvalue of aggregate
- 3.water absorption of aggregate
- 4.SieveAnalysis of Aggregate
- 5.Specific gravity &bulk density
- 6.Grading of aggregates.

III.FineAggregate :

- 1.Sieveanalysisofsand
- 2.Silt content of sand
- 3.Bulkingofsand

IV **Cement concrete:** Workability tests, compressive strength, Tensile strength

V **Reinforcing Steel :**Tensile and yield strength, Percentage elongation

VI **Non destructive testing on concrete**

VII Bricks:

- 1.Waterabsorption.
- 2.Dimension Tolerances
- 1Compressive strength
- 4.Efflorescence

NCE 303 Surveying

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Unit - I

Importance of surveying to engineers, plane and geodetic surveying, principles of surveying, classification of surveys, Accuracy and Errors **(2)**

Linear Measurements, Measurement of directions: Reference meridians, bearing and azimuths, Compass, Vernier theodolite, Measurements of horizontal and vertical angles, Horizontal Control, Electronic Theodolites and Total Station. **(4)**

Unit – II

Methods of determining elevations, Direct levelling- basic terms and definitions, principle, booking and reduction of field notes, curvature and refraction correction, Automatic level, Digital Level, Vertical Control **(4)**

Contouring: methods and uses, Principles of stadia systems, subtense bar and tangential methods **(2)**

Unit – III

Principles of traversing by compass and theodolite, computations of traverse coordinates, Principles and classification of triangulation systems, strength of figures, satellite stations, triangulation field work **(5)**

Plane table surveying, equipments, methods, resection by three point problem **(2)**

Unit – IV

Elements of simple circular curves, theory and methods of setting out simple circular curves, transition curves- types and their characteristics, ideal transition curve, equations of various transition curves, Introduction to vertical curves **(5)**

References

1. B. C. Punamia et al: Surveying Vol. I, II
2. A. M. Chandra: Plane Surveying, Higher Surveying
3. S K Duggal: Surveying Vol. I, II
4. R Subramanian : Surveying & Leveling , Oxford University Press
5. C Venkatramaih : Text Book of Surveying , University Press
6. W. Schofield, Mark Breach, Engineering Surveying
7. Charles D. Ghilani, Elementry Surveying

NCE 353 SURVEYING LAB

L T P
0 0 3

1. To prepare conventional symbol chart based on the study of different types of topographical maps.
2. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
3. To find out reduced levels of given points using Auto/dumpy level.
4. To perform fly leveling with Auto/tilting level.
5. To study parts of a Vernier theodolite and measurement of horizontal and vertical angle.
6. To measure horizontal angle between two objects by repetition/reiteration method.
7. To determine the height of a vertical structure (e.g. chimney/ water tank etc.) using trigonometrical levelling by taking observations in single vertical plane.
8. To study various parts of Electronic Theodolite, Total Station and practice for measurement of distance, horizontal and vertical angles.
9. To set out a simple circular curve by Rankine's method

NCE-354 BUILDING PLANNING & DRAWING LAB.

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0 0 3

Drafting of following Using Any CAD software

1. Symbols used in Civil Engineering drawing , Types of Masonry Bonds
2. Doors, Windows and staircases.
3. Plumbing & Electrical fitting drawings
4. Comprehensive Planning and Drawings of Residential building (Layout, plan, elevation & sectional elevation) elevation, plumbing & electrical fillings in out.
5. Preparation of Layout plans of different types of Civil Engg. Projects. Viz Primary School, Intermediate college, Hospital building, Industrial Building etc.

NCE-401STRUCTURALANALYSIS-I

LTP
310

Unit-I :

Classification of Structures, Types of structural frameworks and Load transfer Mechanisms, stress resultants, degrees of freedom per node, Static and Kinematic Indeterminacy for beams, trusses and building frames.[03]
Classification of Pin jointed determinate trusses, Analysis of determinate plane and space trusses (compound and complex). Method of Substitution and Method of tension coefficient.[05]

Unit- II

Rolling loads and influence line diagrams for beams and trusses, Absolute maximum bending moment and shear force.
Muller-Breslau's principal & its applications for determinate structures[08]

Unit – III

Arches, Types of Arches, Analysis of Arches, Linear arch, Eddy's theorem, Analysis of three hinged parabolic arch, spandrel
braced arch, moving load & influence lines for three hinged arch.[08]

Unit – IV

Strain Energy of deformable systems, Maxwell's reciprocal & Betti's theorem, Castigliano's first theorem, Calculations of deflections: Moment area method, unit load method & Conjugate beam methods for statically determinate beams, truss and frames.[08]

Unit-V

Unsymmetrical bending in beams, location of neutral axis, computation of stresses and deflection,
Shear Centre its location for common structural sections.[05]
Bending of curved bars in plane of bending, stresses in bars of small & large initial curvatures.[03]

References

- 1.Hibbler ,” Structural Analysis “, Pearson Education
- 2.T S Thandavmorthy ,” Analysis of Structures “, Oxford University Press
- 3.Wilbur and Norris, “Elementary Structural Analysis”, Tata McGraw Hill.
- 4.Reddy,C.S., “Basic Structural Analysis”, Tata McGraw Hill.

5. Jain, O.P. and Jain, B.K., "Theory & Analysis of Structures". Vol. I & II Nem Chand.
6. Vazirani & Ratwani et al., "Analysis of Structures", Khanna Publishers
7. Coates, R.C., Coutie, M.G. & Kong, F.K., "Structural Analysis", English Language Book Society & Nelson, 1980.

NCE-451 STRUCTURAL ANALYSIS LAB

LTP

003 Following experiments to be performed

1. To determine Flexural Rigidity (EI) of a given beam
2. To verify Maxwell's Reciprocal theorem.
3. To find horizontal thrust in a three-hinged arch and to draw influence line diagrams for Horizontal Thrust end Bending moment.
4. To find horizontal thrust in a two hinged arch and to draw influence line diagrams for horizontal Thrust and bending moment.
5. To find deflection of curved members.
6. To find bar forces in a three members structural frames with pin jointed bar
7. To find Critical load in Struts with different end conditions.
8. To find deflections in Beam having unsymmetrical bending.

NCE 402 GEOINFORMATICS

L T P

3 1 0

Unit - I

Aerial Photographs- Basic terms & Definitions, scales, relief displacements, Flight Planning, Stereoscopy, Characteristics of photographic images, Fundamentals of aerial photo-interpretation, Introduction to Digital Photogrammetry.

Unit - II

Remote Sensing: Physics of remote sensing, Remote sensing satellites and their data products, Sensors and orbital characteristics, Spectral reflectance curves, resolution and multi-concept, FCC

Unit - III

Satellite Image - Characteristics and formats, Image histogram, Introduction to Image rectification, Image Enhancement, Land use and land cover classification system, Unsupervised and Supervised Classification, Applications of remote sensing

Unit - IV

Basic concepts of geographic data, GIS and its components, Data models, Topology, Process in GIS: Data capture, data sources, data encoding, geospatial analysis, GIS Applications

Unit - V

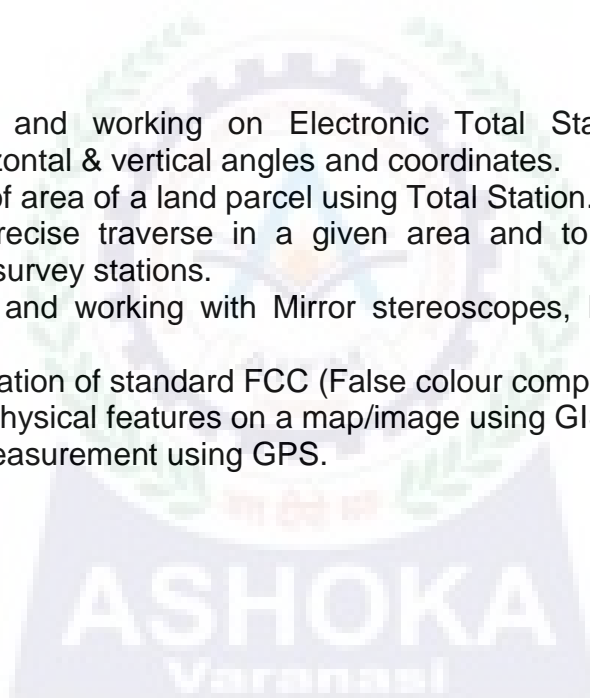
Global Navigation Satellite System (GNSS), GPS, GLONASS, GALILEO, GPS: Space segment, Control segment, User segment, GPS satellite signals, Datum, coordinate system and map projection, Static, Kinematic and Differential GPS, GPS Applications

References

1. A M Chandra : Higher Surveying
2. B C Punamia : Higher Surveying
3. T M Lillesand et al: Remote Sensing & Image Interpretation
4. B. Bhatta: Remote Sensing & GIS
5. M Anjireddy : Remote Sensing & GIS , BS Publications
6. A. E Rabbany: Introduction to GPS
7. N K Agarwal : Essentials of GPS , Spatial Networks: Hyderabad.

NCE 452 GEOINFORMATICS LAB**L T P
0 0 3**

1. Demonstration and working on Electronic Total Station. Measurement of distances, horizontal & vertical angles and coordinates.
2. Measurement of area of a land parcel using Total Station.
3. To layout a precise traverse in a given area and to compute the adjusted coordinates of survey stations.
4. Demonstration and working with Mirror stereoscopes, Parallax bar and Aerial photographs.
5. Visual Interpretation of standard FCC (False colour composite).
6. Digitization of physical features on a map/image using GIS software.
7. Coordinates measurement using GPS.



NCE 403 Hydraulics & Hydraulic Machines

L T P
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Unit - I

Difference between open channel flow and pipe flow, geometrical parameters of a channel.

Continuity equation for steady and unsteady flow.

Critical depth, concepts of specific energy and specific force, application of specific energy principle for interpretation of open channel phenomena, flow through vertical and horizontal contractions.

Unit - II

Chezy's and Manning's equations for uniform flow in open channel, Velocity distribution, most efficient channel section, compound channels.

Unit - III

Equation of gradually varied flow and its limitations, flow classification and surface profiles, integration of varied flow equation by analytical, graphical and numerical methods, Flow in channels of non-linear alignment specifically for the case of a bend.

Unit - IV

Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds.

Rotodynamic pumps, classification on different basis, basic equations, Velocity triangles, manometric head, efficiencies, cavitation in pumps, characteristics curves.

Unit - V

Open channel surge, celerity of the gravity wave, deep and shallow water waves, Rectangular free overfall.

Rotodynamic Machines, Pelton Turbine, equations for jet and rotor size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, Head on reaction turbine, unit quantities, similarity laws and specific speed, cavitation, characteristic curves.

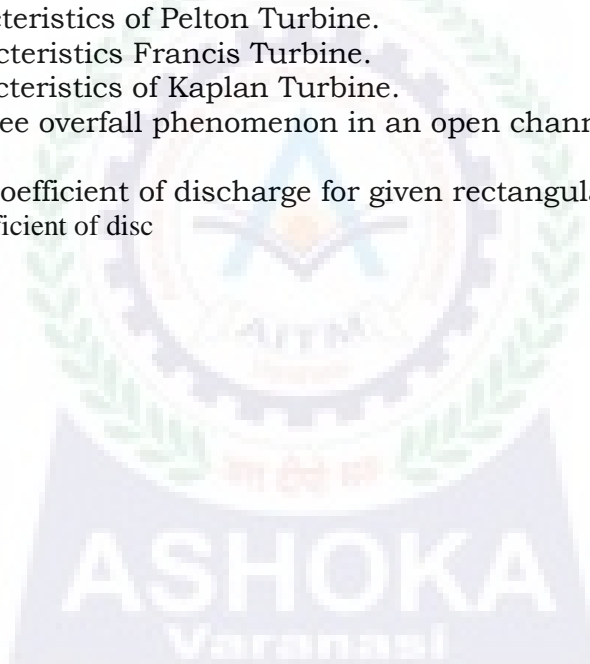
References :

1. Chow, V.T. "Open Channel hydraulics" McGraw Hill Publication
2. Subramanya, K., Flow through Open Channels, TMH, New Delhi
3. Ranga Raju, K.G., Flow through open channels, T.M.H. New Delhi
4. Rajesh Srivastava, Flow through Open Channels , Oxford University Press
5. Streeter, V.L.& White E.B., "Fluid Mechanics" McGraw Hill Publication

NCE 453 Hydraulics & Hydraulic Machines LAB**L T P
0 0 3**

Note: Ensure to conduct at least 10 experiments from the list:

1. To determine the Manning's coefficient of roughness 'n' for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad-crested weir.
6. To study the characteristics of free hydraulic jump.
7. To study centrifugal pump and their characteristics
8. To study characteristics of Pelton Turbine.
9. To study characteristics Francis Turbine.
10. To study characteristics of Kaplan Turbine.
11. To study the free overfall phenomenon in an open channel and to determine the end depth
12. To determine coefficient of discharge for given rectangular notch.
13. To determine coefficient of disc

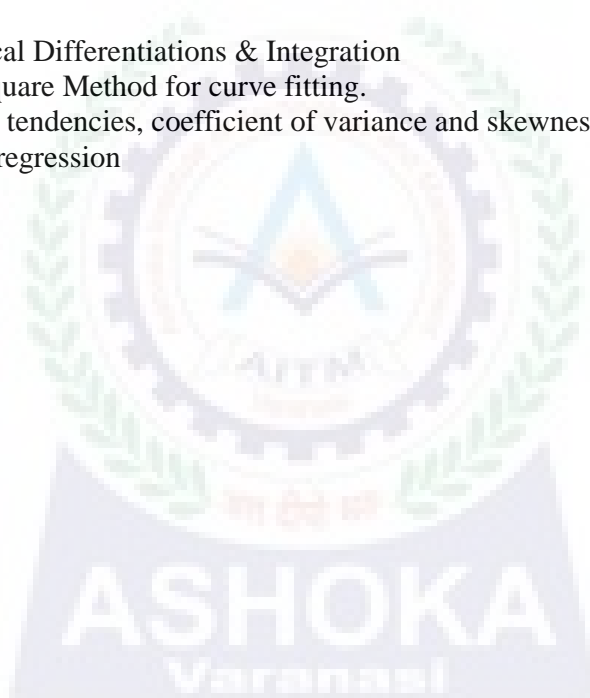


**NCE 454 COMPUTER BASED STATISTICAL & NUMERICAL TECHNIQUES
LAB**

L T P
0 0 3

Write Programs in 'C' Language:

