SYLLABUS

OF

B. TECH
Civil Engineering

OF

II YEAR

B. TECH. (CBCS)

DEPARTMENT OF CIVIL ENGINEERING

INTEGRAL UNIVERSITY LUCKNOW

STUDY AND EVALUATION SCHEME

Branch: B.Tech Civil Engineering Program

(w.e.f. Batch 2022-23)

Year – II, Semester – III

S. No.	Course Category	Code No	Name of Subject	Periods				Evaluation Scheme				Subject Total
				L	T	P	C	Continuous Assessment (CA)			Exam ESE	
								CT	TA	Total		
1	DC	CE201	Fluid Mechanics	3	1	-	4	40	20	60	40	100
2	DC	CE202	Basic Surveying	3	1	-	4	40	20	60	40	100
3	DC	CE204	Strength of Material	3	1	-	4	40	20	60	40	100
4	DC	CE231	Geotechnical Engineering	3	1	-	4	40	20	60	40	100
5	ESA	ES101	Environmental Studies	2	1	-	3	40	20	60	40	100
6	DE	As per Annexure	Departmental Elective II	3	1	-	4	40	20	60	40	100
PRACTICAL / DRAWING / DESIGN												
7	DC	CE205	Fluid Mechanics Lab	0	0	2	1	40	20	60	40	100
8	DC	CE206	Basic Surveying Field Work	0	0	2	1	40	20	60	40	100
9	DC	CE238	Geotechnical Engineering Lab	0	0	2	1	40	20	60	40	100
10	DC	CE208	Material Testing Lab	0	0	2	1	40	20	60	40	100
Total				**17**	**6**	**8**	**27**					**1000**
**** A non credit foundation course, Candidate has to pass the course be securing at least 50% marks up to second semester.**												

L – Lecture; **T –** Tutorial; **P –** Practical; **C** – Credits; **CT** – Class Tests; **TA** – Teacher Assessment
Continuous Assessment (CA) = Class Tests + Teacher Assessment

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

DC – Departmental Core **DE** – Departmental Elective
ESA – Engineering Science & Art (Foundation Course & Engineering Courses)

Departmental Elective - II

CE211 Concrete Technology

CE261 Concreting Techniques and Practices*

***Courses offered by L&T EduTech**

STUDY AND EVALUATION SCHEME

Branch: B.Tech Civil Engineering Program

(w.e.f. Batch 2022-23)

Year – II, Semester – IV

S. No.	Course Category	Code No	Name of Subject	Periods				Evaluation Scheme				Subject Total
				L	T	P	C	Continuous Assessment (CA)			Exam ESE	
								CT	TA	Total		
1	DC	CE209	Hydraulic & Hydraulic Machines	3	1	-	4	40	20	60	40	100
2	DC	CE210	Advance Surveying	3	1	-	4	40	20	60	40	100
3	DC	CE212	Structural Analysis-I	3	1	-	4	40	20	60	40	100
4	DC	CE234	Design of Reinforced Concrete Elements	3	1	-	4	40	20	60	40	100
5	OE	-	Open Elective I	3	1	-	4	40	20	60	40	100
6	ESA	ES202	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	CE213	Hydraulic & Hydraulic Machines Lab	0	0	2	1	40	20	60	40	100
9	DC	CE214	Advance Surveying Field Work	0	0	2	1	40	20	60	40	100
10	DC	CE215	Concrete Technology Lab	0	0	2	1	40	20	60	40	100
11	DC	CE252	Comprehensive Annual Assessment-I	-	-	-	1	-	-	100	-	100
Total				**20**	**6**	**6**	**27**					**1050**

**** A non credit foundation course, Candidate has to pass the course be securing at least 50% marks up to second semester.**

L – Lecture; **T –** Tutorial; **P –** Practical; **C** – Credits; **CT** – Class Tests; **TA** – Teacher Assessment
Continuous Assessment (CA) = Class Tests + Teacher Assessment

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

DC – Departmental Core
HM – Humanities
OE – Open Elective
ESA – Engineering Science & Art (Foundation Course & Engineering Courses)

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	CE201	**Title of the Course**	Fluid Mechanics	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	3	1	0	4
Pre-Requisite	NIL	**Co-requisite**	NIL				
Course Objectives	The main objective of this course is to understand the basics of the fluid mechanics such as fluid and flow properties, fluid behavior at rest and in motion and fundamental equations like mass, energy and momentum conservation of the fluid flow.						

