

SYLLABUS

OF

B. TECH

OF

II YEAR

B. TECH. (CBCS)

**DEPARTMENT OF CIVIL
ENGINEERING**

**INTEGRAL UNIVERSITY
LUCKNOW**

STUDY AND EVALUATION SCHEME

Branch: Civil Engineering

(w.e.f. 2021-22)

Year – II, Semester – III

S. No.	Course Category	Code No	Name of Subject	Periods				Evaluation Scheme			Exam ESE	Subject Total
				L	T	P	C	Continuous Assessment (CA)				
								UE	TA	Total		
1	BS	MT201	Engineering Mathematics-III	3	1	-	4	40	20	60	40	100
2	DC	CE201	Fluid Mechanics	3	1	-	4	40	20	60	40	100
3	DC	CE202	Basic Surveying	3	1	-	4	40	20	60	40	100
4	DC	CE203	Building Material and Construction	3	1	-	4	40	20	60	40	100
5	DC	CE204	Strength of Material	3	1	-	4	40	20	60	40	100
6	ESA	CS203/ ES202	Cyber Law & Information Security / Disaster Management	2	1	-	3	40	20	60	40	100
7	HM	BM226	Human Value & Professional Ethics	3	0	-	0	-	-	-	50	50
PRACTICAL / DRAWING / DESIGN												
8	DC	CE205	Fluid Mechanics Lab	0	0	2	1	40	20	60	40	100
9	DC	CE206	Basic Surveying Field Work	0	0	2	1	40	20	60	40	100
10	DC	CE207	Building Planning & Drawing	0	0	2	1	40	20	60	40	100
11	DC	CE208	Material Testing Lab	0	0	2	1	40	20	60	40	100
Total				20	6	8	27					1000

L – Lecture; **T** – Tutorial; **P** – Practical; **C** – Credits; **UE** – Unit Exams; **TA** – Teacher Assessment

Continuous Assessment (CA) = Unit Exams + Teacher Assessment

Subject Total = Continuous Assessment (CA) + End Semester Examination (ESE)

BS – Basic Sciences

DC – Departmental Core

HM – Humanities

OE – Open Elective

DE – Departmental Elective

ESA – Engineering Science & Art (Foundation Course & Engineering Courses)

STUDY AND EVALUATION SCHEME

Branch: Civil Engineering

(w.e.f. 2021-22)

Year – II, Semester – IV

S. No.	Course Category	Code No	Name of Subject	Periods				Evaluation Scheme			Exam ESE	Subject Total
				L	T	P	C	Continuous Assessment (CA)				
								UE	TA	Total		
1	ESA	MT205	Computer Based Numerical Techniques	3	1	-	4	40	20	60	40	100
2	DC	CE209	Hydraulic & Hydraulic Machines	3	1	-	4	40	20	60	40	100
3	DC	CE210	Advance Surveying	3	1	-	4	40	20	60	40	100
4	DC	CE211	Concrete Technology	3	1	-	4	40	20	60	40	100
5	DC	CE212	Structure Analysis-I	3	1	-	4	40	20	60	40	100
6	ESA	CS203/ ES202	Cyber Law & Information Security / Disaster Management	2	1	-	3	40	20	60	40	100
7	HM	BM226	Human Value & Professional Ethics	3	0	-	0	-	-	-	50	50
PRACTICAL / DRAWING / DESIGN												
8	DC	MT209	Numerical Techniques Lab	0	0	2	1	40	20	60	40	100
9	DC	CE213	Hydraulic & Hydraulic Machines Lab	0	0	2	1	40	20	60	40	100
10	DC	CE214	Advance Surveying Field Work	0	0	2	1	40	20	60	40	100
11	DC	CE215	Concrete Technology Lab	0	0	2	1	40	20	60	40	100
12	DC	CE252	Comprehensive Annual Assessment-I	-	-	-	1	-	-	100	-	100
Total				20	6	8	28					1100
** A non credit foundation course, Candidate has to pass the course by securing at least 50% marks up to second semester.												

L – Lecture; T – Tutorial; P – Practical; C – Credits; UE – Unit Exams; TA – Teacher Assessment

Continuous Assessment (CA) = Unit Exams + Teacher Assessment

Subject Total = Continuous Assessment (CA) + End Semester Examination (ESE)

BS – Basic Sciences

DC – Departmental Core

HM – Humanities

OE – Open Elective

DE – Departmental Elective

ESA – Engineering Science & Art (Foundation Course & Engineering Courses)