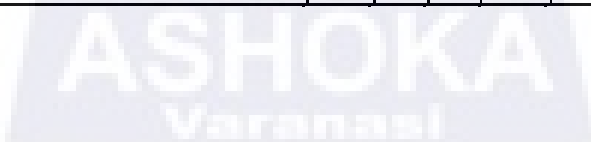
1. To Find out the root of the Algebraic and Transcendental equations using Bisection, Regula-falsi, Newton Raphson and Iterative Methods. Also give the rate of convergence of roots in tabular form for each of these methods.
2. To implement Newton's Forward and Backward Interpolation formula.
3. To implement Gauss Forward and Backward, Bessel's, Sterling's and Evertt's Interpolation formula
4. To implement Numerical Differentiations & Integration
5. To implement Least Square Method for curve fitting.
6. Computation of central tendencies, coefficient of variance and skewness
7. Linear correlation and regression



U.P. TECHNICAL UNIVERSITY, LUCKNOW
 STUDY & EVALUATION SCHEME
 B. Tech. Civil Engineering
 (Effective from the session – 2015-16)

Third Year, 5th Semester

S.No	Course Code	Subject	Period			Evaluation Scheme				Subject Total	Credit
						Sessional Exam			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1	NHU 501	Engineering Economics	2	0	0	15	10	25	50	75	2
2	NCE 501	Geotechnical Engineering	3	1	0	30	20	50	100	150	4
3	NCE 502	Transportation Engineering-1	3	1	0	30	20	50	100	150	4
4	NCE 503	Environmental Engineering-1	2	1	0	15	10	25	50	75	3
5	NCE 504	Structural Analysis-2	3	1	0	30	20	50	100	150	4
6	NCE 505	Design of Concrete Structure-1	3	1	0	30	20	50	100	150	4
PRACTICAL/DRAWING/DESIGN											
7	NCE 551	Geotechnical Engineering Lab	-	-	3	10	10	20	30	50	1
8	NCE 552	Transportation Engineering Lab	-	-	3	10	10	20	30	50	1
9	NCE 553	CAD Lab-1	-	-	3	10	10	20	30	50	1
10	NCE 554	Estimation Costing & Valuation	-	-	3	10	10	20	30	50	1
11	NGP 501	General Proficiency	-	-	-	-	-	50	-	50	
		TOTAL	16	5	12					1000	25



U.P. TECHNICAL UNIVERSITY, LUCKNOW
STUDY & EVALUATION SCHEME
B. Tech. Civil Engineering
(Effective from the session – 2015-16)

Third Year, 6th Semester

S. No	Course Code	Subject	Period			Evaluation Scheme				Subject Total	Credit
						Sessional Exam			ESE		
			L	T	P	CT	TA	Total			
THEORY SUBJECTS											
1	NHU 601	Industrial Management	2	0	0	15	10	25	50	75	2
2	NCE 601	Design of Concrete Structure-2	3	1	0	30	20	50	100	150	4
3	NCE 602	Environmental Engineering-2	3	1	0	30	20	50	100	150	4
4	NCE 603	Construction Technology & Management	3	1	0	30	20	50	100	150	4
5	NCE 011 -014	Departmental Elective-1	3	1	0	30	20	50	100	150	4
6	NCE 021-024	Departmental Elective-2	2	1	0	15	10	25	50	75	3
PRACTICAL/DRAWING/DESIGN											
7	NCE 651	Structural Detailing Lab	0	0	3	10	10	20	30	50	1
8	NCE 652	Environmental Engineering Lab	0	0	3	10	10	20	30	50	1
9	NCE 653	CAD Lab-2	0	0	3	10	10	20	30	50	1
10	NCE 654	Survey Camp*	0	0	0	0	0	50	-	50	1
11	NGP 601	General Proficiency	0	0	0	0	0	50	-	50	
		TOTAL	16	5	9					1000	25

Note:*The teaching load of survey camp will be counted as equivalent to 0-0-3.

Departmental Elective -1 (Full Unit Course with Credit: 4)

Sl.No.	Code and Course
5 (A)	NCE 011 – Advanced Foundation Design
5 (B)	NCE 012 – Matrix Analysis of Structures
5 (C)	NCE 013 – Environmental Management for Industries
5 (D)	NCE 014 – Principals of Town Planning and Architecture

Departmental Elective – 2 (Half Unit Course with Credit: 3)

Sl.No.	Code and Course
6 (A)	NCE 021 – Advanced Concrete Design
6 (B)	NCE 022 – Earth and Earth Retaining Structure
6 (C)	NCE 023 – Transportation System and Planning
6 (D)	NCE 024 – Rural Water supply and Sanitation

5.2 NCE – 501: GEOTECHNICAL ENGINEERING

**L– 3, T– 1, P- 0
CT–30, TA–20, ESE -100**

UNIT – 1

Origin and classification: Preview of Geotechnical field problems in Civil Engineering, Soil formation, transport and deposit, Soil composition, Basic definitions, Weight volume relationships, Clay minerals, Soil structure, Index properties, Particle size analysis, Soil classification.

UNIT – 2

Soil Hydraulics: Modes of occurrence of water in soil. Stress conditions in soil- total, effective and neutral stresses and relationships. Permeability - Bernaulli's equation, Darcy's Law, hydraulic conductivity, laboratory determination of hydraulic conductivity, equivalent hydraulic conductivity in stratified soil.

Seepage- Laplace equation of continuity, flow nets, seepage calculation from a flow net, flow nets in anisotropic soils, seepage through earth dam, critical hydraulic gradient and quick sand condition.

Soil compaction, water content – dry unit weight relationships. Factors controlling compaction. Field compaction equipment; field compaction control; Proctor needle method.

UNIT – 3

Stresses in soils: Normal and shear Stresses on a plane, Stresses due to applied loads, Boussinesq's solution for a point load, line load, strip load, uniformly loaded circular and rectangular areas, Isobar and pressure bulb concept, stress distribution on horizontal and vertical planes, Newmark's chart and its application, contact pressure.

Consolidation: Consolidation and compaction, primary and secondary consolidation, Terzaghi's one dimensional theory of consolidation, Consolidation test, Normal and Over Consolidated soils, Over Consolidation Ratio, determination of coefficient of consolidation, consolidation under construction loading.

UNIT – 4

Shear Strength: Mohr-Coulomb failure criterion, shear strength parameters and determination; direct and tri-axial shear test; unconfined compression test; vane shear test; sensitivity and thixotropy; pore pressure, Skempton' s pore pressure coefficients. Earth pressure: Classical theories, Coulomb and Rankine approaches for frictional and $c-\phi$ soils, Smooth and rough walls, Inclined backfill, graphical methods of earth pressure determination. Types of retaining structures.

UNIT – 5

Characterization of ground, site investigations, groundwater level, methods of drilling, sampling, in situ tests, SPT, CPT, DCPT.

Sub-Structures: Introduction to foundations- types and differences; choice; loads; design philosophies.

Bearing capacity of shallow foundations; modes of failures; corrections for size, shape, depth and eccentricity; provisions of IS code of practice. Introduction to deep foundations.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ*

Text & References Books

1. V.N.S. Murthy – Soil Mechanics and Foundation Engineering (Fifth Edition)
2. K.R. Arora – Soil Mechanics and Foundation Engineering
3. Narasinga Rao, B.N.D, “Soil Mechanics & Foundation Engineering”, John Wiley & Sons, Wiley India Pvt. Ltd., Daryaganj, New Delhi – 110 002.
4. Alam Singh – Modern Geotechnical Engineering
5. Brij Mohan Das – Geotechnical Engineering , CENGAGE Learning
6. I.H. Khan – Text Book of Geotechnical Engineering
7. C. Venkataramaiah – Geotechnical Engineering
8. Gopal Ranjan and A.S.R. Rao – Basic and Applied Soil Mechanics
9. G.V. Rao & G.V.S.S. Raju – Engineering with Geosynthetics
- 10.P. Purushottam Raj- Soil Mechanics and Foundation Engineering, Pearson Education in South Asia, New Delhi.
11. Shenbaga R Kaniraj- Design Aids in Soil Mechanics and Foundation Engineering
- 12.Gulati, S.K., “Geotechnical Engineering” McGraw Hill Education (India), Pvt. Ltd., Noida.

5.3NCE – 502: TRANSPORTATION ENGINEERING-I

L-3, T-1, P-0

CT-30, TA-20, ESE-100

UNIT-1

Introduction: Role of Transportation, Modes of Transportation History of road development, Road types and pattern, Nagpur road plan, Bombay road plan & 3rd 20 Year Road Plan, NHAI Act (1988), Road Development Plan Vision: 2021 documents, Expressway Master Plan, Features of PMGSY.

UNIT-2

Highway Alignment & Location Survey: Horizontal Profile, Vertical Profile, Factors Controlling the alignment, Survey for route location, Preparation of Detailed Project Report (DPR)

Geometric Design: Cross sectional elements, camber, shoulder, sight distance, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves.

UNIT-3

Traffic Engineering: Traffic Characteristics, traffic volume and speed study, traffic capacity, density, traffic control devices, signs, signals, Island, Intersection at grade and grade separated intersections, design of rotary intersection

UNIT-4

Highway Materials: Road Construction materials : Properties of Subgrade, Aggregates & Binding materials, Various tests and specifications,

Design of Highway Pavement : Types of Pavements, Design factors, Design of Flexible Pavement by CBR method (IRC : 37-2012), Design of rigid pavement, Westergaard theory, load and temperature stresses, joints, IRC method of rigid pavement design (IRC:58-2011)

UNIT-5

Highway Construction: Construction of Subgrade, Water Bound Macadam (WBM), Wet mix macadam (WMM), Granular Sub Base (GSB), Tack Coat, Prime Coat, Seal Coat, Surface Dressing, Bituminous Macadam (BM), Semi dense bituminous concrete (SDBC) and Bituminous concrete, Dry lean concrete (DLC), Cement Concrete (CC) road construction, Roller Compacted Concrete Roads.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Book:

1. Khanna S. K., Justo C.E.G, & Veeraragavan, A. “Highway Engineering”, Nem Chand and Bros., Roorkee- 247 667.
2. Khanna S. K., Justo C.E.G, & Veeraragavan A., “Highway Materials and Pavement Testing”, Nem Chand and Bros., Roorkee- 247 667.

References:

3. Kadiyali L. R., & Lal, N.B. “Principles and Practices of Highway Engineering (including Expressways and Airport Engineering)”, Khanna Publications, Delhi – 110 006
4. Saxena, Subhash C, A Textbook of Highway and Traffic Engineering, CBS Publishers & Distributers, New Delhi
5. Kumar, R Srinivasa, “A Text book of Highway Engineering”, Universities Press, Hyderabad.
6. Kumar, R Srinivasa, “Pavement Design”, Universities Press, Hyderabad.
7. Chakraborty Partha & Das Animesh., “Principles of Transportation Engineering”, Prentice Hall (India), New Delhi,
8. IRC : 37-2012, “Tentative Guidelines for the design of Flexible Pavements” Indian Roads Congress, New Delhi

9. IRC: SP:68-2005, “Guidelines for Construction of Roller Compacted Concrete Pavements”, Indian Roads Congress, New Delhi.
10. IRC: 58-2011, “Guidelines for The design of Plain Jointed Rigid Pavements for Highways”, Indian Roads Congress, New Delhi.
11. IRC: 15-2002, “Standard Specifications and Code of Practice for construction of Concrete Roads” Indian Roads Congress, New Delhi.
12. MORTH, “Specifications for Road and Bridge Works”, Ministry of Shipping, Road Transport & Highways, Published by Indian Roads Congress, New Delhi.

5.4 NCE – 503 ENVIRONMENTAL ENGINEERING – I

L – 2, T – 1, P -0
CT – 15, TA – 10, ESE – 50

Unit-1

Water supply: Water demands and domestic use, variation in demands; population forecasting by various methods using logistic curve method; basic needs and factors affecting consumption; design period. Sources of water and their characteristics, quality of surface and ground waters; factors governing the selection of a source of water supply; intakes structures and their design, determination of the capacity of impounding reservoir.

Unit-2

Transmission of water: Various types of conduits, capacity and sizes including economical sizes of rising main, structural requirements; laying and testing of water supply pipelines; pipe materials, joints, appurtenances and valves; leakages and control.

Storage and distribution of water: Methods of distribution, pressure and gravity distribution systems, Concept of service and balancing reservoirs.

Unit-3

Capacity of distribution reservoirs; general design guidelines for distribution system, Hardy - Cross method, equivalent pipe method of pipe network analysis. Plumbing systems in buildings and houses: water connections, different cocks and pipe fittings. Wastewater collection: Systems of sanitation and wastewater collection, estimation of wastewater flows and variations in wastewater flows.

Storm water: Collection and estimation of storm water by different formulae.

Unit-4

Flow in sewers: Flow in full and partially full sewers and design of sewers; types of sewers, materials and construction of sewers, joints and sewer appurtenances, layout and construction of sewer lines, small bore sewer systems, Planning of sewerage systems.

Air Pollution: Definition, Sources, Classification of air Pollutants, National ambient

air quality standards, Lapse rate, Inversion, Plume behavior, Acid rain, Vehicular emission and its standards.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books:

1. Peavy, Howard S., Rowe, Donald R and Tchobanoglous, George, “Environmental Engineering” McGraw Hill Education (India) Pvt. Ltd., New Delhi.
2. Metcalf & Eddy “Wastewater Engineering: Treatment & Reuse”, Tata Mc-Graw Hill.
3. Garg, S.K.: Water Supply Engineering (Environmental Engineering Vol. – I)
4. Garg, S.K.: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol.–II).
5. Seinfeld, J.H. and Pandis, S.N. “Atmospheric Chemistry and Physics: From Air Pollution to Climate Change”, John Wiley
6. <http://cpcb.nic.in/>, National ambient air quality standards, Central Pollution Control Board, Ministry of Environment and Forest, Government of India.