Course Outcomes	
CO1	Students are able to understand basic concept of properties of fluid and its properties.
CO2	Students are able to understand the Kinematics and Dynamics of Fluid and its application.
CO3	To understand the concept of fluid measurement, types of flows and dimensional analysis.
CO4	To determine the losses in a flow system, flow through pipes, boundary layer flow and flow past immersed bodies.
CO5	Students are able to understand the concept of turbulent flow in in pipe and its nature.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Introduction &Fluid Statics	**Introduction:** Fluid Statics Fluid and continuum, physical properties of fluids, ideal and real fluids, Newtonian and NonNewtonian fluids, measurement of surface tension. **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.	08	CO1
2	Kinematics & Dynamics ofFluid Flow	**Kinematics of Fluid Flow**: Types of fluid flow, streamlines, streak lines, and path lines, continuity equation, rotation and circulation, elementary explanation of stream function and velocity potential. **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, Venturimeter, Orifice meter, free and forced vortex flow, momentum equation and its application to stationary and moving vanes, pipe bends, and combined application of energy and momentum equations, determination of Cv, Cc and Cd.	08	CO2
3	Dimensional Analysis & Laminar Flow	**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. **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.	08	CO3
4	Turbulent Flow & Boundary Layer Analysis	**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. **Boundary Layer Analysis:** Boundary layer thicknesses, boundary layer over a flat plate, laminar boundary layer, turbulent boundary layer, laminar sub-layer, smooth and rough boundaries, local and average friction coefficient, separation of boundary layer and its control, measurement of shear.	08	CO4
5	Flow Past Submerged Bodies & Pipe	**Flow Past Submerged Bodies:** Drag and lift, drag on sphere, Cylinder and disc, lift, Magnus effect and circulation. **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, bends, and siphons, concept of equivalent length, branched pipes, pipes in series and parallel. **Compressibility Effects in Pipe Flow**: Transmission of pressure waves in rigid and elastic pipes; Water hammer.	08	CO5

Reference Books:
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

e-Learning Source:
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/

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO / **CO**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	1	0	2	2	0	0	1	0	0	1	2	3
CO2	3	0	1	0	2	1	0	0	1	0	1	1	3	2
CO3	2	3	2	2	2	1	0	0	1	1	1	2	2	2
CO4	2	0	2	1	2	2	0	0	1	0	2	1	2	2
CO5	3	2	1	0	0	2	0	0	1	0	0	1	2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2019-20							
Course Code	CE202	**Title of the Course**	Basic Surveying	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	3	1	0	4
Pre-Requisite	NIL	**Co-requisite**	NIL				
Course Objectives	• To learn the different techniques of measurements of distances, directions and elevations by means of advanced surveying instruments. • To learn about the process of establishment of horizontal control points necessary for carrying out survey of the area. • To learn about the procedures of preparations of topographical maps of the areas.						

Course Outcomes	
CO1	The students have the ability to understand the measurement techniques and equipment used in land surveying.
CO2	The students have the ability to take angular measurement from compass and correct them from different errors.
CO3	The students have an ability to calculate the linear measurement and area of the land.
CO4	The students will Gain the ability to measure differences in elevation
CO5	The students will be able to represent the topography of the land graphically.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Introduction to Basic Surveying	**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	08	1
2	Measurement of Angles and Bearings	**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.	08	2
3	Traversing and Tachometry	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.	08	3
4	Levelling	**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.	08	4
5	Contouring and Sheet	**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	08	5

Reference Books:

Agor, R, "Surveying", Vol. I & II, Khanna Publications, Delhi, 1995.

Arora, K, R., "Surveying ", Vol. I & II, Standard Book House, Delhi, 1993.