CE201/CEE201	FLUID MECHANICS				
Pre-requisite	Co-Requisite	L	T	P	C
NIL	NIL	3	1	0	4
Objectives	The main objective of this course is to understand the basics of the fluid mechanics such as fluid and flow properties, fluid behaviour at rest and in motion and fundamental equations like mass, energy and momentum conservation of the fluid flow.				
Unit-I	Introduction & Fluid Statics				08 Hrs
<p>Introduction: Fluid Statics Fluid and continuum, physical properties of fluids, ideal and real fluids, Newtonian and NonNewtonian fluids, measurement of surface tension.</p> <p>Fluid Statics: Pressure-density-height relationship, measurement of pressure, manometers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to uniform acceleration.</p>					
Unit-II	Kinematics & Dynamics of Fluid Flow				08 Hrs
<p>Kinematics of Fluid Flow: Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, one, two and three dimensional flows, streamlines, streak lines, and path lines, continuity equation, rotation and circulation, elementary explanation of stream function and velocity potential, graphical and experimental methods of drawing flow nets.</p> <p>Dynamics of Fluid Mechanics: Euler's equation of motion along a streamline, Bernoulli's equation from Euler's equation. Application of Bernoulli's equation- Pitot Tube, flow through orifice, mouthpieces, nozzles, notches, weirs, Venturimeter, Orifice meter, sluice gates under free and submerged flow conditions. Aeration of nape, cavitations, free and forced vortex, momentum equation and its application to stationary and moving vanes, pipe bends, and problems related to combined application of energy and momentum equations, flow measurements, determination of C_v, C_c and C_d, energy loss.</p>					
Unit-III	Dimensional Analysis & Laminar Flow				08 Hrs
<p>Dimensional Analysis and Hydraulic Similitude: Dimensional analysis, Buckingham's π theorem, important dimensional numbers and their significance, similitude, similarity laws, geometric, Kinematics and dynamic similarity, model studies.</p> <p>Laminar Flow: Equation of motion for laminar flow through pipes, Stoke's Law, flow between parallel plates, flow through porous media, Fluidization, measurement of viscosity.</p>					
Unit-IV	Turbulent Flow & Boundary Layer Analysis				08 Hrs
<p>Turbulent Flow: Transition from laminar to turbulent flow, equation for turbulent flow, eddy viscosity, mixing length concept and velocity distribution in turbulent flow, Hot-wire anemometer and LDA.</p> <p>Boundary Layer Analysis: Boundary layer thicknesses, boundary layer over a flat plate, laminar boundary layer, application of momentum integral equation, turbulent boundary layer, laminar sub-layer, smooth and rough boundaries, atmospheric boundary layer, local and average friction coefficient, separation of boundary layer and its control, measurement of shear.</p>					
Unit-V	Flow Past Submerged Bodies & Pipe Flow				08 Hrs
<p>Flow Past Submerged Bodies: Drag and lift, drag on sphere, Cylinder and disc, lift, Magnus effect and circulation.</p> <p>Pipe Flow: Nature of turbulent flow in pipes, equation for velocity distribution over smooth and rough surfaces, resistance coefficient and its variation, flow in sudden expansion, contraction, diffusers, bends, valves and siphons, concept of equivalent length, branched pipes, pipes in series and parallel, simple networks.</p> <p>Compressibility Effects in Pipe Flow: Transmission of pressure waves in rigid and elastic pipes; Water hammer, analysis of simple surge tank excluding friction.</p>					
<p>References:</p> <ol style="list-style-type: none"> Grade,R.J and A.G Mirajgaoker, 'Engineering Fluid Mechanics (including Hydraulic Machines), Second Edition, Nem Chand and Bros., Roorkee, 1983. R. K. Bansal, 'Fluid Mechanics and Hydraulic Machines', Laxmi Publication, New Delhi 2007 R.K. Rajput, 'Fluid Mechanics and Hydraulic Machines', S.Chand Publication, New Delhi 2002 Hunter Rouse," Elementary Mechanics of Fluid", John Wiley & Sons. Omc/.1946. Grade,R.J 'Fluid Mechanics through Problems.', Wiley Eastern Limited, New Delhi, 1989 <p>Web links to e-learning:</p> <ol style="list-style-type: none"> https://nptel.ac.in/courses/105103095/7 https://nptel.ac.in/downloads/103104043/ https://nptel.ac.in/courses/112105171/8 https://nptel.ac.in/courses/112105183/ 					