References:

1. Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
2. Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
3. Steel and McGhee: Water Supply and Sewerage
4. Fair and Geyer: Water Supply and Wastewater Disposal
5. Hammer and Hammer Jr.: Water and Wastewater Technology
6. Raju: Water Supply and Wastewater Engineering
7. Rao: Textbook of Environmental Engineering
8. Davis and Cornwell: Introduction to Environmental Engineering
9. Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II
10. Punmia: Water Supply and Wastewater Engineering Vol. I and II
11. Birdie: Water Supply and Sanitary Engineering
12. Ramalho: Introduction to Wastewater Treatment Processes
13. Davis Mackenzie L., Cornwell, David A., “Introduction to Environmental Engineering” McGraw Hill Education (India) Pvt. Ltd., New Delhi.

5.5 NCE - 504: STRUCTURAL ANALYSIS-2

L-3, T -1, P-0

CT- 30, TA- 20, ESE- 100

Unit – 1

Analysis of fixed beams, Continuous beams and simple frames with and without translation of joint, method of Consistent Deformation, Slope-Deflection method, Moment Distribution method, Strain Energy method.

Unit – 2

Muller-Breslau's Principle and its applications for drawing influence lines for indeterminate beams, Analysis of two hinged arches, Influence line diagrams for maximum bending moment, Shear force and thrust.

Unit – 3

Suspension Bridges, Analysis of cables with concentrated and continuous loadings, Basics of two and three hinged stiffening girders, Influence line diagrams for maximum bending moment and shear force for stiffening girders.

Unit – 4

Basics of Force and Displacement Matrix methods for beams , frames and trusses.

Unit – 5

Basics of Plastic Analysis, Applications of Static and Kinematic theorem for Plastic Analysis of Beams and Frames.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books & References:

1. Jain, A. K., "Advanced Structural Analysis ", Nem Chand & Bros., Roorkee.
2. Hibbeler, R.C., "Structural Analysis", Pearson Prentice Hall, Sector - 62, Noida-201309
3. C. S. Reddy "Structural Analysis", Tata Mc Graw Hill Publishing Company Limited, New Delhi.
4. Jain, O. P. and B. K. Jain, "Theory and Analysis of Structures", Vol. I & II, Nem Chand & Bros., Roorkee.
5. Timoshenko, S. P. and D. Young, " Theory of Structures" , Tata Mc-Graw Hill Book Publishing Company Ltd., New Delhi.
6. Dayaratnam, P. " Analysis of Statically Indeterminate Structures", Affiliated East-West Press.
- 7.

8. Wang, C. K. “ Intermediate Structural Analysis”, Mc Graw-Hill Book Publishing Company Ltd.
9. Thandavamoorthy, T.S., “Structural Analysis” Oxford University Press, New Delhi.
10. Martin, H. C.” Introduction to Matrix Methods of Structural Analysis”, Mc-Graw Hill Book Publishing Company Ltd, New Delhi..

5.6 NCE - 505: DESIGN OF CONCRETE STRUCTURE-1

L -3, T -1, P-0

CT – 30, TA – 20, ESE - 100

Unit – 1

Concrete Making materials, Properties of concrete and reinforcements, testing of concrete , Introduction to Various Design Philosophies, Design of Rectangular Singly and Doubly Reinforced Sections by Working Stress Method.

Unit – 2

Assumptions in Limit State Design Method, Design of Rectangular Singly and Doubly Reinforced beams, T-beams, L-beams by Limit State Design Method.

Unit – 3

Behaviour of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear, Introduction to development length, Anchorage bond, flexural bond. (Detailed Examples by Limit State Design Method), Failure of beam under shear, Concept of Equivalent Shear and Moments.

Unit – 4

Design of one way and two way solid slabs by Limit State Design Method, Serviceability Limit States, Control of deflection, cracking and vibrations.

Unit – 5

Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts.

Note:

1. All designs shall be conforming to IS: 456 – 2000.
2. The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books & References:

1. IS: 456 – 2000, “ Code of Practice for Plain and Reinforced Concrete”, Bureau of Indian Standards, New Delhi.
2. Jain, A.K., “Reinforced Concrete: Limit State Design”, Nem Chand & Bros., Roorkee.
3. Gambhir, M L ,”Fundamentals of Reinforced Concrete”, Prentice Hall of India.
4. Unnikrishna Pillai, S. & D. Menon, “ Reinforced Concrete Design”, Tata Mc-Graw Hill Company Limited.
5. Jain, O. P. & Jai Krishna, “ Plain and Reinforced Concrete”, Vol. I & II, Nem Chand & Bros., Rookee.
6. Park, R. and T. Pauley,” Reinforced Concrete Structures”, John Wiley & Sons.
7. Dayaratnam, P,”Reinforced Concrete Design”, Oxford & IBH.
8. Sinha, S.N., “Reinforced Concrete Design” Mc-Graw Hill Book Publishing Company Ltd., New Delhi
9. Subramanian, N.,”Design of Reinforced Concrete Structures”, Oxford University Press,New Delhi – 110 001.

5.7NCE – 551: GEOTECHNICAL ENGINEERING LAB

L-0, T-0, P-3
CT-10, TA-10, ESE-30

1. Determination of water content of a given moist soil sample by (i) oven drying method, (ii) pycnometer method.
2. Determination of specific gravity of a given soil sample by (i) density bottle, (ii) pycnometer method.
3. Determination of in situ dry density of soil mass by (i) core-cutter method, (ii) sand replacement method.
4. Determination of relative density of a given soil sample.
5. Determination of complete grain size distribution of a given soil sample by sieve analysis and sedimentation (hydrometer) analysis.
6. Determination of consistency limits (liquid, plastic and shrinkage limits) of the soil sample used in experiment no. 5 (grain-size analysis).
7. Classify the soil as per the IS 1498- 1970 based on the results obtained from experiments at serial nos. 5 & 6 (grain size distribution and consistency limits).
8. Determination of compaction characteristics (OMC & MDD) of a given soil sample.
9. Determination of permeability of a remolded soil sample by constant head &/or falling head method.
10. Determination of consolidation characteristics of a remolded soil sample by an oedometer test.
11. Determination of shear strength characteristics of a given soil sample by U/U test from Tri-axial Compression Machine.

12. Retrieving soil samples and conducting SPT tests by advancing boreholes through hand-held auger.

Note: Any 8 experiments are to be performed from the list of experiments.

References:

- 1. Bowles, Joseph E., "Engineering Properties of Soil and Their Measurement" Fourth Edition, Indian Edition, McGraw Hill Education (India) Pvt. Ltd, New Delhi-110032.**

5.8NCE – 551: TRANSPORTATION ENGINEERING LAB

L-0, T-0, P-3

CT-10, TA-10, ESE-30

LIST OF EXPERIMENTS

- 1. To Determine the Crushing Value of Coarse Aggregates.**
- 2. To Determine the Impact Value of Coarse Aggregates.**
- 3. To determine the Flakiness Index and Elongation Index of Coarse Aggregates.**
- 4. To determine the Los Angeles Abrasion Value of Coarse Aggregates.**
- 5. To determine the Stripping Value of Coarse Aggregates.**
- 6. To determine the penetration Value of Bitumen.**
- 7. To determine the Softening Point of Bituminous material.**
- 8. To determine the Ductility Value of Bituminous material.**
- 9. To determine the Flash and Fire Point of Bituminous material.**
- 10. To determine the Stripping Value of Bituminous material.**
- 11. Classified both directional Traffic Volume Study.**
- 12. Traffic Speed Study. (Using Radar Speedometer or Enoscope).**
- 13. Determination of CBR Value of soil sample in the Lab or in Field.**

Note: A minimum of 8 experiments are to be performed from the list of Experiments.

References:

- 1. Khanna S. K., Justo C.E.G, & Veeraragavan A., "Highway Materials and Pavement Testing", Nem Chand and Bros., Roorkee- 247 667.**
- 2. Gambhir, M.L., Jamwal, Neha," Lab Manual: Building and Construction Materials, Testing and Quality Control" McGraw Hill Education (India), Pvt.Ltd., Noida.**

3. Duggal, Ajay K., Puri, Vijay P.,” Laboratory Manual in Highway Engineering” New Age International (P) Limited, Publishers, New Delhi.
4. Sood Hemant, Mittal, L.N., Kulkarni,P.D., “ Laboratory Manual on Concrete Technology” CBS Publishers & Distribiters Pvt. Ltd. New Delhi.

5.9NCE - 553: CAD LAB I

L-0, T-0, P-3
CT-10, TA-10, ESE-30

1. Working on Latest Version of ANALYSIS SOFTWARE LIKE ANSYS , ADINA , NISA, MATLAB
2. Working on Latest Version of DESIGN SOFTWARE LIKE STAAD PRO / STRUDS / SAP / ETAB / STRAP
3. Working on Latest Version of GEOTECHNICAL SOFTWARES like GEO-5 / PLAXIS

5.10 NCE - 553: ESTIMATION COSTING & VALUATION

L-0, T-0, P-3
CT-10, TA-10, ESE-30

1. Method of Estimation: General items of works for estimates, units and measurement, method of accounting for the deduction of openings etc.
2. Detailed estimates of a single roomed and a two roomed residential building.
3. Analysis of rates: Definition of analysis of rates, Prime cost, and work charged establishment.
4. Quantity of materials per unit of works for major Civil Engineering items. Resource planning through analysis of rates, market rates.
5. PWD scheduled and cost indices for building material and labour.
6. Valuation: Purpose of Valuation, Market Value, Book Value, Rateable Value, Capital Cost, Capilized Value, Ideal investment, Sinking fund, Depreciation, Straight Line method, sinking fund method, quantity survey method, Valuation of building, rent fixation.

References:

1. Dutta, B.N., “Estimation and Costing in Civil Engineering (Theory and Practice)”, UBS Publishers Distributers Private Ltd., New Delhi.
2. Singh, Gurucharan, Singh Jagadish, “A Text book of Estimation Costing and Valuation” Standard Publishers Distributers, Delhi -110006.
3. Peurifoy, Robert L., Oberlender, Garold D., “Estimating Construction Costs” Tata Mc Graw Hill Education Pvt. Ltd., New Delhi.

6.2 NCE- 601 DESIGN OF CONCRETE STRUCTURE II

L -3, T -1, P-0

CT – 30, TA – 20, ESE - 100

Unit – 1

Nature of Stresses in flat slabs with and without drops, coefficient for design of flat slabs, reinforcement in flat slabs. (IS Code Method).

Unit –2

Analysis and design of beam curved in plan. Structural behaviour of footings, design of footing for a wall and a single column, combined rectangular and trapezoidal footings, Design of strap footing.

Unit – 3

Structural behaviour of retaining wall, stability of retaining wall against overturning and sliding, Design of T-shaped retaining wall, Concept of Counter fort retaining wall. Loads, forces and I.R.C. bridge loadings, Design of R.C. slab culvert.

Unit – 4

Design criteria, material specifications and permissible stresses for tanks, design concept, of circular and rectangular tanks situated on the ground / underground, design of overhead tanks.

Unit – 5

Advantages of prestressing, methods of prestressing, losses in prestress, analysis of simple prestressed rectangular and T-section.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text Books & References

1. IS : 456 – 2000, “ Code of Practice for Plain and Reinforced Concrete”, Bureau of Indian Standards, New Delhi.
2. Jain, A.K., “Reinforced Concrete : Limit State Design”, Nem Chand & Bros., Roorkee.
3. Dayaratnam, P, “Limit State Design of Reinforced Concrete Structures” Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Gambhir, M L ,”Fundamentals of Reinforced Concrete”, Prentice Hall of India.
5. Unnikrishna Pillai, S. & D. Menon, “ Reinforced Concrete Design”, Tata Mc-Graw Hill Company Limited.
6. Jain, O. P. & Jai Krishna, “ Plain and Reinforced Concrete”, Vol. I & II, Nem Chand & Bros., Rookee.
7. Park, R. and T. Pauley,” Reinforced Concrete Structures”, John Wiley & Sons.
8. Dayaratnam, P,”Reinforced Concrete Design”, Oxford & IBH.

6.3 NCE-602: ENVIRONMENTAL ENGINEERING – 2

L – 3, T – 1, P-0

CT – 30, TA – 20, ESE - 100

Unit-1

Introduction: Beneficial uses of water and quality requirements, standards. Concepts of water and wastewater quality: physical, chemical and bacteriological examination of water and wastewater, Water borne diseases and their control.

Wastewater characteristics: Temperature, pH, colour and odour, solids, nitrogen and phosphorus, chlorides, toxic metals and compounds, BOD, COD etc. **Objectives of treatment:** Water and wastewater treatment, unit operations and processes and flow sheets.

Disposal of wastewater on land and in water bodies, Recycling and Reuse of wastewater.

Unit-2

Screen, Sedimentation: Determination of settling velocity, efficiency of ideal sedimentation tank, short circuiting; different classes of settling; design of settling tanks; removal efficiency for discrete and flocculent settling.

Coagulation: Mechanisms of coagulation, coagulants and their reactions, coagulant aids; design of flocculators and clariflocculators.

Adsorption.

Unit-3

Filtration: Theory of filtration; hydraulics of filtration; Carmen - Kozeny and other equations, slow sand, rapid sand and pressure filters, backwashing; design of slow and rapid sand filters.

Disinfection: Requirements of an ideal disinfectant; kinetics of disinfection, various disinfectants, chlorination and practices of chlorination. **Water softening and ion exchange:** calculation of dose of chemicals.

Unit-4

Wastewater Treatment: Preliminary, primary, secondary and tertiary treatment processes. **Primary Treatment:** Screens, grit chamber and their design.