Bannister, A. and Baker, R., "Solving Problems in Surveying "Longman Scientific Technical, U.K., 1994.

Kennie, T.J.M. and Petrie, G., "Engineering Surveying Technology", Blackie & Sons Ltd., London, 1990.

e-Learning Source:

https://nptel.ac.in/courses/105107122/

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO / **CO**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	2	1	1	1	0	0	0	2	1	0	1	0	0
CO2	2	1	1	0	1	1	0	0	1	0	1	1	0	0
CO3	1	1	1	0	1	0	0	0	1	0	0	0	0	0
CO4	2	2	1	1	1	0	1	0	2	1	0	1	0	0
CO5	2	1	1	1	0	0	0	0	1	1	0	1	0	0

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2019-20							
Course Code	CE204	**Title of the Course**	Strength of Materials	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	3	1	0	4
Pre-Requisite	------	**Co-requisite**	------				
Course Objectives	• To understand the stress-strain developed in structural members including their materials properties. • To form bending moment equations, shear force equations and bending stress diagram for a determinant beams. • To familiarize with strain energy and the theories of failure. • To introduce methods in order to calculate the deflections and rotations of a determinant beams and buckling load of long columns. • To impart knowledge in order to access the stress and strain developed in cylindrical and spherical vessels.						

Course Outcomes	
CO1	In-depth understanding of stress strain relationship and of various properties for different materials with ability to calculate stress- strain for different structural members subjected to given loading conditions.
CO2	Interpretation of bending moments, shear forces and bending stresses for determinant beams under different loading and support conditions. Be able to analyze the effects of torsion on shafts.
CO3	Insight of strain energy in a structural element subjected to various types of forces and understanding of different failure theories.
CO4	Ability to calculate the deflections and rotations of a beam under given loading and support conditions and be able to comprehend the buckling loads of a long column according to its support conditions.
CO5	Ability to analyze the stresses and strains associated with thin- thick wall cylindrical and spherical pressure vessels.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Stress - Strain	**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]	08	CO1
2	Bending & Torsion Theory	**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]	08	CO2
3	Strain Energy and Theories of Failure	**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]	08	CO3
4	Slope & Deflection and Compression Members	**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.	08	CO4
5	Thin and Thick Cylinder	**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]	08	CO5

Reference Books:
Kazmi, S. M. A., 'Solid Mechanics' TMH, Delhi, India.
R. K. Rajput, 'Strength of Materials', S. Chand & Company Ltd., New Delhi.
Norris, C.H. and Wilber, J. B. 'Elementary Structural Analysis' McGraw Hill.
Timoshenko, S. and Young, D. H., 'Elements of Strength of Materials', New York.
Surendra Singh, 'Strength of Materials', Vikas Publishing House Pvt. Ltd., New Delhi.
e-Learning Source:
https://nptel.ac.in/Aeronautical/Strength%20of%20Materials/course_strength%20of%20materials.pdf
https://nptel.ac.in/courses/105105108/
https://nptel.ac.in/downloads/105105108/

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO / **CO**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	0	3	0	0	0	0	0	0	0	0	3	2
CO2	3	3	0	3	0	0	0	0	0	0	0	0	3	2
CO3	3	3	0	3	0	0	0	0	0	0	0	0	3	2
CO4	3	3	0	3	0	0	0	0	0	0	0	0	3	2
CO5	3	3	0	3	0	0	0	0	0	0	0	0	3	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	CE231	**Title of the Course**	Geotechnical Engineering	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	3	1	0	4
Pre-Requisite	------	**Co-requisite**	------				
Course Objectives	• To impart origin, index properties and classification of soil engineering. • To Impart basics principles of flow, soil permeability through porous media and effective stress. • To impart about how stress are developed and distributed in soil due different load conditions. • To impart the knowledge of soil compaction, Consolidation and their application. • To impart the knowledge about shear strength of soil and their application.						