CE202/CEE202	BASIC SURVEYING				
Pre-requisite	Co-Requisite	L	T	P	C
NIL	NIL	3	1	0	4
Objectives	1. To learn the different techniques of measurements of distances, directions and elevations by means of advanced surveying instruments. 2. To learn about the process of establishment of horizontal control points necessary for carrying out survey of the area. 3. To learn about the procedures of preparations of topographical maps of the areas.				
Unit-I	Introduction to Basic Surveying				08 Hrs
Introduction: Importance of surveying to Engineers- Examples from different branches; plane and Geodetic Surveying, Control points, Classification of surveys, Methods of location a point, , principles of surveying, Conventional signs, Surveying instruments, their care and adjustment. Measurement of Distances: Measurement by chain and tape. Source of errors and precautions, Corrections to tape measurements, Field problems, Use and adjustment of auxiliary instruments, Modern trends EDM and Total Station.					
Unit-II	Measurement of Angles and Bearings				08 Hrs
Measurement of Angles and Directions: Reference meridians and Bearings, Magnetic declination and its variations. Use of prismatic and surveyor compass, local attraction, Vernier and microptic theodolites, Temporary and permanent adjustments, Requirements of nonadjustable parts, Measurement of horizontal and vertical angles by different methods.					
Unit-III	Traversing and Tachometry				08 Hrs
Traversing: Principles of traversing by compass and theodolite, Field work and checks, Computation of coordinates, Sources of errors, precision of traversing, checking and adjusting of traverses, Omitted measurements. Tachometry: Definitions, principles of stadia systems, Instrument constants Substance and Tangential system, Construction and use of Reduction Tachometers, Range Finders, Errors and precision.					
Unit-IV	Levelling				08 Hrs
Measurement of Elevations: Different methods of determining elevations: Spirit, Trigonometric and Barometric methods, Spirit leveling- Definitions of terms, principle, Temporary and permanent adjustment of dumpy level. Sensitivity of bubble tube, Automatic levels, Levelling staff, Methods of spirit leveling Booking and reduction of fields notes , Curvature and refraction, Reciprocal leveling, plotting of profiles, Barometric leveling. Trigonometric leveling, sources of errors and precision of leveling procedures.					
Unit-V	Contouring and Sheet				08 Hrs
Contouring: Definition and characteristics of contours, contour interval, Use of contour maps, storage capacity of reservoir, direct and Indirect methods of contouring. Sheet Numbering System: CIM and I and A.C series, Scales and Numbering of Indian Topographic maps					
References: <ol style="list-style-type: none"> 1. Agor, R, "Surveying", Vol. I & II, Khanna Publications, Delhi, 1995. 2. Arora, K, R., "Surveying ", Vol. I & II, Standard Book House, Delhi, 1993. 3. Bannister, A. and Baker, R., "Solving Problems in Surveying "Longman Scientific Technical, U.K., 1994. 4. Kennie, T.J.M. and Petrie, G., "Engineering Surveying Technology", Blackie & Sons Ltd., London, 1990. 5. Punmia, B.C., "Surveying" Vol. I & II Laxmi Publications, New Delhi- 1996. 6. Duggal S.K., Surveying Vol. I and II TMH. 					
Web links to e-learning: <ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/105107122/ 					

CE203/CEE203	BUILDING MATERIAL AND CONSTRUCTION				
Pre-requisite	Co-Requisite	L	T	P	C
NIL	NIL	3	1	0	4
Objectives	1. The objective of this course is to introduce students to the science and technology of construction materials. 2. To teach students how to select appropriate construction materials. 3. To teach technologies of basic construction materials, such as bricks, lime, timber, Plywood, Glass, plastics, P.V.C. Steel, Aluminum, Gypsum, pozzolana, Asphalt, Bitumen and Tar, Metals, insulating material. 4. To impart the state of art construction practices of buildings and other structures including Bye laws, site preparation etc.				
Unit-I	Introduction to Building Materials				08 Hrs
Building Materials: Classification, properties and selection criteria of Bricks, Stone, Lime, Timber, Mortar: Types, classification and strength, I.S. specifications.					
Unit-II	Advance Building Materials used in Construction				08 Hrs
Classification, properties and selection criteria Plywood, Glass, plastics, P.V.C. Steel, Aluminum, Gypsum, pozzolana, Asphalt, Bitumen and Tar, Metals, insulating material.					
Unit-III	Building Bye Laws				08 Hrs
Building Construction: Classification of buildings, Recommendations of NBC, Building byelaws, modular co-ordinations; orientation of buildings, desirable conditions of comforts, and components of building area considerations. Types of foundations and selection criteria, causes of unequal settlement.					
Unit-IV	Treatment in Construction				08 Hrs
Prefabricated construction. Plastering and pointing, Damp Proofing Materials and techniques, Antitermite treatment. Types of floors, construction details and selection criteria, Types of Roofs and roof covering, treatment of water proofing, Doors and Windows: Sizes and locations, materials.					
Unit-V	Building Services				08 Hrs
Stair and Staircases; types, materials, proportions. Lifts and escalators, White washing, colour washing, painting, distempering. Shuttering, Scaffolding and centering, Expansion and Construction joints. Sound and fire proof construction, I.S. specifications.					
References: <ol style="list-style-type: none"> Jha. J. & Sinha S.K. ,”Building Construction”, Khanna Publishers, Delhi,1977 Arora, S.P & Bindra S.P.,” A Text Book of Building Construction”, Dhanpat Rai & Sons., Delhi 1977. Kulkarni, C.J, “A Text Book of Engineering Construction”, Ahmedabad Book Depot, Ahmedabad, 1968. Kumar Sushil, “Engineering Material”, Standard Publishers Distributors, Delhi, 1944. McKay W.B. ,”Building Construction”, Vol. 1 to 4, Orient Longman Ltd., Hyderabad, Bombay, Madras, Delhi, Vol. 1 & 2-1955, Vol. 3-1996, Vol.4- 1998. Punmia, B.C., “A Text Book of Building Construction”, Laxmi Publications, Delhi, Madras, 1987. Singh Surendra,”Engineering Materials”, Konark Publishers Pvt. Ltd., 1994 					
Web links to e-learning: <ol style="list-style-type: none"> https://nptel.ac.in/courses/105102088/ 					