Secondary Treatment: Theory of organic matter removal; activated sludge process, design of different units and modifications, extended aeration systems; trickling filters; aerated lagoons, waste stabilization ponds, oxidation ditches, R.B.C. etc.

Anaerobic digestion of sludge.

Unit-5

Design of low and high rate anaerobic digesters and septic tank. Basic concepts of anaerobic contact process, anaerobic filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and upflow anaerobic sludge blanket (UASB) reactor.

Other emerging technologies for wastewater treatment: Duckweed pond,

vermiculture, root zone technologies, sequential batch reactor (SBR) etc.
Solid waste Management: Definition of solid waste and its classification,
Hazardous waste, Prevailing regulations of solid waste management in India.
Noise Pollution: Definition, Sources, Prevailing noise standards in India.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

Text books:

1. Peavy, Rowe and Tchobanoglous: Environmental Engineering, Mc-Graw Hill.
2. Metcalf and Eddy Inc.: Wastewater Engineering
3. Garg: Water Supply Engineering (Environmental Engineering Vol. – I)
4. Garg: Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II).
5. Davis, M.L. & Cornwell, D.A.: Introduction to Environmental Engineering, Mc-Graw Hill.

Reference books:

1. Manual on Water Supply and Treatment, C. P. H. E. E. O., Ministry of Urban
 2. Development, Government of India, New Delhi
 3. Manual on Sewerage and Sewage Treatment, C. P. H. E. E. O., Ministry of Urban Development, Government of India, New Delhi
 4. Fair and Geyer: Water Supply and Wastewater Disposal
 5. Arceivala: Wastewater Treatment for Pollution Control
 6. Hammer and Hammer Jr.: Water and Wastewater Technology
 7. Raju: Water Supply and Wastewater Engineering
 8. Sincero and Sincero: Environmental Engineering: A Design Approach
 9. Pandey and Carney: Environmental Engineering
 10. Rao: Textbook of Environmental Engineering
 11. Davis and Cornwell: Introduction to Environmental Engineering
 12. Kshirsagar: Water Supply and Treatment and Sewage Treatment Vol. I and II
 13. Punmia: Water Supply and Wastewater Engineering Vol. I and II
 14. Birdie: Water Supply and Sanitary Engineering
 15. Ramalho: Introduction to Wastewater Treatment Processes
 16. Parker: Wastewater Systems Engineering
- 6.4 NCE-603: CONSTRUCTION TECHNOLOGY & MANAGEMENT

L – 3, T –1, P-0

CT – 30, TA – 20, ESE - 100

Unit-1

Elements of Management and Network Techniques: Project Cycle, Organisation, Planning, Scheduling, Monitoring, updating and Management System in Construction.

Unit-2

Network Techniques: Bar Chart, Mile stone chart, work break down structure, and preparation of networks. Net work techniques like PERT and CPM. In construction Management, Project Monitoring and resource allocations through network techniques.

Unit-3

Project Cost Control: Cost Planning, Direct Cost, Indirect Cost, Total Cost Curve, Cost Slope. Time Value of Money, Present Economy studies, Equivalence Concept, financing of projects, Economic comparisons present worth method, Equivalent annual cost method, discounted cash flow method. Depreciation and break even cost analysis of construction projects.

Unit-4

Contract Management: Legal Aspects of Contracts, laws related to contracts, land acquisition, labour safety and welfare, Different types of contracts, their relative advantages and disadvantages, Elements of Tender Preparation, Process of tendering, pre qualifications of contracts, Evaluation of tenders, contract negotiation and award of work, monitoring of contract, settlement of disputes, arbitration and commissioning of project.

Unit-5

Equipment Management: Productivity, operational cost, owning and hiring cost. Constriction equipment: Earth moving, Hauling equipments, Hoisting equipments, Conveying Equipments, Concrete Production equipments, Tunneling equipments.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. Robert L. Peurifoy, Clifford J., Schexnayder, Aviad Shapira “ Construction Planning Equipment and Methods” McGraw Hills Education (India), Private Ltd.,New Delhi.
2. Srinath, L.S., “PERT and CPM Principals and applications” Affiliated East-West Press Pvt. Ltd., New Delhi.
3. Patil, B.S., “Civil Engineering Contracts and Estimates” University Press India, Pvt. Ltd. Hyderabad – 500 004
4. Construction Management by Ojha
5. Srivastava, U.K.,”Construction Planning and Management”, Galgotia Publications Pvt. Ltd., New Delhi.
6. Construction Technology By Sarkar, Oxford.

DEPARTMENTAL ELECTIVE – 1 SUBJECT (NCE-011 to NCE-014)

6.5 (A) NCE-011: ADVANCED FOUNDATION DESIGN

L – 3, T –1, P-0

CT – 30, TA – 20, ESE – 100

Unit -1

Modern methods of soil investigations ,Geophysical methods; soil resistivity methods seismic refraction method ,stress below ground due to loads

Unit -2

Bearing capacity and settlement analysis of shallow foundations: Meyerhof and Hansen’s bearing capacity equations, BIS bearing capacity equation, immediate and consolidation settlements in cohesive soil, De-Beer and schmmerman’s methods of settlement prediction in non cohesive soil.

Unit -3

Classification of piles, load carrying capacity of single piles in clay, silt and sand by dynamic and static methods, Pile load test, Pile group, Negative skin friction, Settlement of pile group.

Unit – 4

Foundation on expansive soil, Construction on expansive soil, Alteration of soil condition, under-reamed piles. Elements of well foundation, Shape, Depth of scour,

Well sinking, Tilt, shift and their prevention.

Unit -5

Stability of slopes, Limit equilibrium method, Method of slices, Simplified Bishop method, Stability Charts. Soil behavior under dynamic loads ,Machine foundation: classification, definitions, design principle in brief, Barken’s method.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Text & Reference Books:

- 1. K. R. Arora – Soil Mechanics & Foundation Engineering.**
- 2. Alam Singh – Modern Geotechnical Engineering.**
- 3. Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics**
- 4. J. E. bowles – Analysis and Design of Foundation.**
- 5. V. N. S. Murthy – Soil Mechanics and Foundation Engineering.**
- 6. B. M. Das – Foundation Engineering, CENGAGE Learning**

6.5 (B) NCE – 012 MATRIX ANALYSIS OF STRUCTRES

L – 3, T –1, P-0

CT – 30, TA – 20, ESE - 100

UNIT – 1

Introduction of Flexibility and stiffness method. Hand computation of problems on beam,

UNIT – 2

Hand computation of problems on trusses, frames and grids.

UNIT – 3

Generalized computer oriented treatment of stiffness method, Method of assembling the stiffness matrix, substructure technique for solving very large structures.

UNIT – 4

Analysis for imposed deformation, temperature, support settlement, etc.

UNIT – 5

Transfer matrix method of analyzing framed structure.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

Reference:

- 1. Weaver & Gere, Matrix Analysis of Framed structures.**
- 2. H.C. Matrix, Introduction to Matrix Methods, of structural Analysis, McGraw Hill New York**
- 3. Pandit, G.S.,” Structural Analysis: A Matrix Approach” McGraw Hill Education (India) Pvt. Ltd., Noida.**

6.5(C) NCE – 013: ENVIRONMENTAL MANAGEMENT FOR INDUSTRIES

L – 3, T –1, P-0

CT – 30, TA – 20, ESE – 100

Unit-1

Environmental legislations for setting up and for operation of an industrial activity, Compliance procedure of these legislations, Need of Environmental Impact Assessment (EIA) study, Other Pollution control legislations.

Unit-2

Defining the industrial activity: Location, approach, manufacturing processes, raw

materials and other inputs of natural resources; Defining the local environment format: Physical environment, biological, environment and socio-economic environment.

Unit-3

Detailing of the local environment: Physical environment- water, air, land resources & solid wastes, noise emissions, radiation emissions etc.; biological environment- all flora & fauna including microbial activities in the local vicinity; Socio-economic environment- history of the area, customs & rituals, demography, infrastructural activities, education, health, and developmental profile of the area, specific local environmental issues.

Unit-4

Environmental Pollution in Industries: various industrial processes, sources and types of pollutions - solid, liquid, gaseous, noise & radiation emissions. Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc.

Unit-5

Environmental Impact Assessment (EIA): definitions, methodologies, environmental toxicology; Environmental management Plan, Risk Assessment & risk management plan, pollutant exposure assessment, Environmental Management Cell (EMC): Environmental monitoring schedules, Environmental Statement, Application for consent, Authorization for hazardous wastes, ISO and ISO 14000 etc.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ.

References:

1. EIA Manuals of MOEF (Available on <http://envfor.nic.in/essential-links/eia-specific-manuals> and <http://envfor.nic.in/division/introduction-8>)
2. Environment (protection) Act 1986. Any authorized & recent publication on Government Acts. Also available on CPCB/MoEF Website
3. Environmental Impact Assessment-Training resource manual, UNEP 2001
4. Wastewater Reuse and Recycling Technology-Pollution Technology Review 72, Culp, Gordan,
5. George Wasner, Robert Williams and Mark , V.Hughes Jr., Noyes Data Corporation, New Jersey.
6. Industrial Pollution Control –Issues and Techniques. Nancy, J. Sell, Van Nostrand Reinhold Co, NY.
7. Industrial Pollution Prevention Handbook. Shen, T.T., Springer-Verlag, Berlin.
8. Environmental Engineering. Pandey, G.N. and Corney, G.C., Tata McGraw Hill, New Delhi

6.5 (D) NCE – 014 PRINCIPLES OF TOWN PLANNING AND ARCHITECTURE

L – 3, T –1, P-0

CT – 30, TA – 20, ESE – 100

Unit - 1

Principles and history of town planning, Comprehensive planning of towns: Contemporary planning concepts, Problems of urban growth. Land use classification and patterns, Housing demographic and social surveys, economic and environmental aspects. Concept of master plan, Zoning and Density. Transportation network and planning. Planning standards for different land use allocation. Role of town planners.

Unit - 2

An overview of ancient human settlements, Evolution of towns: Garden city movement, Linear city and concentric city concepts, Neighbourhood and Radburn, La-cite industrielle, Radiant city to present day planning, Satellite town concepts. Concept of habitat, Neighborhood planning, problems of metropolis.

Unit -3

Factors influencing architectural development. Impact of development of materials and techniques through ages. Evolution of architectural forms. Brief history of architecture.

Unit - 4

Elements of Architectural Design: Line, Form, Shape, Space, texture, value and colour. Principles of Architectural Design: Balance, Rhythm, Emphasis, Proportion and Scale, Movement, Contrast, Unity, Harmony, Repetition, Hierarchy. Creation of 2 D and 3 D compositions. Role of architects.

Unit - 5

Functional planning of buildings: Occupancy classification of buildings, General requirements of site and building. Building codes, Acts and Bye-laws, Licensing of building works. Functional planning of building such as residential, institutional, public, commercial, industrial buildings - identifying activity areas and linkages, checking for circulation, ventilation, structural requirements and other constraints. Different symbols used in building industry as per NBC and preparing sketch plan, working drawing etc.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. Sir Banister Fletcher's, A History of Architecture, CBS Publisher.
2. Percy Brown, Indian architecture (Buddhist and Hindu Period), D. B. Taraporevala Sons & Co., Bombay.
3. Percy Brown, Indian architecture (The Islamic Period), D. B. Taraporevala Sons & Co., Bombay.
4. G.K. Hiraskar, Great Ages of World Architecture, Dhanpat Rai Publications.
5. Geoffrey Broadbent, Design in Architecture: Architecture and the Human Sciences, John Wiley & Sons, London.
6. Arthur Gallion, The Urban Pattern: City Planning & Design, D.Van Nostrand CD. Inc.
7. Nelson P. Lewis, Planning to Modern City, Routledge.
8. George S. Salvan, Architectural Theories of Design, JMC Press, Quezon city
9. S.C. Rangwala, Town Planning, Charotar Publishing House.
10. G.K. Hiraskar, Fundamentals of Town Planning, Dhanpat Rai Publications.
11. S.C. Agarwala, Architecture and Town Planning, Dhanpat Rai & Co.
12. A. Bandopadhyay, Text book of town planning, Books and Allied, Calcutta
13. B.B.Dutt, Town Planning in Ancient India, Gyan Publishing House, New Delhi
14. National Building Code of India, latest edition

DEPARTMENTAL ELECTIVE –2 SUBJECT (NCE-021 to NCE-024) (Half Unit Course)

6.6 (A) NCE-021: ADVANCED CONCRETE DESIGN

L – 2, T –1, P-0

CT – 15, TA – 10, ESE – 50

Unit - 1

Design of over-head tanks: Design of RC domes and beams curved in plan, design of Cylindrical and rectangular tanks with different end conditions using IS: 3370 tables, Intze tank design based on membrane analysis with mention of continuity effects. Design of staging: Braces, Columns and Raft Foundation.

Unit - 2

Building Frames: Dead, Live, Wind and Earthquake loads, Analysis of framed building by approximate methods for vertical and horizontal loads, concept of Exact Analysis, joint detailing.

Unit - 3

Design of Bridges: Loads, Forces and Permissible Stresses, Code Recommendations regarding design and detailing, Design of slabs under-concentrated loads using, Effective width and Pigeaud's method, Courbon's method of load distribution, Detailed design of Highway Bridges: RC slab and R.C. T-beam types.

Unit - 4

High performance concrete, Production and no -conventional concrete. Design of composite Sections: Composite beam and slabs in simple conditions.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

- 1.Reinforced Concrete Design by M L Gambhir**
- 2. Reinforced Concrete Design by B C Punamia**
- 3. Essentials of Bridge Engineering by D.J. Victor**

6.6(B) NCE- 022: EARTH AND EARTH RETAINING STRUCTURE

L – 2, T –1, P-0

CT – 15, TA – 10, ESE – 50

Unit -1

Earth and Rock Fill Dam, Choice of types, material, foundation, requirement of safety of earth dams, seepage analysis. Mechanically Stabilized Earth retaining walls: General considerations, backfill and reinforced materials, construction details, design method, stability

Unit -2

Soil nailing: applications, advantages, limitations, methods of soil nailing, case histories, analysis and design.