Course Outcomes	
CO1	Learner should be able to describe soil properties, relate index properties and able to classify soil.
CO2	Learner should be able to assess the permeability and formulate effective stress for different conditions.
CO3	Leaner should be able to compute stress in soil under different loading condition.
CO4	Leaner should be able to interpret compaction and consolidation characteristics of different soil and their application.
CO5	Leaner should be able to evaluate shear strength of soil.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Introduction to Soil and Index Properties	Engineering Geology of Soil and its formation, Preliminary definitions of Soil Properties, phase diagram, inter-relationship, Index properties of Soil. Classification of Soils: Classification of soil systems – Particle size classification, Textural classification, AASHTO classification, Unified soil classification and Indian soil classification.	08	CO1
2	Permeability in Soil	Soil Water: Types of soil water, Capillarity in soils, Permeability of soils, Darcy's law, Determination of permeability of soils, Permeability of stratified soils, Seepage velocity, flow net, Absolute coefficient of permeability, Factors affecting permeability, Effective stress principle- Effective stress under different field conditions- Seepage pressure-Quick sand condition.	08	CO2
3	Stresses in Soil	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.	08	CO3
4	Compaction and Consolidation	Soil structure. Compaction of soil – Theory of compaction, laboratory compaction tests, optimum moisture content and zero air void line, Field methods and compaction control. Compressibility and Consolidation: Virgin compression curve, Normal and Over Consolidated soils, Over Consolidation Ratio, Terzaghi's one dimensional consolidation theory, Laboratory consolidation test. Determination of coefficient of consolidation by log of time fitting and square root of time fitting methods, Consolidation settlement.	08	CO4
5	Shear Strength	Introduction of Shear Strength of Soil: State of stress at a point, Mohr's stress circle. Shear strength of soil. Mohr-Coulomb failures envelop. Direct, Triaxial, Unconfined and Vane shear tests, principles of drained and undrained tests, Strength of loose and dense sands, pore pressures.	08	CO5

Reference Books:

Gopal Ranjan and A.S.R.Rao, "Basic and Applied Soil Mechanics", New Age International (P) Ltd, 2nd Edition (2005), New Delhi

K R Arora, "Soil Mechanics and Foundation Engineering", Standard Publisher Dist., 2nd Edition 2009.

V.N.S.Murty, "Soil Mechanics and Foundation Engineering", Sai Kripa Technical Consultants, 1st edition 2009.

By B. C. Punmia, Ashok Kumar Jain, "Soil Mechanics and Foundations", Laxmi Publications Ltd., 16th edition (2017), New Delhi.

e-Learning Source:

https://nptel.ac.in/courses/105105168/

https://nptel.ac.in/courses/105101201/

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO / **CO**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	0	2	0	0	0	0	0	0	0	0	3	2
CO2	3	3	0	2	0	0	0	0	0	0	0	0	3	2
CO3	3	3	0	2	0	0	0	0	0	0	0	0	3	2
CO4	3	3	0	2	0	0	0	0	0	0	0	0	3	2
CO5	3	3	0	2	0	0	0	0	0	0	0	0	3	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	ES101	**Title of the Course**	Environmental Studies	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	3	1	0	4
Pre-Requisite	------	**Co-requisite**	------				
Course Objectives	The objectives of environmental studies are: (a) Creating awareness about environmental problems among people. (b) Imparting basic knowledge about the environment and its allied problems. The importance of environmental science and environmental studies cannot be disputed. The need for sustainable development is a key to the future of mankind. Continuing problems of pollution, loss of forget, solid waste disposal, degradation of the environment, issues like economic productivity and national security, Global warming, the depletion of the ozone layer and loss of biodiversity have made everyone aware of environmental issues.						