CE204/CEE204	STRENGTH OF MATERIAL				
Pre-requisite	Co-Requisite	L	T	P	C
NIL	NIL	3	1	0	4
Objectives	1. To develop basic understanding of three dimensional state of stress in materials and structures. 2. To develop understanding of basic principles and methods of analysis: (a) theory of bending and torsion (b) Macaulay's method, Area Moment method, Conjugate Beam method for beams (c) Euler's Formula and Rankine's law for columns.				
Unit-I	Stress - Strain				08 Hrs
Stress and Strain: Concept of stress and strain relationship, Ductility, Toughness, Elastic constants, Hardness, Brittleness, Tension, Compression, Shear, and Elongation, Concept of thermal stresses [5] Principal stresses: Stress transformation, Application of Mohr's circle in stress analysis [3]					
Unit-II	Bending & Torsion Theory				08 Hrs
Bending of Beams: Review of bending of beams, shear forces & bending moment diagrams for statically Determinant Beams, Shearing and bending stresses in beam section. [5] Torsion of Shafts: Torsion of circular shaft, power transmitted by shaft, combined bending and torsion in shafts. [3]					
Unit-III	Strain Energy and Theories of Failure				08 Hrs
Strain Energy and Impact Loading: Concept of strain energy or resilience, Strain energy in simple tension and compression, Stress due to different types of loading. [4] Theories of Failure: Maximum principal stress theory, Maximum shear stress theory, Maximum principal strain theory, Strain energy theory, Shear strain energy theory and their comparison.[4]					
Unit-IV	Slope & Deflection and Compression Members				08 Hrs
Deflection of Beams: Deflection of beams, Integration method, Macaulay's method, Area Moment method, Conjugate Beam method. [4] Columns and Struts: Theory of columns & struts, Elastic stability, End conditions, Effective length and Buckling load, Euler's and Rankine's formulae and their limitations.					
Unit-V	Thin and Thick Cylinder				08 Hrs
Thin Cylinders: Theory of thin cylinders subjected to pressure, expression for hoop stress and longitudinal stress, Design of thin cylinders, Thin walled pressure vessels and uniform torsion. [4] Thick Cylinders and Spherical Shells: Stresses and strain in thick shells/cylinder subjected to pressures, compound cylinders press fits on solid shaft.[4]					
References: <ol style="list-style-type: none"> 1. Kazmi, S. M. A., 'Solid Mechanics' TMH, Delhi, India. 2. R. K. Rajput, 'Strength of Materials', S. Chand & Company Ltd., New Delhi. 3. Bansal R.K. 'Strength of Materials'. 4. Surendra Singh, 'Strength of Materials', Vikas Publishing House Pvt. Ltd., New Delhi. 5. Norris, C.H. and Wilber, J. B. 'Elementary Structural Analysis' McGraw Hill. 6. Timoshenko, S. and Young, D. H., 'Elements of Strength of Materials', New York. 7. Punamia B.C.' Mechanics of materials' 8. R.S. Khurmi 'strength of materials' 					
Web links to e-learning: <ol style="list-style-type: none"> 1. https://nptel.ac.in/Aeronautical/Strength%20of%20Materials/course_strength%20of%20materials.pdf 2. https://nptel.ac.in/courses/105105108/ 3. https://nptel.ac.in/downloads/105105108/ 					

CE205/CEE205	FLUID MECHANICS LAB				
Pre-requisite	Co-Requisite	L	T	P	C
NIL	NIL	0	0	2	1
Objectives	The main objective of this lab course is to make the students in better understanding of fluid mechanics phenomena such as variation of velocity and pressure, measurement of flow rate by various devices such as orifice meter, weir etc.				
<p>(Minimum 08 experiments out of the following)</p> <ol style="list-style-type: none"> To determine experimentally the meta-centric height of a ship model. To verify the Bernoulli's equation experimentally. To verify the Impulse Momentum equation experimentally. To plot flow net using the Hele-shaw apparatus. To calibrate an orifice meter and study the variation of the coefficient of discharge with the Reynolds number. To calibrate an venturimeter and study the variation of the coefficient of discharge with the Reynolds number. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number. To study the velocity distribution in a circular pipe To calibrate a given V-notch and Rectangular notch and determine the coefficient of discharge. To study the variation of friction factor 'f', for turbulent flow in commercial pipes. To determine the loss coefficients for the pipe fittings. To study the behaviour of forced vortex motion. 					
<p>References:</p> <ol style="list-style-type: none"> Lab Manual Provided by the Department. Modi P.N. and Seth S.N., "Hydraulics and Fluid Mechanics", Standard Book House, Delhi, India. Shames, "Mechanics of Fluids", McGraw-Hill, Auckland, N. Land. Garde R.J., "Fluid Mechanics" RPH, Roorkee, India. Additional Learning Source. Streete V.L.R, "Fluid Mechanics", McGraw-Hill, N.Y., USA. 					