Unit - 3

Reinforced Soil: Introduction, basic components, strength characteristics, soil-reinforcement interface-friction, Reinforced Earth wall: Stability analysis, construction procedure, drainage, design Procedure

Unit -4

Foundation on Reinforced Soil Bed: Pressure ratio, analysis of strip, isolated, square and rectangular footing on reinforced soil bed, Ultimate bearing capacity of footing on reinforced earth slab. Fiber reinforced soil.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

- 1. V N S Murthy - Soil Mechanics and Foundation Engg**
- 2. Swami Saran - Reinforced Soil and its Engineering Application**
- 3. J. E. Bowles - Analysis and Design of Foundation.**
- 4. B. M. Das - Foundation Engineering , CENGAGE Learning**
- 5. P.C Varghese- Foundation Engineering, PHI Learning Pvt. Ltd., Delhi**
- 6. N.N.SOM, S.C.Das, Theory and Practice of Foundation Design, PHI Learning Pvt. Ltd., Delhi**

6.6 (C) NCE-023: TRANSPORTATION SYSTEM AND PLANNING

L – 2, T –1, P-0
CT – 15, TA – 10, ESE – 50

UNIT-1

Introduction: Overview of transportation system, nature of traffic problems in cities. Present Scenario of road transport and rail transport assets. Role of transportation: Social, Political, Environmental. Goals and objective of Transportation planning,

UNIT-2-

Type of transportation system: Different modes of surface transport, Public Transport Intermediate Public Transport (IPT), Rapid and mass transport system like MRTS & bus rapid transit. Traffic Flow and traffic stream theory & variables, Queing theory.

UNIT-3

Travel demand: Estimation and fore casting, trip classification, trip generation: factor and methods, multiple regression analysis. Trip distribution methods, modal split, trip assignment.

UNIT-4

Evaluation of transport planning proposals: Land Use Transport Planning, Economic Evaluation methods like Net present Value methods, Benefit Cost method, Internal rate of return method, Land use transport models. Transport system management: Long term and short term planning

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

1. Introduction to Transportation Engineering: William W. Hay.
2. Introduction to Transportation Engineering planning- E.K.Mortak.
3. Metropolitan Transportation planning-J.W.Dickey.
4. Traffic Engineering, L.R. Kadiyali
5. Banks, James H., "Introduction to Transportation Engineering", McGraw Education (India), Pvt. Ltd., Noida.

6.6 (D) NCE-024: RURAL WATER SUPPLY AND SANITATION

L – 2, T –1, P-0
CT – 15, TA – 10, ESE – 50

Unit-1

Rural Water Supply: Issues of rural water supply –Various techniques for rural water supply- merits- National rural drinking water program- rural water quality monitoring and surveillance- operation and maintenance of rural water supplies.

Low Cost water Treatment: Introduction – Epidemiological aspects of water quality methods for low cost water treatment - Specific contaminant removal systems

Unit-2

Rural Sanitation: Introduction to rural sanitation- Community and sanitary latrines - Planning of wastewater collection system in rural areas- Treatment and Disposal of wastewater - Compact and simple wastewater treatment units and systems in rural areas stabilization ponds - septic tanks - Imhoff tank- soak pits- low cost excreta disposal systems Effluent disposal. Identify problems pertaining to rural water supply and sanitation. Design water supply and sanitation system for rural community.

Unit-3

Industrial Hygiene and Sanitation: Occupational Hazards- Schools- Public Buildings-Hospitals- Eating establishments- Swimming pools – Cleanliness and maintenance and comfort- Industrial plant sanitation.

Unit-4

Solid Waste Management: Disposal of Solid Wastes- Composting- land filling incineration- Biogas plants - Rural health - Other specific issues and problems encountered in rural sanitation.

Note: The students should be given a comprehensive problem at the end which requires inputs/ knowledge/ application from all the units of the syllabus. It may be evaluated as a part of TAQ•

References:

- 1. 'Water Treatment and Sanitation – Simple Method for Rural Area' by Mann H.T. and Williamson D.**
- 2. Operation and maintenance of rural water supply and sanitation systems by Brikké F**
- 3. 'Water Supply for Rural Areas & Small Communities' by Wanger E.G. and Lanoix J.N.,**
- 4. WHO 'Water Supply and Sewerage', by E.W.Steel & T.J.McGhee, McGraw Hill.**
- 5. 'Manual on Water Supply and Treatment', CPHEEO, Ministry of Urban Development, Govt. of India.**

6. 'Manual on Sewerage and Sewage Treatment', CPHEEO, Ministry of Urban Development, Govt. of India
7. 'Environmental Engineering' by D. Srinivasan, PHI Learning Pvt. Ltd. 2009.
8. Metcalf & Eddy, " Wastewater Engineering: Treatment and Reuse", McGraw Hill Education Pvt. Ltd. (India) Noida.

6.7 NCE- 651: STRUCTURAL DETAILING LAB

L -0, T -0, P -3
CT – 10, TA – 10, ESE – 30

1. Preparation of working drawings for the following using any drafting software
2. RC Beams- Simply supported, Continuous, Cantilever
3. T – beam / L-beam floor
4. Slabs – Simply supported, Continuous, One way and two way slabs.
5. Columns – Tied Columns and Spirally reinforced columns.
6. Isolated footings for RC Columns.
7. Combined rectangular and trapezoidal footings.
8. Detailing of Buildings with respect to Earthquake Resistant Design

References:

1. Krishna Raju N., "Structural Design and Drawing" University Press (India), Pvt. Ltd., Hyderabad.

6.8NCE-652: ENVIRONMENTAL ENGINEERING LAB

L -0, T -0, P -3
CT – 10, TA – 10, ESE – 30

1. Determination of turbidity and conductivity.
2. Determination of pH, alkalinity and acidity.
3. Determination of hardness and chlorides.
4. Determination of residual chlorine.
5. Determination of MPN (most probable number) of coliforms.
6. Measurement of SPM and PM₁₀ with high volume sampler.
7. Measurement of sound level with sound level meter.
8. Determination of total, suspended and dissolved solids.
9. Determination of BOD.
10. Determination of COD.
11. Determination of kjeldahl nitrogen.
12. Determination of fluoride.
13. Determination of optimum dose of coagulants by Jar Test Apparatus.
14. Field Visit of Water/ Sewage Treatment Plant of A Nearby area.

Note: Any 8 Experiments out of the list of experiments are to be performed.

References:

1. A.P.H.A. “Standard Methods for the Examination of Water and Wastewater”, American Public Health Association.
2. Sawyer, C.N., McCarty, P.L. & Parkin, G.F. “Chemistry for Environmental Engineering”, Mc-Graw Hill.
3. Mathur, R.P. “Water & Wastewater Testing”, Lab Manual, Roorkee.

6.9 NCE-653: CAD LAB II

L -0, T -0, P -3

CT – 10, TA – 10, ESE – 30

1. Working on Latest Version of Environmental Engineering software for Analysis and Design of water & wastewater treatment and distribution systems (WATER CAD / SEWER CAD / WATER GEM / SEWER GEM /LOOP)
2. Working on Latest Version of Transportation Engineering software like MAX ROAD/ Surveying Software.
3. Working on Latest Version of GIS software (ARC GIS / ENVI / GEPSY)
4. Working on Latest Version of Project Management software (PRIMAVEERA / MS PROJECT)

6.10NCE-654: SURVEY CAMP

TOTAL MARKS: 50

The purpose of the camp is to train students in using modern surveying techniques and equipment such as GPS, total stations, automatic and digital levels, electronic theodolites, etc. to prepare a detailed digital map.

The course will be run in the form of a camp for 7 working days and will involve the following components:

1. Reconnaissance of the area to be mapped.
2. Control establishment: Observations and Adjustment using GPS and/or Total station traverse to yield adjusted coordinates of control points.
3. Detail digital mapping using Total station/GPS.
4. Preparing a digital map using open source mapping software and report writing.

Note: Teaching load will be equivalent to 0-0-3.

G. B. TECHNICAL UNIVERSITY, LUCKNOW

Study & Evaluation Scheme

B Tech Civil Engineering

Effective from session 2011-12

Final Year , VII Semester

S No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	EOE071- EOE074	Open Elective – I	3	1	0	30	20	50	100	150	4
2	ECE031- ECE034	Department Elective-III	3	1	0	30	20	50	100	150	4
3	ECE041- ECE044	Department Elective-IV	3	1	0	30	20	50	100	150	4
4	ECE701	Design of Steel Structures	3	1	0	30	20	50	100	150	4
5	ECE702	Water Resources Engg	3	1	0	30	20	50	100	150	4
PRACTICAL / DESIGN / DRAWING											
6	ECE751	Seminar	0	0	4		-	50	-	50	1
7	ECE752	Industrial Training**					-	50	-	50	1
8	ECE753	Project#	0	0	4		-	100	-	100	3
9	GP 701	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	15	5	8					1000	26

** 4 weeks Industrial Training after VI semester to be evaluated in VII semester.

Project should be initiated in VII semester beginning and should be completed by the end of VIII semester.

G. B. TECHNICAL UNIVERSITY, LUCKNOW

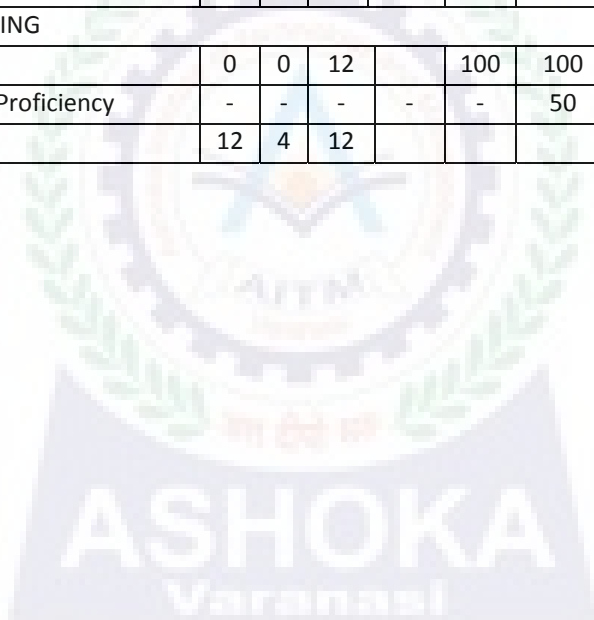
Study & Evaluation Scheme

B Tech Civil Engineering

Effective from session 2011-12

Final Year , VIII Semester

S No	Course Code	SUBJECT	PERIODS			Evaluation Scheme				Subject Total	Credit
			L	T	P	Sessional Exam			ESE		
						CT	TA	Total			
THEORY SUBJECT											
1	EOE081- EOE084	Open Elective – II	3	1	0	30	20	50	100	150	4
2	ECE051- ECE054	Departmental Elective-V	3	1	0	30	20	50	100	150	4
3	ECE061- ECE064	Departmental Elective-VI	3	1	0	30	20	50	100	150	4
4	ECE801	Construction Technology & Management	3	1	0	30	20	50	100	150	3
PRACTICAL / DESIGN / DRAWING											
5	ECE851	Project	0	0	12		100	100	250	350	8
6	GP 801	General Proficiency	-	-	-	-	-	50	-	50	1
		Total	12	4	12					1000	24



MODIFIED LIST OF PROFESSIONAL / DEPARTMENTAL ELECTIVES

Departmental Elective-I

- ECE 011 - Advanced Foundation Design
- ECE 012 - Matrix Analysis of Structures
- ECE 013 - Environmental Management for Industries
- ECE 014 - Principles of Town Planning and Architecture

Departmental Elective-II

- ECE 021 - Advanced Concrete Design
- ECE 022 - Earth and Earth Retaining Structures
- ECE 023 - Transportation System and Planning
- ECE 024 - Rural Water Supply and Sanitation

Departmental Elective-III

- ECE 031 - Bridge Engineering
- ECE 032 - Finite Element Methods
- ECE 033 - Environmental Geo-technology
- ECE 034 - Industrial Pollution Control & Env. Audit
- ECE 035 – Engineering Hydrology

Departmental Elective-IV

- ECE 041 - Precast and Modular Construction Practices
- ECE 042 - Plastic Analysis of Structures
- ECE 043 - Open Channel Flow
- ECE 044 – Tunnel Engineering

Departmental Elective-V

- ECE 051 - Computer Aided Design
- ECE 052 - Analysis and Design of Hydraulic Structures
- ECE 053 - Water Resources Systems
- ECE 054 - Machine Foundation Design

Departmental Elective-VI

- ECE061 - Ground Improvement Techniques
- ECE 062 - River Engineering
- ECE 063 – Groundwater Management
- ECE 064 - Earthquake Resistant Design of Structures

2. Determination of pH, alkalinity and acidity.
3. Determination of hardness and chlorides.
4. Determination of residual chlorine.
5. Determination of most probable number of coliforms.
6. Measurement of air pollutants with high volume sampler.
7. Measurement of sound level with sound level meter.
8. Determination of total, suspended and dissolved solids.
9. Determination of BOD.
10. Determination of COD.
11. Determination of kjeldahl nitrogen.
12. Determination of fluoride.

ECE-653 : CAD Lab – 2 (L-T-P:: 0-0-3)

1. Working on Environmental Engineering softwares for Analysis and Design of water & waste water treatment and distribution systems (Water Cad / Sewer Cad / Water Gem / Sewer Gem / Loop)
2. WORKING Transportation Engg softwares / Surveying Softwares
3. WORKING ON GIS softwares (Arc GIS / Envi / GePSy)
4. Working on Project Management softwares (Primaveera / MS Project)

ECE – 701 STEEL STRUCTURE I

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

Unit - 1

General Considerations

Introduction, Advantages of Steel as a Structural. Material, Disadvantages of Steel as a Structural Material, Structural Steel, Stress-Strain Curve for Mild Steel, Rolled Steel Sections, Convention for Member Axes, Loads, Dead Load, Live Loads, Environmental Loads, Seismic Forces, Snow and Rain Loads, Erection Loads, Basis for Design, Design Philosophies, Local Buckling of Plate Elements.