Course Outcomes	
CO1	Gain in-depth knowledge on natural processes and resources that sustain life and govern the economy.
CO2	Understand the consequences of human actions on the web of life, global economy, and quality of human life.
CO3	Acquire values and attitudes towards understanding complex environmental- economic-social challenges, and active participation in solving current environmental problems and preventing the future ones.
CO4	Aware students about problems of environmental pollution, its impact on humans and ecosystems and control measures.
CO5	Adopt sustainability as a practice in life, society, and industry.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Humans and the Environment**	The man-environment interaction: Humans as hunter-gatherers; Mastery of fire; Origin of agriculture; Emergence of city-states; Great ancient civilizations and the environment; Middle Ages and Renaissance; Industrial revolution and its impact on the environment; Population growth and natural resource exploitation; Global environmental change. The emergence of environmentalism: Anthropocentric and eco-centric perspectives (Major thinkers).	04	CO1
2	**Natural Resources and Sustainable Development**	Overview of natural resources: Definition of resource; Classification of natural resources- biotic and abiotic, renewable and non-renewable. Microbes as a resource; Status and challenges. Water resources: Types of water resources- fresh water and marine resources; Availability and use of water resources; Environmental impact of over-exploitation, issues and challenges; Water scarcity and stress; Conflicts over water. Soil and mineral resources: Important minerals; Mineral exploitation; Environmental problems due to extraction of minerals and use; Soil as a resource and its degradation. Energy resources: Sources of energy and their classification, Implications of energy use on the environment. Introduction to sustainable development: Sustainable Development Goals (SDGs)- targets and indicators, challenges and strategies for SDGs.	06	CO2
3	**Conservation of Biodiversity and Ecosystems**	Biodiversity as a natural resource; Levels and types of biodiversity; Biodiversity in India and the world; Biodiversity hotspots. Major ecosystem types in India and their basic characteristics; Ecosystem services classification and their significance. Threats to biodiversity and ecosystems, Major conservation policies: in-situ and ex-situ conservation approaches; National and International Instruments for biodiversity conservation; the role of traditional knowledge, community-based conservation; Gender and conservation.	06	CO3
4	**Environmental Pollution and Health**	Understanding pollution: Production processes and generation of wastes; Assimilative capacity of the environment; Definition of pollution; Point sources and non-point sources of pollution. Air pollution: Sources of air pollution; Primary and secondary pollutants; Indoor air pollution; Adverse health impacts of air pollutants; National Ambient Air Quality Standards. Water pollution: Sources of water pollution; River, lake, and marine pollution, groundwater pollution; Water quality parameters and standards; adverse health impacts of water pollution on human and aquatic life. Soil pollution and solid waste; Solid and hazardous waste; Impact on human health. Noise pollution: Definition; Unit of measurement of noise pollution; Sources of noise pollution; Noise standards; adverse impacts of noise on human health. Thermal and Radioactive pollution: Sources and impact on human health and ecosystems. Definition of pollution; Point sources and non-point sources of pollution.	07	CO3, CO4
5	**Climate Change: Impacts, Adaptation and Mitigation**	Observed impacts of climate change on ocean and land systems; Sea level rise, changes in marine and coastal ecosystems; Impacts on forests and natural ecosystems; Impacts on animal species, agriculture, health, urban infrastructure; the concept of vulnerability and its assessment; Adaptation vs. resilience; Climate-resilient development; Indigenous knowledge for adaptation to climate change. Mitigation of climate change: Synergies between adaptation and mitigation measures; Green House Gas (GHG) reduction vs. sink enhancement; Concept of carbon intensity, energy intensity, and carbon neutrality; National and international policy instruments for mitigation, decarbonizing pathways and	06	CO4

		net zero targets for the future; Energy efficiency measures; Renewable energy sources; Carbon capture and storage, National climate action plan and Intended Nationally Determined Contributions (INDCs); Climate justice.		
6	**Environmental Treaties and Legislation**	Major International Environmental Agreements: CBD; Cartagena Protocol on Biosafety; Nagoya Protocol on Access and Benefit-sharing; CITES; Ramsar Convention; UNCCD; Vienna Convention for the Protection of the Ozone Layer; Montreal Protocol and the Kigali Amendment; Basel Convention; Stockholm Convention; Minamata Convention; UNFCCC; Kyoto Protocol; Paris Agreement; India's status as a party to major conventions. Major Indian Environmental Legislations: The Wild Life (Protection) Act, 1972; The Water (Prevention and Control of Pollution) Act, 1974; The Forest (Conservation) Act, 1980; The Air (Prevention and Control of Pollution) Act, 1981; The Environment (Protection) Act, 1986; The Biological Diversity Act, 2002; The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006; Noise Pollution (Regulation and Control) Rules, 2000; Industry-specific environmental standards; Waste management rules; Ecologically Sensitive Areas; Coastal Regulation Zone; India; National Green Tribunal; Some landmark Supreme Court judgments. Major International organizations and initiatives: UNEP, IUCN, WCED, UNESCO, IPCC, and MAB) program.	07	CO4
7	**Case Studies and Field Work**	Discussion on one national and one international case study related to the environment and sustainable development. Field visits to identify local/regional environmental issues, make observations including data collection and prepare a brief report. Documentation of campus biodiversity. Campus environmental management activities such as solid waste disposal, water management, and sewage treatment.	04	CO5