CE206/CEE206	BASIC SURVEY FIELD WORK				
Pre-requisite	Co-Requisite	L	T	P	C
NIL	NIL	0	0	2	1
Objectives	<ol style="list-style-type: none"> 1. To apply knowledge of mathematics, science, and engineering to understand the measurement techniques and equipment used in land surveying. 2. To use techniques, skills, and modern engineering tools necessary for engineering practice. 3. To use techniques, skills, and modern engineering tools necessary for engineering practice. 4. To function as a member of a team. 				
<ol style="list-style-type: none"> 1. Ranging and taking offset along a survey line. 2. To find out the reduced level of given points using Dumpy level by height of collimation method. 3. Study of Auto level and find out the reduced levels of given points by rise and fall method. 4. To perform fly leveling with a level. 5. To draw the longitudinal and cross sectional profiles along a given route. 6. Study and use of transit theodolite and total station. 7. Measurement of a horizontal angle by Repetition method using transit theodolite. 8. Measurement of a horizontal angle by reiteration method using transit theodolite 9. Determination of the Tacheometric constants of a given Theodolite. 10. To determine the bearing of a given traverse using prismatic compass and plotting of the traverse. 11. Determination of elevations of a given point. 					
References: <ol style="list-style-type: none"> 1. Lab Manual Provided by the Department. 2. Kanetkar, T. P., "Surveying and Levelling" Vol I and II, Pune Vidyarthi Griha Prakashan, Pune, India. 3. Punmia, B. C., "Surveying Vol I and II" Laxmi Publications, Delhi, India. 					

CE207/CEE207	BUILDING PLANNING AND ENGINEERING DRAWING				
Pre-requisite	Co-Requisite	L	T	P	C
NIL	NIL	0	0	2	1
Objectives	To make the students understand the basic concept of engineering drawings with the help of Drawing sheets and Auto Cadd System.				
<ol style="list-style-type: none"> 1. Symbols Used in Civil Engineering Drawing. 2. Brick Masonry Bonds. 3. Panelled Door (Plan, Section & Elevation). 4. Glazed Window (Plan, Section & Elevation). 5. Staircase (Plan, Section & Elevation). 6. Comprehensive Drawing of Building Plan, Section & Elevation). 7. Electrical Drawing of a Building. 8. Plumbing and Sanitary Drawing of a Building. 9. Preparation of Plan for a residential building using Drawing Sheet along with AUTO CADD system. 					
<p>References:</p> <ol style="list-style-type: none"> 1. Lab Manual Provided by the Department. 2. Bhavikatt S. S. "Building Planning and Drawing" I K International Publication Pvt. Ltd. 3. Rangwala, "CIVIL ENGINEERING DRAWING" K.K. Publication India. 4. Verma B.P, " Civil Engineering Drawing & House Planning" Khanna Publishers. 					

CE208/CEE208	MATERIAL TESTING LAB				
Pre-requisite	Co-Requisite	L	T	P	C
NIL	NIL	0	0	2	1
Objectives	The objective of this course is to understand the characteristics and behavior of brick and steel used in buildings and infrastructure.				
<p>BRICKS:</p> <ol style="list-style-type: none"> 1. Water absorption test 2. Dimension tolerance 3. Compressive strength 4. Efflorescence Test <p>STEEL:</p> <ol style="list-style-type: none"> 5. Hardness test 6. Impact Test 7. Torsion test 8. Tensile Strength test 9. Double Shear test 					
<p>References:</p> <ol style="list-style-type: none"> 1. Lab Manual Provided by the Department. 2. Neville, A.M., "Properties of Concrete", Longman, India. 3. Jha. J. & Sinha S.K. , "Building Construction", Khanna Publishers, Delhi. 4. Arora, S.P. & Bindra S.P., "A text book of building Construction", Dhanpat Rai & Sons., Delhi. 5. Singh Surendra, "Engineering Materials", Konark Publishers Pvt. Ltd. 					