Introduction to Limit State Design

Introduction, Limit States for Steel Design, Limit States of Strength, Limit States of Serviceability, Actions (Loads), Probabilistic Basis for Design, Design Criteria

Unit -2

Simple Connections--Riveted, Bolted and Pinned Connections

Introduction, Riveted Connections, Patterns of Riveted Joints, Bolted Connections, Types of Bolts, Types of Bolted Joints, Load Transfer Mechanism, Failure of Bolted Joints, Specification for Bolted Joints, Bearing-Type Connections, Prying Action, Tensile Strength of Plate, Efficiency of the Joint, Combined Shear and Tension, Slip-Critical Connections, Combined Shear and Tension for Slip-Critical Connections, Working Load Design, Pin Connections

Simple Welded Connections

Introduction, Types, Symbols, Welding Process, Weld Defects, Inspection of Welds, Assumptions in the Analysis of Welded Joints, Design of Groove Welds, Design of Fillet Welds, Fillet Weld Applied to the Edge of A Plate Or Section, Fillet Weld for Truss Members, Design of Intermittent Fillet Welds, Plug and Slot Welds, Stresses Due To Individual Forces, Combination of Stresses, Failure of Welds, Distortion of Welded Parts, Fillet Weld Vs Butt Weld, Welded Jointed Vs Bolted and Riveted Joints, Section of Fasteners, Working Load Design

Unit – 3

Tension Members

Introduction, Types of Tension Members, Net Sectional Area, Effective Net Area, Types of Failure, Design Strength of Tension Members, Slenderness Ratio (λ), Displacement, Design of Tension Member, Lug Angles, Splices, Gusset Plate, Working Load Design

Unit – 4

Compression Members

Introduction, Effective Length, Slenderness Ratio (λ), Types of Sections, Types of Buckling, Classification of Cross Sections, Column Formula, Design Strength, Design of Axially Loaded Compression Members, Built-Up Columns (Latticed Columns), Lacing, Batten, Compression Member Composed of Two Components Back-to-Back, Encased Column, Splices, Design of Column Bases

Unit – 5

Beams

Introduction, Types of Sections, Behaviour of Beam in Flexure, Section Classification, Lateral Stability of Beams, Lateral-Torsional Buckling, Bending Strength of Beams, Laterally Supported Beams, Laterally Unsupported Beams, Shear Strength of Beams, Web Buckling, Bearing Strength, Web Crippling, Deflection, Design Procedure of Rolled Beams, Built-Up Beams (Plated Beams), Lintels, Purlins, Beam Bearing Plates, Castellated Beam, Effect of Holes in Beam, Introduction to Plate Girder, Introduction to Gantry Girder

Text Books

1. *Limit State Design of Steel Structures* by S. K. Duggal, Tata Mcgraw Hill.
2. *Design of Steel Structures* by K S Sairam, Pearson Education

Reference Books

3. *Design of Steel Structures* by N. Subramanian, Oxford University Press
4. *Steel Structures* by Robert Englekirk. Hohn Wiley & sons inc.
5. *Structural Steel Design* by Lambert tall (Ronald Press Comp. Newyork.
6. *Design of steel structures* by Willam T Segui, CENGAGE Learning
7. *Structural Steel Design* By D MacLaughlin, CENGAGE Learning

ECE – 702 WATER RESOURCES ENGINEERING

L – 3, T – 1

UNIT – I

Hydrology : Hydrologic Cycle. Water Budget Equation, Hydrologic system, Precipitation : Types, measurements and analysis, error in estimation, missing data, consistency of rainfall records, Intensity during frequency (IDF) and probabilistic maximum Precipitation (PMP) curves.

Evaporation and consumptive use: Process affecting factors, estimation and measurement techniques.

Infiltration : Process affecting factors, measurement and estimation, Infiltration Indices.

UNIT – II

Surface Runoff: Components and factors affecting runoff, methods of estimation of runoff volume and peak runoff, rating curve, Rainfall – runoff relationships
Hydrograph analysis: components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph, Unit Hydrograph: Theory and assumptions. Derivation of Unit Hydrograph, Synthetic Unit Hydrograph Introduction to computer models for rainfall runoff analysis.

Irrigation: Developments in India, Necessity and types Advantages & disadvantages of irrigation. Functions of water in plant growth, Methods of Irrigation, Water requirement of crops. Irrigation frequency, Irrigation efficiencies, Principal crops and crop season, crop rotation.

Canal irrigation: Classes and alignment, Parts of a canal system, Commanded area, curves in channels, channel losses.

UNIT – III

Sediment Transportation: Suspended and Bed load and its estimation

Irrigation channels: Types: lined and unlined, silt theories: Kennedy's and Lacey's

Design procedure for irrigation channels, Longitudinal cross section, Schedule of area

statistics and channel dimensions, use of Garret's Diagrams in channel design, cross sections of an Irrigation channel, Computer programmes for design of channels
Lining of Irrigation Canals: Advantages and types, factors for selection of a particular type, design of lined channels, cross section of lined channels, Economics of canal lining.
Water Logging: Definition, effects, causes and anti-water logging measures, Drainage of water logged land, Types of drains open and closed, spacing of closed drains.

UNIT – IV

Regulation and control of canal system: Purpose, Types of canal regulation works and their functional aspects

Irrigation Outlets: Requirements, types, non-modular, semi-module and rigid module, selection criterion

River Training: Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge.

UNIT – V

Ground Water Hydrology: Zones of underground water, Aquifers and their types, important terms, Determination of discharge through unconfined and confined aquifers with steady flow conditions, Interference among wells, determination of aquifer constants, Well loss and specific capacity, efficiency of a well, types of water wells, bored and open wells, specific yield of a well, Relative merits of well and canal irrigation, type of tube wells, well surrounding and well development, Suitable site selection for a tube well, Types of open wells, Methods of lifting water. Infiltration galleries.

Text Book

1. Irrigation Engg. and Hydraulic Structures by S.K. Garg, Khanna Publishers.
2. Irrigation and water Power engineering by B.C. Punmia, Laxmi Publications.
3. Engineering Hydrology by K. Subramanya, TMH.
4. Irrigation Water Power and Water Resource Engg. by K.R. Arrora.

References

5. Water Resources Engg. By Larry W. Mays, John Wiley India
6. Water resources Engg. By Wurbs and James, John wiley India
7. Water Resources Engg. By R. K. Linsley, McGraw Hill
8. Irrigation and water Resources Engg. By G L Asawa, New age International Publishers
9. Irrigation Theory and practices by A.M. Michel.

ECE – 801

CONSTRUCTION TECHNOLOGY & MANAGEMENT

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

L 3 T 1

Unit – 1

Elements of Management : Project cycle, Organisation, planning, scheduling monitoring updating and management system in construction.

Unit -2

Network Techniques : Bar charts, milestone charts, work break down structure and preparation of networks. Application of network Techniques like PERT, GERT, CPM AON and AOA in construction management. Project monitoring, cost planning, resource allocation through network techniques. Line of balance technique.

Unit – 3

Engineering Economics : Time value of money, Present economy studies, Equivalence concept, financing of projects, economic comparison present worth

method Equivalent annual cost method, discounted cash flow method, analytical criteria for postponing of investment retirement and replacement of asset. Depreciation and break even cost analysis.

Unit – 4

Contract Management :Legal aspects of contraction, laws related to contracts, land acquisition, labour safety and welfare. Different types of contracts, their relative advantages and disadvantages. Elements of tender preparation, process of tendering pre-qualification of contracts, Evaluation of tenders, contract negotiation and award of work, monitoring of contract extra items, settlements of disputes, arbitration and commissioning of project.

Unit – 5

Equipment Management : Productivity, operational cost, owning and hiring cost and the work motion study. Simulation techniques for resource scheduling. Construction Equipments for earth moving , Hauling Equipments, Hoisting Equipments , Conveying Equipments , Concrete Production Equipments

Text Books

1. “Construction Planning”, Equipment and Methods. : R.L. Peurify. T.M.H., International Book Company.
2. “PERT & CPM Principles and Applications” L.S. Srinath, E.W.P. Ltd., New Delhi.
3. “Network Analysis Techniques” S.K. Bhatnagar, Willey Eastern Ltd.
4. Construction Technology by Sarkar , Oxford

ECE 011 Advanced Foundation Design

L	T	P
3	1	0

Unit -1

Vertical pressures under surface loads, Elastic Solution, Boussinesq and New Mark Charts, Westergaard's equation, approximate solution.

Unit -2

Bearing capacity and settlement analysis of shallow foundations: Meyerhof and Hansen's bearing capacity equations, BIS bearing capacity equation, immediate and consolidation settlements in cohesive soil, De-Beer and Schmertman's methods of settlement prediction in non cohesive soil.

Unit -3

Classification of piles, load carrying capacity of single piles in clay, silt and sand by dynamic and static methods, Pile load test, Pile group, Negative skin friction, Settlement of pile group.

Unit – 4

Foundation on expansive soil, Construction on expansive soil, Alteration of soil condition, under-reamed piles.

Elements of well foundation, Shape, Depth of scour, Well sinking, Tilt, shift and their prevention.

Unit -5

Stability of slopes, Limit equilibrium method, Method of slices, Simplified Bishop method, Stability Charts.

Machine foundation: classification, definitions, design principle in brief, Barken's method.

Text Books:

1. K. R. Arora – Soil Mechanics & Foundation Engineering.
2. Alam Singh – Modern Geotechnical Engineering.
3. Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics

Reference:

1. J. E. bowles – Analysis and Design of Foundation.
2. V. N. S. Murthy – Soil Mechanics and Foundation Engineering.
3. B. M. Das – Foundation Engineering , CENGAGE Learning

ECE – 012 MATRIX ANALYSIS OF STRUCTRES

L – 3, T – 1
CT – 30, TA – 20, ESE – 100

UNIT – 1

Introduction of Flexibility and stiffness method. Hand computation of problems on beam,

UNIT – 2

Hand computation of problems on trusses, frames and grids.

UNIT – 3

Generalized computer oriented treatment of stiffness method, Method of assembling the stiffness matrix, substructure technique for solving very large structures.

UNIT – 4

Analysis for imposed deformation, temperature, support settlement, etc.

UNIT – 5

Transfer matrix method of analyzing framed structure.

Reference:

1. Weaver & Gere , Matrix Analysis of Framed structures.
2. H.C. Matrix, Introduction to Matrix Methods, of structural Analysis, McGraw Hill, New York.

ECE-013 Environmental Management for Industries

Unit-1

Environmental legislations for setting up and for operation of an industrial activity, Compliance procedure of these legislations, Need of Environmental Impact Assessment (EIA) study, Other Pollution control legislations.

Unit-2

Defining the industrial activity: Location, approach, manufacturing processes, raw materials and other inputs of natural resources; Defining the local environment format: Physical environment, biological environment and socio-economic environment.

Unit-3

Detailing of the local environment: Physical environment- water, air, land resources & solid wastes, noise emissions, radiation emissions etc.; Biological environment- all flora & fauna including microbial activities in the local vicinity; Socio-economic environment- history of the area, customs & rituals, demography, infrastructural activities, education, health, and developmental profile of the area, specific local environmental issues.

Unit-4

Environmental Pollution in Industries: various industrial processes, sources and types of pollutions - solid, liquid, gaseous, noise & radiation emissions. Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc.

Unit-5

Environmental Impact Assessment (EIA): definitions, methodologies, environmental toxicology; Environmental management Plan, Risk Assessment & risk management plan, pollutant exposure assessment, Environmental Management Cell (EMC): Environmental monitoring schedules, Environmental Statement, Application for consent, Authorization for hazardous wastes, ISO and ISO 14000 etc.

Recommended References:

1. EIA Guidelines of MoEF Available on CPCB/MoEF Website

2. Environment (protection) Act- 1986. Any authorized & recent publication on Government Acts. Also available on CPCB/MoEF Website
3. Environmental Impact Assessment-Training resource manual, UNEP 2001
4. Wastewater Reuse and Recycling Technology-Pollution Technology Review-72, Culp, Gordan, George Wasner, Robert Williams and Mark , V.Hughes Jr., Noyes Data Corporation, New Jersey.
5. Industrial Pollution Control –Issues and Techniques. Nancy, J. Sell, Van Nostrand Reinhold Co, NY.
6. Industrial Pollution Prevention Handbook. Shen, T.T., Springer-Verlag, Berlin.
7. Environmental Engineering. Pandey, G.N. and Corney, G.C., Tata McGraw Hill, New Delhi

ECE – 014 Principles of Town Planning and Architecture

Unit - 1

Principles of town planning, Land use patterns, Population survey, Density concepts, and transportation planning,

Unit - 2

Concept of habitat including environmental pollution, problems of metropolis, Satellite town concepts, Garden city movement, Neighbourhood planning, Brief history of architecture,

Unit - 3

Impact of development of materials through ages, Evolution of architectural forms, Anesthetics and functional proportions,

Unit - 4

Principles of architecture Design, Building Bye-Laws, Scale, Forms, Texture, Colour, Balance, Composition of Space, Role of architects and town planners,

Unit - 5

Architectural Drawing, Different symbols used in building industry, Design of typical buildings such as school, hospital, residential and commercial complex, etc.

ECE – 021 ADVANCED CONCRETE DESIGN

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT – 1

Design of over-head tanks: Design of RC domes and beams curved in plan, design of Cylindrical and rectangular tanks with different end conditions using IS: 3370 tables, Intze tank design based on membrane analysis with mention of continuity effects.

UNIT – 2

Design of staging: Braces, Columns and Raft Foundation.

UNIT – 3

Building Frames: Dead, Live, Wind and Earthquake loads, Analysis of framed building by approximate methods for vertical and horizontal loads, concept of Exact Analysis, joint detailing.

UNIT - 4

Design of Bridges: Loads, Forces and Permissible Stresses, Code Recommendations regarding design and detailing, Design of slabs under concentrated loads using, Effective width and Pigeaud's method, Courbon's method of load distribution, Detailed design of Highway Bridges: RC slab, and R.C. T-beam types.