Reference Books:

Agarwal, K.C. 2001 Environmental; Biology, Nidi Pub. Ltd. Bikaner.

Bharucha Erach, The Biodiversity of India, Mapin Pub. Pvt. Ltd., Ahemdabad-380, India.

Brunner R.C. 1989. Hazardous waste incineration, Mc Graw Hill.

Clark R.S. Marine Pollution, Clanderon Press Oxford (TB)

Cunningham W.P.2001.Cooper, T.H. Gorhani, E & Hepworth, Environmental encyclopedia, Jacob Publication House, Mumbai.

De. A.K. Environmental chemistry Willey Eastern Limited.

Glick, H.P.1993 water in crisis, Pacific Institute for studies in dev, Environment & security, Stockholm Env, Institute, Oxford Univ, Press 473 p.

Hawkins R E. Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay.

Heywood, V.H. & Watson, R. T.1995.Global biodiversity Assessment.Cambridge Univ. Press 1140 p.

Jadhave, H. and Bhosale, V. M. 1995 Environmental protection and laws, Himalaya pub, house, Delhi.284 p.

Mckinnery, M.L. and School, R. M.1996 Environmental science systems and solutions, web enhanced edition 639 p.

Mhaskar A.K. Matter Hazardous, Techno Science Pub (TM)

Miller T.G. Jr, Environmental Ecology, W. B. Saunders Co.USA,574 p. 16

Odum, E.P.1997.Fundamental chemistry, Goel Pub House Meerut.

Survey of the Environment, The Hindu (M).

Sharma B.K.2001.Environmental Chemistry, Goel Pub House Meerut.

e-Learning Source:

https://byjus.com/biology/difference-between-environment-and-eCOsystem.

https://www.youtube.com/watch?v=dRPl4TB8w7k

https://www.youtube.com/watch?v=3fbEVytyJCk

https://www.vedantu.com/biology/conservation-of-biodiversity

https://youmatter.world/en/definition/soil-erosion-degradation-definition/

https://byjus.com/biology/difference-between-environment-and-eCOsystem.

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	0	1	3	0	1	1	0	0	0	0	0	0	0	0	0
CO2	0	1	3	1	0	1	2	0	0	0	0	0	0	0	0
CO3	0	1	3	0	1	0	0	0	0	0	0	0	0	0	1
CO4	1	1	3	0	1	2	0	0	0	0	0	0	0	0	2
CO5	1	2	3	0	2	2	0	0	0	0	0	0	0	0	0

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2019-20							
Course Code	CE211	**Title of the Course**	Concrete Technology	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	3	1	0	4
Pre-Requisite	NIL	**Co-requisite**	NIL				
Course Objectives	• To understand concepts related to Concrete technology which involves types and property of concrete. • To known the procedure & significance of test on concrete and mix design.						

Course Outcomes	
CO1	To understand the manufacturing process of cement and its various properties.
CO2	To learn about various types of cement and test on coarse aggregates.
CO3	To learn about various problems arising while concreting and tests performed on fresh and hardened concrete.
CO4	To learn the procedure of the mix design of concrete as per Indian standard.
CO5	To understand about special concretes.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Introduction of Cement Concrete	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.	08	CO1
2	Types of Cement	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.	08	CO2
3	Tests on Fresh and Hardened Concrete	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.	08	CO3
4	Mix Design	Concrete Mix Design: Principle and methods, Statistical quality control, concrete rheology, maturity concept, IS code method, ACI code method. Admixture in concrete: Introduction, functions, classification, and IS specification.	08	CO4
5	Special Concrete	Special Concrete: Light weight concrete. High density concrete. Sulphar Impregnated concrete, polymer concrete, lime concrete, constituents and uses. High Strength Concrete, Fibre Reinforced Concrete	08	CO5

Reference Books:

Gambhir M.L., "Concrete Technology", - Tata McGraw Hill Publishing Company Ltd., New Delhi.