CE209/CEE209	HYDRAULIC & HYDRAULIC MACHINES				
Pre-requisite	Co-Requisite	L	T	P	C
Recommended CE201/ CEE201	CE314/CEE314	3	1	0	4
Objectives	Students are expected to realize the importance of Hydraulics & Hydraulic Machines and its application in the field of Civil Engineering.				
Unit-I	Introduction & Uniform Flow				08 Hrs
<p>Introduction: Difference between open channel flow and pipe flow, geometrical parameters of a channel, continuity equation.</p> <p>Uniform Flow: Chezy's and Manning's Equations for uniform flow in open channel, velocity distribution, most efficient channel section.</p>					
Unit-II	Energy and Momentum Principles				08 Hrs
<p>Energy and Momentum Principles: Critical depth, concept of specific energy and specific force, application of specific energy principle for interpretation of open channel phenomenon, flow through vertical and horizontal contractions.</p>					
Unit-III	Non-uniform Flow in Open Channel				08 Hrs
<p>Non-uniform flow in open channel: 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 curved channel.</p>					
Unit-IV	Hydraulic Jump & Hydraulic Pumps				08 Hrs
<p>Hydraulic Jump, Surges, Water Waves: Classical hydraulic Jump, evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, equation of motion for unsteady flow, open channel surge, celerity of the gravity wave, deep and shallow water waves.</p> <p>Hydraulic Pumps: Rotodynamic pumps, basic equations, axial and mixed flow pumps, cavitation in pumps, characteristic curves.</p>					
Unit-V	Hydraulic Turbines				08 Hrs
<p>Hydraulic Turbines: Introduction, rotodynamic machines, Pelton turbine, equation for jet and roter size, efficiency, spear valve, reaction turbines, Francis and Kaplan type, head on reaction turbine, basic equation for type, head on reaction turbine, basic equation for rotodynamic machines, similarity law and specified speed, cavitations, characteristic curves.</p>					
<p>References:</p> <ol style="list-style-type: none"> 1. K. Subramanya: Flow in Open Channels, Tata McGraw Hills, 2014. 2. V.T. Chow: Open Channel Hydraulics, Blackburn Press, 2009. 3. K. Rang Araju: Open Channel Flow, McGraw Hill Education, 2001. 4. Madan Mohan Das: Open Channel Flow, PHI Learning Private Limited, 2008. 5. Grade, R.J and A.G Mirajgaoker, 'Engineering Fluid Mechanics (including Hydraulic Machines), Second Edition, Nem Chand and Bros., Roorkee, 1983. 6. R. K. Bansal, 'Fluid Mechanics and Hydraulic Machines', Laxmi Publication, New Delhi 2007. 7. R.K. Rajput, 'Fluid Mechanics and Hydraulic Machines', S.Chand Publication, New Delhi 2002. <p>Web links to e-learning:</p> <ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/105106114/ 2. https://nptel.ac.in/courses/105107059/6 3. https://nptel.ac.in/courses/105103021/ 4. https://nptel.ac.in/courses/105103096/2 					

CE210/CEE210	ADVANCE SURVEYING				
Pre-requisite	Co-Requisite	L	T	P	C
Recommended CE202/CEE202	NIL	3	1	0	4
Objectives	1. To learn about the principles involved in the advanced surveying instruments. 2. To learn about the process of establishment of horizontal control points necessary for carrying out survey of the area and also learn about theory of error. 3. To learn about the techniques of layout: (a) curves in transportation and irrigation engineering (b) building, culvert etc.				
Unit-I	Plane Table Surveys				08 Hrs
Plane Table Surveys: Principles, advantages and disadvantages, plane table equipment, Use of Telescopic Alidade and Indian Patterns Tangent Clinometer, different methods of plane table surveying, resection- two and three point problems, Field work in plane table surveying and contouring.					
Unit-II	Trilateration and Triangulation				08 Hrs
Trilateration and Triangulation: Principle of Trilateration, EDM instrument and their uses, reduction of observation, principle and classification of Triangulation system, Triangulation chains, strength of figures, station marks and signals, satellite station, intersected and resected points, Field work- Reconnaissance, intervisibility of station, angular measurement, base line measurement and its extension, adjustment of field observation and computation of coordinates.					
Unit-III	Theory of Errors				08 Hrs
Adjustment Computations: Weighting of observations, treatment of random errors, probability equation, normal law of errors, most probable value and measures of precision, propagation of errors and variances, most probable value, principle of least square, observations and correlative normal equations, adjustment of triangulation figures and level nets.					
Unit-IV	Curves				08 Hrs
Curves: Classification of curves, elements of circular, transition and vertical curves, theory and methods of setting out simple, transition and vertical curves, special field problem.					
Unit-V	Project Surveys				08 Hrs
Project Surveys: General requirements and specifications for engineering project surveys, Reconnaissance's, preliminary and locations surveys for highways, railways and canals. Correlation of surface and underground surveys in case of culverts, bridges and tunnels. Principles and practice of hydrographic surveys, Layout of culverts, canals, bridges and buildings. Field Astronomy: Astronomical terms, coordinate systems, spherical trigonometry, Astronomical Triangle, relationship between coordinates.					
References:					
1. Agor, R., "Surveying", vol. II & III Khanna Publications, Delhi, 1995. 2. Arora, K. R., "Surveying", vol. II & III Standard Publishing House, Delhi, 1993. 3. Bannister, A. and Baker, R., "Solving Problems in surveying". Longman Scientific Technical, U.K, 1994. 4. Kennie, T.J.M. and Petrie,G., "Engineering Surveying Technology", Blackie & Sons Ltd., London, 1990. 5. Punmia, B.C., "Surveying", vol. II & III , Laxmi Publications, New Delhi, 1996					
Web links to e-learning:					
1. https://nptel.ac.in/courses/105107158/					