UNIT – 5

High performance concrete, Production and no-conventional concrete. Design of composite Sections: Composite beam and slabs in simple conditions.

Reference:

1. Reinforced Concrete Design by M L Gambhir
2. Reinforced Concrete Design by B C Punamia
- 3 Essentials of Bridge Engineering by D.J. Victor

ECE 022 Earth and Earth Retaining Structure

L T P
3 1 0

Unit -1

Earth and Rock Fill Dam, Choice of types, material, foundation, requirement of safety of earth dams, seepage analysis

Unit -2

Mechanically Stabilized Earth retaining walls: General considerations, backfill and reinforced materials, construction details, design method, stability.

Unit -3

Soil nailing: applications, advantages, limitations, methods of soil nailing, case histories, analysis and design.

Unit – 4

Reinforced Soil: Introduction, basic components, strength characteristics, soil-reinforcement interface friction,
Reinforced Earth wall: Stability analysis, construction procedure, drainage, design Procedure

Unit -5

Foundation on Reinforced Soil Bed: Pressure ratio, analysis of strip, isolated, square and rectangular footing on reinforced soil bed, Ultimate bearing capacity of footing on reinforced earth slab. Fiber reinforced soil.

Books:

1. V N S Murthy – Soil Mechanics and Foundation Engg
2. Swami Saran – Reinforced Soil and its Engineering Application
3. J. E. Bowles – Analysis and Design of Foundation

TCE – 023 Transportation System Planning

L – 3 T – 1 P - 0

UNIT-1

Introduction: Overview of transportation system, nature of traffic problems in cities, Present Scenario of road transport and transport assets. Role of transportation: Social, Political, Environmental, Goals and objectives of transportation planning,

UNIT-2

Type of transportation system: Intermediate Public Transport (IPT), Public Transport, Rapid and mass transport system. Traffic Flow and traffic stream variables.

UNIT-3

Travel demand: Estimation and fore casting, trip classification, trip generation: factors and methods, multiple regression analysis. Trip distribution methods, modal split, trip assignment.

UNIT-4

Evaluation of transport planning proposals: Land Use Transport Planning, Economic Evaluation methods, net-present-Value methods, Benefit Cost method, Internal rate of return method.

UNIT-5

Transportation Facilities: Pedestrian facilities, Bicycle facilities, parking and

terminal facilities. Transport system management. Long term and short term planning, use of IT in transportation.

Reference:

1. Introduction to Transportation Engineering: William W. Hay.
2. Introduction to Transportation Engineering planning – E.K. Mortak.
3. Metropolitan transportation planning – J.W. Dickey.
4. Traffic Engineering, L.R. Kadiyali

ECE-024 : Rural Water Supply and Sanitation

Unit-I

Concept of environment and scope of sanitation in rural areas. Magnitude of problems of rural water supply and sanitation. Population to be covered, difficulties. National policy.

Unit-II

Water supply: Design population and demand loads. Various approaches of planning of water supply schemes in rural areas. Development of proffered sources of water springs. Wells, infiltration wells, radial wells and infiltration galleries, collection of raw water from surface source. Specific practices and problems encountered in rural water supply.

Unit-III

Improved methods and compact systems of treatment of surface and ground waters for rural water supply. Brief Details of multi-bottom settlers (MBS), diatomaceous earth filter, cloth filter, slow sand filter, chlorine diffusion cartridges. Pumps, pipe materials, appurtenances and improved devices for use in rural water supply. Planning of distribution system in rural areas.

Unit-IV

Community and sanitary latrines. Various methods of collection and disposal of night soil. Planning of waste water collection system in rural areas. Treatment and Disposal of waste water. Compact and simple waste water treatment units and systems in rural areas such as stabilization ponds, septic tanks, Imhoff tank, soak pit etc. Disposal of waste water soakage pits and trenches.

Unit-V

Disposal of Solid Wastes. Composting, land filling, incineration, Biogas plants, Rural health. Other specific issues and problems encountered in rural sanitation

Recommended books:

1. 'Water Treatment and Sanitation – Simple Method for Rural Area' by Mann H.T. and Williamson D.
2. 'Water Supply for Rural Areas & Small Communities' by Wanger E.G. and Lanoix J.N., WHO
3. 'Water Supply and Sewerage', by E.W.Steel & T.J.McGhee, McGraw Hill.
4. 'Manual on Water Supply and Treatment', CPHEEO, Mini. Of Urban Development, Govt. of India.
5. 'Manual on Sewerage and Sewage Treatment', CPHEEO, Mini. Of Urban Development, Govt. of India
6. 'Environmental Engineering' by D. Srinivasan, PHI Learning Pvt. Ltd. 2009

ECE 031 Bridge Engineering

Unit – 1

Site selection, various types of bridges and their suitability, loads, forces and IRC bridge loading and permissible stresses, Design of RC bridges under concentrated loads using effective width and Pigeauds Method,

Unit – 2

Courbon's method of load distribution. Detail design of slab culvert

Unit – 3

T-beam bridge, box culverts,

Unit – 4

Design and detailing of plate girder and steel Truss type bridges,

Unit – 5

Design of piers and pier caps. Abutments, and bearings

Text Books :

1. Essentials of Bridge Engineering by D J Victor
2. Limit State Design of Steel Structures by S K Duggal
3. Design of steel Structures by Ramchandra

ECE 032 Finite Element Methods**Unit - 1**

Calculus of variation, Introduction to calculus of variations, Introduction to equilibrium equations in elasticity, Euler's Lagrange's equations, Principal of virtual work, virtual displacements, Principles of minimum potential energy, boundary value, initial value problems, Flexibility approach, Displacement approach, Different problems in structural analysis. (08 Hrs)

Unit - 2

FEM Procedure, Derivation of FEM equations by variation principle polynomials, Concept of shape functions, Derivation for linear simplex element, Need for integral forms, Interpolation polynomials in global and local coordinates. Weighted residual Methods: Concept of weighted residual method, Derivation of FEM equations by Galerkin's method, Solving cantilever beam problem by Galerkin's approach, Derivation of shape functions for CST triangular elements, Shape functions for rectangular elements, Shape functions for quadrilateral elements. (10 Hrs)

Unit - 3

Higher order Elements: Concept of iso-parametric elements, Concept of sub-parametric and super-parametric elements, Concept of Jacobin matrix. (04 Hrs)

Numerical Integration: Numerical Integration, one point formula and two point formula for 2D formula, Different problems of numerical integration evaluation of element stiffness matrix, Automatic mesh generation schemes, (05Hrs)

Unit - 4

Pascal's triangle law for 2D shape functions polynomial, Pascal's triangle law for 3D shape function polynomials, Shape function for beam elements, Hermitian shape functions.

Convergence: Convergence criteria, Compatibility requirements, Geometric isotropy invariance, Shape functions for iso-parametric elements, Special characteristics of stiffness matrix, Direct method for deriving shape functions using Lagrange's formula, Plane stress problems. (08 Hrs)

Unit - 5

Analysis of structures: Truss elements, Analysis of truss problems by direct stiffness method.

Analysis of frames and different problems, Different axi-symmetric truss problems. (08 Hrs)

Text Book:

1. The Finite Element method -ZIENKIEWICZ.O.C.Tata McGraw Hill Pub. New Delhi, 2000
2. Finite Element Methods by C R Alaval, PHI
3. Finite Elements in Engineering:- Chandrupatta, et. Al. Prentice Hall of India Pvt. Ltd.,

Reference Books:

1. Concepts and Applications of Finite Element Analysis: COOK. D. Robert. Malus.S.David, Plesha E. Michel, John wiley & sons 3rd Edn. New York, 2000
2. Finite Element Analysis -C.S. Krishnanmoorthy, Tata McGraw Hill Publishing Co. Ltd, New Delhi,
3. Introduction to the Finite Element method -Desai / ABEL-C.B.S. Publishers & Distributors, New

ECE 033 Environmental Geotechnology

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Unit -1

Introduction, Development of Environmental Geotechnology, Aims, Environmental Cycle and their interaction with geotechnology, Natural environment, cycles of nature, environmental geotechnical problems.

Unit -2

Identification and characteristics of contaminated soil, classification, Characteristics of dust, dust in environment, ion-exchange reaction and ion exchange capacity, ion exchange reaction in contaminated soil-water system, Site Investigation for detection of sub-surface contamination

Unit -3

Load-environment factor design criteria, soil-structure vs structure soil interaction, load and environmental loads, Bearing capacity based on load footing interaction, lateral earth pressure, pile foundations, environmental factors affecting pile capacity, under-water foundation problems.

Unit – 4

Ash Pond and Mine Tailing Impoundments, Geotechnical re-use of waste materials and fills, Grouting and injection process, Grout used for controlling hazardous wastes, Sinkhole: interaction with environment , remedial action

Unit -5

Sanitary landfills: Selection of waste disposal sites, Landfills for Municipal and Hazardous wastes, Design of liners: clay and synthetic clay liners, Bearing capacity of foundation on sanitary landfills

Recommended Books:

1. Fang, H. – Introduction to Environmental Geotechnology.
2. Sharma, H. D. and Sangeeta, P.L. - waste containment systems, waste stabilization and landfills: design and evaluation.
3. Koerner, R. M. - Designing with geosynthetics

ECE – 034 Industrial Pollution Control and Environmental Audit

Unit-1

Industrial wastes & their sources: various industrial processes, sources and types of wastes- solid, liquid, gaseous, noise & radiation emissions. Sources for industrial water usages and various industrial processes requiring water use and water quality.

Unit-2

Processes responsible for deterioration in water quality, Various waste water streams, Control and removal of specific pollutants in industrial wastewaters, e.g., oil and grease, bio-degradable organics, chemicals such as cyanide, fluoride, toxic organics, heavy metals, radioactivity etc. Wastewater re-uses & recycling, concept of zero discharge effluent.

Unit-3

Control of gaseous emissions: hood and ducts, tall stacks, particulate and gaseous pollutant control; Solid waste generation and disposal management; Hazardous wastes: definitions, concepts and management aspects; Noise & radiation: generation, control and management.

Unit-4

Recent trends in industrial waste management, cradle to grave concept, life cycle analysis, clean technologies; Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp and paper, iron and steel, metal plating, thermal power plants, etc.

Unit-5

Environmental audit: definitions and concepts, environmental audit versus accounts audit, compliance audit, relevant methodologies, various pollution regulations, Introduction to ISO and ISO 14000.

Recommended References:

1. *Industrial Wastewater Management Handbook*, Azad, Hardom Singh, Editor-in-Chief, McGraw Hill, New York.
2. *Wastewater Reuse and Recycling Technology-Pollution Technology Review-72*, Culp, Gordan, George Wasner, Robert Williams and Mark, V.Hughes Jr., Noyes Data Corporation, New Jersey.
3. *The Treatment of Industrial wastes*. Edmund, B. Besseliave P.E., McGraw Hill, New York.
4. *Industrial Pollution Control –Issues and Techniques*. Nancy, J. Sell, Van Nostrand Reinhold Co, NY.
5. *Wastewater Engineering: Treatment & Re-use*. Metcalf & Eddy, Tata Mc Graw-Hill.
6. *Industrial Pollution Prevention Handbook*. Shen, T.T., Springer-Verlag, Berlin.
7. *Environmental Engineering*. Pandey, G.N. and Corney, G.C., Tata McGraw Hill, New Delhi
8. *Environment (protection) Act- 1986*. Any authorized & recent publication on Government Acts.

ECE-035 : Engineering Hydrology

Unit-1

Introduction: hydrologic cycle, water budget equations, world water balance, application in engineering. Precipitation: Forms of precipitation, measurement, depth-area-duration & intensity- duration- frequency relationships, probable maximum precipitation.

Unit-2

Abstraction from Precipitation: Evaporation – process, measurement and estimation; Evapo-transpiration-measurement and estimation; Initial Losses- Interception & Depression storage; Infiltration- process, capacities, indices, measurement & estimation

Unit-3

Runoff and Hydrographs : Hydrograph, runoff characteristics of stream, Yield, Rainfall-runoff correlations, flow duration curve, mass curve, droughts and floods. Factors affecting flood hydrographs, unit hydrograph and its analysis, s-curve hydrograph, synthetic and instantaneous unit hydrographs.

Unit-4

Flood: Rational method, empirical formulae, unit hydrograph method, flood frequency studies, statistical analysis, regional flood frequency analysis, design storm & design flood, risk/reliability and safety factor; Flood Routing: Basic equation, hydrologic storage routing & attenuation, hydrologic channel routing, flood forecasting & control, hydraulic method of flood routing.

Unit-5

Groundwater: introduction, forms of subsurface water, aquifers & its properties, Compressibility of aquifers, flow equations for confined and unconfined aquifers, well hydraulics- steady and unsteady flow to a well in confined aquifer, well losses, specific capacity, ground water irrigation, rain water harvesting.

Recommended Books:

- *'Hydrology for Engineers'* by Linsley R. K., Kohler M. A. and Paulhus J. L. H.
- *'Engineering Hydrology'* by K. Subramanya
- *'Hydrology: Principles. Analysis. Design'* by Raghunath H. M.
- *'Handbook of Applied Hydrology'* by Chow V. T.
- *'Irrigation: Theory & Practice'* by Michael A. M.

ECE- 041 Precast and Modular Construction Practices

Unit – 1

Overview of reinforced and prestressed concrete construction Design and detailing of precast/prefabricated building components,

Unit – 2

Structural design and detailing of joints in prefabricated structures, Production of ready mixed concrete, quality assurance,

Unit – 3

Use of equipments in precast prefabricated structure, Productivity analysis, Economics of form work, Design of Formwork and their reusability,

Unit – 4

Modular construction Practices, Fibonacci series, its handling and other reliable proportioning concepts.

Unit – 5

Modular coordination, Standardisation, system building, Lamination and Advantages of modular construction.