Shetty M.S, "Concrete Technology, Theory and practices", S. Chand & 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.

e-Learning Source:

https://nptel.ac.in/courses/105102012/

https://npetl.ac.in/courses/105104030/

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	0	1	1	3	2	2	0	0	0	0	0	1	0
CO2	3	1	1	0	2	1	0	0	0	0	0	0	2	0
CO3	2	2	0	2	1	1	1	0	0	0	0	0	1	1
CO4	3	2	3	1	1	1	1	0	0	0	0	0	1	3
CO5	3	1	0	0	2	2	2	0	0	0	0	0	1	0

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	CE261	**Title of the Course**	Concreting Techniques and Practices	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	3	1	0	4
Pre-Requisite	NIL	**Co-requisite**	NIL				
Course Objectives	• The learner will be able to evaluate materials used in concrete as relevant Indian standard codes and practical aspects on concreting activities at projects. • The learner will be able to do a complete mix design as per the project requirement.						

Course Outcomes	
CO1	Students will be able to Design of concrete mix as per requirement of construction project.
CO2	Students will be able to Select and proportionate different materials used in a concrete mix including admixtures.
CO3	Students will be able to evaluate the properties of concrete by conducting test on cement, aggregate and concrete (with & without admixtures) for using the data for Mix design procedures.
CO4	Students will be able to Adopt the best practices in concrete construction from industry's requirement, thumb rules, mitigation of concreting issues at Sites.
CO5	Students will be able to Identify Special Types of Concrete & Challenges faced at Site.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Introduction to constituent materials of Concrete	Introduction to Concrete, Overview of materials- Cement, Coarse aggregate and Fine aggregate. Cement: Types of Cement, Physical Test on Cement, Lab Test - Consistency Test, Initial and final Setting Time of Cement, Fineness test for Cement, Compressive Strength for Cement. Practical demos of testing. Mineral Admixture: Fly Ash, GGBS, Micro silica / Silica Fume, Metakaolin / Rice Husk Ash, Composite Cement and Ultrafine Materials, Lab Test - Fineness of Fly ash Fine Aggregate and Coarse Aggregate – Properties, Requirements, Lab Tests (Coning and Quartering, Sieve analysis, Silt and Clay, Specific gravity, Water absorption, Dry Loose Bulk Density, Organic Impurities, Moisture content, Flakiness Index, Elongation Index, Impact test, Crushing test, Abrasion test)	08	CO1
2	Water, Admixtures and Blending of Aggregates	Water and Chemical Admixture: Source, Requirements, Limits and Testing Blending of Aggregate -: Blending of Fine and Coarse Aggregate, gradation for optimization and practical aspects.	08	CO2
3	Mix Design	Water and Chemical Admixture – Source, Requirements, Limits and Testing Blending of Aggregate - Blending of Fine and Coarse Aggregate, gradation for optimization and practical aspects.	08	CO3
4	Testing, Production, Finishing, Handling & Curing of Concrete	Test on Concrete: Workability of concrete, Flexural and compressive Strength tests. Production of Concrete-: Batching Plant, Calibration, Mixing and Transportation of concrete Handling of concrete at construction: Placing, Levelling and Compaction. Cold Joints Finishing and Curing and Protection of Concrete	08	CO4
5	Special Types of Concrete & Challenges faced at Site	Special Types of concrete: Self-Compacting concrete, Mass Concrete, Dry Lean Concrete, Pavement Quality Concrete. Challenges faced at sites: Plastic Shrinkage Cracks, Plastic Settlement, Honey comb, Cold Joint, Bug holes, Cover to Concrete Do's and Don'ts in Concrete Construction. Site Shoot	08	CO5