CE211/CEE211	CONCRETE TECHNOLOGY				
Pre-requisite	Co-Requisite	L	T	P	C
NIL	NIL	3	1	0	4
Objectives	1. To understand concepts related to Concrete technology which involves types and property of concrete. 2. To know the procedure & significance of test on concrete and mix design				
Unit-I	Introduction of Cement Concrete				08 Hrs
Concrete as a Building Material and its Gradients Cement: Manufacture of Portland cement, its composition. Hydration of cement, physical and chemical properties, concept of strength development, Gel space ratio, power's Law, Gel structure [4] Testing of cement for general physical and chemical properties as per BIS specifications.					
Unit-II	Types of Cement				08 Hrs
Different types of cement such as Slag cement, Portland Pozzolana cement and high Alumina cement, their characteristics, composition, use and properties, aggregates and testing of aggregates, classification source, physical and mechanical properties. Testing of aggregates for physical and mechanical properties					
Unit-III	Tests on Fresh Concrete and Hardened Concrete				08 Hrs
Proportioning of concrete, operation involved in concrete production. Workability, factors affecting workability, measurement of workability, problem of segregation, bleeding and Laitance, NDT(Rebound hammer, PUNDIT) methods [8]					
Unit-IV	Mix Design				08 Hrs
Concrete Mix Design: Principle and methods, Statistical quality control, concrete rheology, maturity concept, IS code method, ACI code method [6] Admixture in concrete: Introduction, functions, classification, and IS specification.					
Unit-V	Special Concrete				08 Hrs
Special Concrete: Light weight concrete. High density concrete. Sulphar Impregnated concrete, polymer concrete, lime concrete, constituents and uses. High Strength Concrete, Fibre Reinforced Concrete					
References: <ol style="list-style-type: none"> Rai Mohan and Jai Singh M.P. "Advances in Building Materials and Construction", CBRI, Roorkee. Civil Engineering Materials, "Technical Teachers" Training Institute, Chandigarh, Tata McGraw Hill Publishing Company Ltd., New Delhi. Spence RJS and Cook DJ- "Building Materials in Developing Countries", John Willey and Sons. Shetty M.S, "Concrete Technology, Theory and practices", S. Chand & Company Ltd., New Delhi. Neville A.M., Properties of Concrete, Pitman Publishing Company. Gambhir M.L., "Concrete Technology", - Tata McGraw Hill Publishing Company Ltd., New Delhi. Gambhir M.L, "Concrete Manual ", Dhanpal Rai & Sons, Delhi. 8. SP: 23, BIS Publication. 					
Web links to e-learning: <ol style="list-style-type: none"> https://nptel.ac.in/courses/105102012/ https://nptel.ac.in/courses/105104030/ 					

CE212/CEE212	STRUCTURAL ANALYSIS - I				
Pre-requisite	Co-Requisite	L	T	P	C
Recommended CE204/CEE204	NIL	3	1	0	4
Objectives	1. To make aware student about the classification structure. 2. To develop understanding of basic principles and methods of analysis for rolling loads, arches, unsymmetrical bending for determinate structure etc. 3. To apply energy methods for analyzing simple beams and frames for given load and support condition.				
Unit-I	Classification of Structures				08 Hrs
Classification of Structures, Types of structural framework, stress resultants, degrees of freedom per node, Static and Kinematic determinacy for beam trusses and building frames, Type of supports. Classification of Pin jointed determinate trusses, Analysis of determinate plane and space trusses, method of Tension co-efficient.					
Unit-II	Rolling Loads				08 Hrs
Rolling loads, influence lines for determinate beams and trusses, Absolute maximum bending moment and shear force, Muller-Breslau's principal & its applications for determinate structures					
Unit-III	Arches				08 Hrs
Arches, Types of Arches, Analysis of Arches, Linear arch, Eddy's theorem, Analysis of three hinged arch, spandrel braced arch, moving load & influence lines diagram for three hinged arches.					
Unit-IV	Strain Energy				08 Hrs
Strain Energy of deformable systems, Maxwell's reciprocal & Betti's theorem, Castigliano's first theorem, unit load methods for determinate structures.					
Unit-V	Unsymmetrical Bending				08 Hrs
Unsymmetrical bending, location of neutral axis, computation of stresses and deflection, Shear Centre and its location for common structural section. Bending of curved bars in plane of bending, stresses in bars of small & large initial curvatures.					
References: <ol style="list-style-type: none"> 1. Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill. 2. Reddy, C.S., "Basic Structural Analysis", Tata McGraw Hill. 3. Jain, O.P. and Jain, B.K., "Theory & Analysis of Structures". Vol. I & II Nem Chand. 4. Coates, R.C., Coutie, M.G. & Kong, F.K., "Structural Analysis", English Language Book Society & Nelson, 1980. 5. Jain, A.K., "Advanced Structural Analysis", Nem Chand & Bors, Roorkee, India 1996. 6. Jain O.P & Arya A.S., "Theory of Structures" Vol. II. New Chand Bors., Roorkee 1976. 7. Kinney, J.S., "Indeterminate Structural Analysis " McGraw Hill Book Company, 1957. 8. Theory of structures Vol . II Vazirani and Ratwani Web links to e-learning: <ol style="list-style-type: none"> 1. https://nptel.ac.in/downloads/105101085/ 2. https://nptel.ac.in/downloads/105105109/ 3. https://nptel.ac.in/youtube.com/watch?v=qhEton-EEOW 4. https://nptel.ac.in/courses/105105166/ 					