Books :

1. Handbook of low cost housing by A K Lal
2. Precast Concrete Structures by Kim Elliot

ECE – 042 Plastic Analysis of Structures

Unit - 1

Introduction, Historical review, plastic failure, plastic moment, capacity of a cross-section, shape factor, concept of load factor.

Unit – 2

Plastic hinge and collapse Mechanisms. Analysis of beams and frames.

Unit – 3

Semi Graphical method and Mechanism method.

Unit – 4

Plastic moment distribution for multi-storey and multi-bay frames.

Unit – 5

Analysis for deflections at collapse. Effect of axial force and shear.

Books :

1. Plastic Analysis of Structures by P G Hodge, McGraw Hill
2. Plastic Analysis and Design of steel structures by M Bill Wong
3. Inelastic Analysis of Structures by M Jirasek & Z P Bazant , John Wiley

ECE- 043 : Open Channel Flow

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3 1 0

Unit – I

Introduction: Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels, Review of Uniform flow: Standard equations, hydraulically efficient channel sections, compound sections,

Energy-depth relations: Concept of specific energy, specific force, critical flow, critical depth, hydraulic exponents, and channel transitions.

Unit – II

Gradually Varied Flow (GVF): Equation of gradually varied flow and its limitations, flow classification and surface profiles, Control sections,

Computation methods and analysis: Integration of varied flow equation by analytical, graphical and advanced numerical methods, Transitions of subcritical and supercritical flow, flow in curved channels.

Unit – III

Rapidly Varied Flow (RVF): Characteristics of rapidly varied flow, Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, Hydraulic jump in gradually and suddenly expanding channels, submerged hydraulic jump, rolling and sky jump, use of jump as an energy dissipater,

Flow measurement: by sharp crested and broad crested weirs, critical depth flumes, sluice gate, Free overfall.

Rapidly varied unsteady flow: Equation of motion for unsteady flow, “Celerity” of the gravity wave, deep and shallow water waves, open channel positive and negative surge,

Unit-IV

Spatially Varied Flow (SVF): Basic principles, Differential SVF equations for increasing and decreasing discharge, Classifications and solutions, Numerical methods for profile computation, Flow over side-weir and Bottom-rack.

Unit – V

Flow in channel of non-linear alignment and non-prismatic channel sections, Design considerations for sub critical and super critical flows, Design of culvert.

References:

1. Chow, V.T., Open channel Hydraulics, McGraw Hill International
2. Henderson, F.M., Open Channel Flow, McGraw Hill International
3. Subramanya, K., Flow in Open Channels, Tata McGraw Hill
4. Ranga Raju, K.G., Flow through open channels, T.M.H.
5. M. Hanif Chaudhry, Open Channel Flow, PHI
6. French, R.H., Open channel Hydraulics, McGraw Hill International

ECE 044 - Tunnel Engineering

Unit – 1

Site investigations , Geotechnical Considerations of tunneling

Unit – 2

Design of Tunnels

Unit – 3

Construction & Excavation methods , soft ground tunnels , Rock tunnels

Unit-4

Micro tunneling techniques , Tunnel support design

Unit – 5

Ventilation of tunnels , tunnel utilities , safety aspects

Books :

1. Tunnel Engineering Handbook by J O Bickel & T R Kuesel
2. Rock Mechanics Design in Mining & Tunneling by Z T Bieniawski

ECE – 051 COMPUTER AIDED DESIGN

L – 3, T – 1 CT – 30, TA – 20, ESE – 100

UNIT – 1

Elements of Computer Aided Design and its advantages over conventional design.
Hardware required for CAD works.

UNIT – 2

Principles of software design, concept of modular programming, debugging and

testing.

UNIT – 3

Computer applications in analysis and design of Civil Engineering systems.

UNIT - 4

Use of software packages in the area of Structural, Geotechnical, and Environmental fields.

UNIT – 5

Expert system, their development and applications, Introduction to Neural Networks.

Reference:

1. Computer Aided Design – S. Rajiv, Narosa Publication
2. A.I. and Expert System – Robert L. Lering & / Lane E. Drang, McGraw Hill
3. “Neural Computing: Waserman, vonnostrand.

ECE – 052 ANALYSIS AND DESIGN OF HYDRAULIC STRUCTURES

L – 3, T – 1

UNIT – I

Types of Head works: Component parts of a diversion headwork, Failure of hydraulic structures founded on permeable foundations, Principles of design, Bligh’s theory, Khosla’s theory for determination of pressure and exit gradient.

Regulation Works: Falls, Classification, Introduction to design principle of falls, Design of Sarda type and straight glacis fall.

Principle and design of Distributory head regulator and cross regulator, canal escape, Bed bars.

UNIT – II

Canal head works: Functions, Location, Layout of head works. Weir and Barrage, Canal head Regulator, Introduction to the design principles of Weirs on permeable foundations, Design of vertical drop and sloping glacis weir.

Cross drainage works: Necessity and types. Aqueduct, Siphon Aqueduct, super passage, canal siphon, level crossing, Introduction to design principles of cross drainage works.

UNIT – III

Flood routing: Types, methods of reservoir routing, channel routing by Muskingham Method. Investigation and planning of dams and Reservoirs: Zones of storage, Estimation of storage capacity, Reservoir losses, Reservoir sedimentation and its control, life of a reservoir. Dams: classification and selection criteria.

Earth Dams: Classification, causes of failure Phreatic line, and its determination Introduction to stability analysis.

UNIT – IV:

Gravity dams: Forces method of analysis, modes of failure and factor of safety, Elementary profile, stability analysis, galleries, joints, control of cracks.

UNIT – V

Spillways: Spillway capacity, types of spillways, Design of ogee spillway, Energy dissipation below spillway, Design criteria for Hydraulic Jump type stilling basins with horizontal and sloping aprons, spillway gates.

Hydro-Electric Power: assessment of potential specially in reference to India, classification of power plants, important terms, types of turbines and their suitability.

Power House layout and important structures of a powerhouse.

Text Books

1. Water Resources Engg. By Larry W Mays, John Wiley India
2. Water resources Engg. By Wurbs and James, John wiley India
3. Water Resources Engg. By R.K. Linsley, McGraw Hill

4. Irrigation and Water Resources Engg. By G L Asawa, New age International Publishers

References

5. Irrigation Engg. And Hydraulic Structures by S. K. Garg, Khanna Publishers

6. Irrigation and Water Power Engineering by B. C. Punimia & Pande B.B. Lal

ECE 053 WATER RESOURCES SYSTEMS

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Unit –I

Concept of System & System Analysis: Definition and types of a system, System Approach and analysis, Basic Problems in System Analysis.

Unit-II

System Techniques in Water Resources: Optimization using calculus, Linear programming, Dynamic programming and Simulation, Combination of Simulation and Optimization.

Unit-III

Economic Considerations in Water Resources Systems: Basics of Engineering Economics, Economic Analysis, Conditions of project optimality, Benefit-cost Analysis

Unit- IV

Multi-objective Planning: Non-inferior solutions, Plan Formulation & Plan Selection.

Unit V

Applications of Linear Programming: Irrigation water allocation for single and multiple crops, Multi-reservoir system for irrigation Planning, Reservoir operation for Irrigation and Hydro-power Optimization

Application of Dynamic Programming: Optimal crop water allocation, Steady State, Reservoir Operation policy for Irrigation.

Books Recommended:

1. Ossenbruggen, P. J. – System Analysis for Civil Engineering, John Wiley, New York
2. Taha, H. –Operational Research-An Introduction, Vth Edn, Prentice Hall.
3. Loucks, D. P., Stedenger, and Haith, D. A. – Water Resources Systems Planning & Analysis, Prentice Hall.
4. Jain, S. K. and Singh, V. P. – Water Resources Systems Planning & Management, Elsevier, Amsterdam

ECE 054 Machine Foundation Design

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Unit -1

Vibration of elementary Systems: Vibration motion, vector representation of harmonic motion, Single degree of freedom system: Free Vibrations- damped and undamped, Forced Vibrations – damped and undamped.

Unit -2

Dynamics of soil-foundation System: types of machine foundation, design criteria, dynamic loads, physical modeling and response analysis, Barken’s approach, Ford & Haddow’s analysis, Hammer foundation, I. S. Codes.

Unit -3

Dynamic soil testing techniques: cyclic plate load test, block vibration test, shear modulus test, geophysical methods, Resonance-column test, Two & three borehole techniques, Model tests using centrifuge and shake table, recent developments

Unit – 4

Vibration isolation and control: vibration transmitted through soil media, active and passive isolation, vibration isolation – rigid foundation and flexible foundation, method of isolation, properties of material and media used for isolation, vibration control of existing machine, foundation isolation by barriers.

Unit -5

Guidelines for design and construction of machine foundation: data required for design of reciprocating, impact and rotary type machines, guidelines for the design of different type machines, construction guidelines, guidelines for providing vibration absorbers.

Books:

1. S. Prakash – Machine Foundation .
2. B. B. Prasad – Fundamentals of Ground Vibration
3. Richard, Hall and Wood – Vibrations of Soil and Foundations

ECE 061 Ground Improvement Techniques

L T P
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Unit -1

Introduction, Review of compaction theory, effect of compaction on surface behaviour, Field methods of compaction, Quality Control, Design of soil-lime, soil-cement, soil-bitumen and soil-lime-flyash mixes.

Unit -2

In-situ densification methods in granular soils, Deep compaction: Introduction, Terra-Probe, Vibroflotation techniques, Ground Suitability for Vibroflotation, Advantages, Mueller Resonance Compaction, Dynamic Compaction, Depth of Improvement

Unit -3

In-situ densification methods in cohesive soil: Introduction, Pre-loading and de-watering, Vertical drains, Electrical method, Thermal method

Unit – 4

Grouting: introduction, suspension grout, solution grout, grouting equipments and methods, Grouting design and layout

Granular Piles: Ultimate bearing capacity and settlement, method of construction, load test

Unit -5

Underpinning of foundations: importance and situations for underpinning, methodology, typical examples.

Geotextiles: types, functions, specifications, precautions in transportation and storage.

Recommended Books:

1. S. K. Garg – Soil Mechanics & Foundation Engineering.
2. Purshotham Raju – Ground Improvement.
3. Gopal Ranjan and A. S. R. Rao – Basic and Applied Soil Mechanics
4. J. N. Mandal – Geosynthetics World
5. Bergado et. al. – Soft Ground Improvement
6. Koerner, R. M. - Designing with geosynthetics

ECE 062 RIVER ENGINEERING

L T P
3 1 0

Unit – I

Introduction, classification of Rivers, Mechanics of alluvial rivers including channel and flood plain features, Sediment transport and budgets, River morphology and various classification schemes.

Unit –II

Behaviour of Rivers: Introduction, River Channel patterns, Straight river channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Hydraulic geometry, Delta formation and control.

Unit-III

Mechanics of Alluvial Rivers, Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration.

Unit-IV

Bio-engineering Techniques, Classification review, Natural Channel Design Analysis, Time Series, Analysis of flow, Sediment and channel geometry data.

Unit-V

River Training and Protection Works: Introduction, Classification of River Training, Types of training works, Protection for Bridges with reduced waterway, Design of Guide Band, embankment and spurs/dampners and other river/ flood protection works.

Textbook:

1. River Behaviour Management and Training (Vol. I & II), CBI&P, New Delhi.
2. Irrigation & Water Power Engineering- B. C. Punmia and Pande B. B. Lal.

ECE-063: Groundwater Management

Unit-1

Introduction, hydrological cycle & definitions, Occurrence of ground water, hydro-geology & aquifers, Ground water movement, Darcy's law, flow-nets in isotropic medium.

Unit-2

Steady and unsteady flow through confined and unconfined aquifers, Dupuits theory, Observation wells, Well Hydraulics: Single & Multiple well system, partially penetrating wells, Image wells, Mutual interference of wells, well losses, specific capacity, Inverse problem i.e. pumping tests for aquifer parameters,

Unit-3

Water Wells: Design of water wells, Well construction, Well completion, Development of wells Pumping equipment for water wells, maintenance of wells, ground water irrigation.

Unit-4

Ground Water quality, Contamination of groundwater and its Control, Ground Water Modeling Techniques, Ground water exploration, Surface and Subsurface Investigations of Ground water, Artificial discharge and Recharge of Ground Water, Groundwater drainage,

Unit-5

Ground Water Management Techniques: Groundwater budgeting, groundwater modeling & stimulation, application of GIS and remote sensing in groundwater management. roof-top rainwater harvesting and recharge.

Recommended References:

- 'Groundwater Hydrology' by Todd D. K.
- 'Groundwater Resource Evaluation' by Walton W. C.
- 'Groundwater' by Raghunath H. M.
- 'Handbook of Applied Hydrology' by Chow V. T.
- 'Irrigation: Theory & Practice' by Michael A. M.

ECE – 064 EARTQUAKE RESISTANT DESIGN

L3 T1

Unit – 1

Internal structure of earth, Causes of earthquakes, Seismic waves, Magnitude, Intensity and Energy released, Characteristics of Earthquakes,

Unit - 2

Response of Structure to Earthquake motion, Modeling of structures, Dynamics of single degree of freedom system,

Unit -3

Dynamics of multi degree of freedom system, Idealization of structures, Dynamics of soils and seismic response, Conceptual design, I

Unit – 4

Introduction to earthquake resistant design, Equivalent lateral force method, Response spectrum method, Time history method, Design of Masonry buildings,

Unit – 5

Reinforced Concrete buildings, Steel Buildings, Material Properties, Code provisions.

Introduction to machine foundation. Degrees of freedom of a block foundation. I.S. code provisions for design and construction of machine foundations.

References:

1. Introduction to Structural Dynamics - J.M. Biggs
2. Elements of Earthquake Engineering - Jai Krishna an A.R. Chandrasekaran
3. IS: 1983 - 1984 Criterion for Earthquake Resistant Design.
4. Structural Dynamics - Theory & computation - Mario Paz.
5. Dynamics of Structures Theory and Applications to Earthquake Engineering - Anil K. Chopra.
6. Earthquake Resistant of Design of structures, Agarwal and Srikhande.
7. Earthquake Resistant of Design of structures, S.K.Duggal

