

UTTAR PRADESH TECHNICAL UNIVERSITY LUCKNOW



SYLLABUS

of

**B. Tech. Civil Engineering
(2nd Year)**

[Effective Form session 2014-15]

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

L T P

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

L T P
0 0 3

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

L T
4 0

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, anti termite 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, Function and efficiency 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

L T
2 1

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.**L T P
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
3 1 0

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