CE213/CEE213	HYDRAULIC & HUDRAULIC MACHINES LAB				
Pre-requisite	Co-Requisite	L	T	P	C
NIL	CE209/CEE209	0	0	2	1
Objectives	1. Students are expected to hand on experience different hydraulic machine. 2. Also understand characteristics of flow and hydraulic machines.				
<ol style="list-style-type: none"> 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 sharp-crested rectangular and triangular weirs. 6. To calibrate a broad-crested weir and study the pressure distribution on the upstream face of the weir. 7. To calibrate a Venturiflume. 8. To study the characteristics of free hydraulic jump. 9. To study the flow over a free overfall in an open channel and to determine the end depth. 10. To study rotodynamic pumps and their characteristics. 11. To study rotodynamic turbines and their characteristics. 					
References: <ol style="list-style-type: none"> 1. Lab manual provided by the department 2. Streeter, V.L. "Fluid Mechanics", Mc Graw-Hill, N.Y, USA. 3. Garde, R.J. "Fluid Mechanics" RPH, Roorkee. 4. Jain, A.K. "Mechanics of fluids", Khanna Publisher., Delhi. Additional Learning Source. 5. Shames, "Mechanics of fluids" Mc Graw-Hill (Int. St. ed.) Auckland, NZ. 					

CE214/CEE214	ADVANCE SURVEY FIELD WORK				
Pre-requisite	Co-Requisite	L	T	P	C
NIL	CE210/CEE210	0	0	2	1
Objectives	<ol style="list-style-type: none"> 1. To apply knowledge of mathematics, science, and engineering to understand the measurement techniques and equipment used in land surveying. 2. to make student competent enough to, carry out triangulation, topographic mapping, layout of building plans & curves on ground 3. To use techniques, skills, and modern engineering tools necessary for engineering practice. 4. To function as a member of a team. 				
<ol style="list-style-type: none"> 1. Setting up the plane table and plotting the given area by radiation method. 2. Setting up the plane table and plotting the given area by intersection method. 3. Traversing of the given area by plane table. 4. To solve three point problem by mechanical method. 5. To solve three point problem by graphical method. 6. To solve two point problem. 7. To carry out Triangulation and Trilateration of a given area 8. Layout a simple circular curve on the ground using tape by perpendicular offset method. 9. Layout a simple circular curve on the ground using tape by radial offset method. 10. Layout a simple circular curve on the ground using two theodolite method. 11. Layout a building on the ground. 12. To plot the details as well as contours (topographic mapping) of area. 13. Demonstration and working of Electronic Total Survey Station. 					
<p>References:</p> <ol style="list-style-type: none"> 1. Lab Manual Provided by the Department. 2. Kanetkar, T. P., "Surveying and Levelling" Vol I and II, Pune Vidyarthi Griha Prakashan, Pune, India. 3. Punmia, B. C., "Surveying Vol I and II" Laxmi Publications, Delhi, India. 					

CE215/CEE215	CONCRETE TECHNOLOGY LAB				
Pre-requisite	Co-Requisite	L	T	P	C
NIL	NIL	0	0	2	1
Objectives	1. To understand the properties of ingredients of concrete. 2. To study the behavior of concrete at its fresh and hardened state.				
<p>CEMENT:</p> <ol style="list-style-type: none"> 1. Normal Consistency of cement. 2. Initial & final setting time of cement. 3. Compressive strength of cement. 4. Fineness of cement by air permeability method. 5. Tensile strength. <p>COARSE AGGREGATE:</p> <ol style="list-style-type: none"> 6. Water absorption of aggregate. 7. Sieve Analysis of Aggregate 8. Specific gravity & bulk density. 8. Grading of aggregates. <p>FINE AGGREGATE:</p> <ol style="list-style-type: none"> 9. Sieve analysis of sand. 10. Silt content of sand. 11. Bulking of sand. <p>TEST ON FRESH CONCRETE:</p> <ol style="list-style-type: none"> 12. Slump Test. 13. Compaction factor test. 14. Vee Bee Consistometer test. <p>TESTS ON HARDENED CONCRETE:</p> <ol style="list-style-type: none"> 15. Compressive Strength test. 16. Flexural Strength test. 17. Non-Destructive Test (Rebound Hammer and PUNDIT) 					
<p>References:</p> <ol style="list-style-type: none"> 1. Lab Manual Provided by the Department. 2. Neville, A.M. and Brooks J.J. "Concrete Technology", Longman, India. 3. Shetty, M.S., "Concrete Technology", SCC Ltd., New Delhi Additional Learning Source. 4. Gambhir, M.L., "Concrete Technology", TMH, New Delhi, India. 					