Reference Books:

Concrete Technology: Theory and Practice By M. S. Shetty & A K Jain

Specialist Techniques and Materials for Concrete Construction By Ravindra K Dhir & Neil Henderson

e-Learning Source:

https://lntedutech.com/concreting-techniques-and-practices

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO / **CO**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	2	0	2	0	0	1	0	0	0	0	2	3
CO2	3	2	2	2	0	3	0	0	0	0	0	0	3	3
CO3	3	3	2	0	2	2	0	0	1	0	0	0	3	3
CO4	3	1	2	1	3	2	0	0	0	0	3	0	3	2
CO5	3	2	2	0	2	3	0	1	0	0	0	0	2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	CE205	**Title of the Course**	Fluid Mechanics Lab	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	0	0	2	1
Pre-Requisite	------	**Co-requisite**	------				
Course 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.						

Course Outcomes	
CO1	Students are able to learn the concept of Buoyancy and Metacenter Height in a ship model
CO2	Students are able to learn the concept of Bernoulli's Theorem and its application.
CO3	Students are able to learn to find the discharge using Venturimeter and Orifice meter.
CO4	Students are able to learn to find the discharge using Orifice meter.
CO5	Students are able to learn to find the Coefficient of Discharge in rectangular and triangular notch.
CO6	Students are able to verify the Impulse Momentum equation experimentally
CO7	Students are able to plot flow pattern net using the Hele-shaw apparatus.
CO8	Students are able to study the variation of friction factor 'f', for turbulent flow in commercial pipes.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Experiment-1	To determine experimentally the meta-centric height of a ship model.	02	1
2	Experiment-2	To verify the Bernoulli's equation experimentally.	02	2
3	Experiment-3	To verify the Impulse Momentum equation experimentally.	02	3
4	Experiment-4	To plot flow net using the Hele-shaw apparatus.	02	4
5	Experiment-5	To calibrate an orifice meter and study the variation of the coefficient of discharge with the Reynolds number.	02	5
6	Experiment-6	To calibrate an venturimeter and study the variation of the coefficient of discharge with the Reynolds number.	02	6
7	Experiment-7	To calibrate a given V-notch and Rectangular notch and determine the coefficient of discharge.	02	7
8	Experiment-8	To study the variation of friction factor 'f', for turbulent flow in commercial pipes.	02	8

Reference Books:

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.

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	0	0	3	0	0	0	0	0	0	0	0	1	3
CO2	2	0	0	2	0	0	0	0	0	0	0	0	1	3
CO3	2	0	0	2	0	0	0	0	0	0	0	0	2	2
CO4	2	0	0	3	0	0	0	0	0	0	0	0	1	3
CO5	2	0	0	3	0	0	0	0	0	0	0	0	2	2
CO6	2	0	0	1	0	0	0	0	0	0	0	0	1	2
CO7	2	0	0	2	0	0	0	0	0	0	0	0	1	2
CO8	3	0	0	3	0	0	0	0	0	0	0	0	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	CE206	**Title of the Course**	Basic Survey Field Work	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	0	0	2	1
Pre-Requisite	------	**Co-requisite**	------				
Course Objectives	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.						

Course Outcomes	
CO1	Learners should be able to perform ranging and taking offset along a survey line.
CO2	Learner should be able to perform measure horizontal angle by using a compass
CO3	Learners should be able to find out the reduced level of given points using Dumpy level by height of collimation method
CO4	Learners should be able to draw the longitudinal and cross sectional profiles along a given route.
CO5	Learners should be able to perform fly leveling with auto level
CO6	Learners should be able to measure vertical angles by reiteration method using theodolite
CO7	Learners should be able to measure the area of given land by using total station
CO8	Learners should be able to find the elevation of given land by using total station
CO9	Learners should be able to perform the layout of building
CO10	Learners should be able to measure horizontal angles by using theodolite

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Experiment-1	Ranging and taking offset along a survey line.	02	1
2	Experiment-2	To determine the bearing of a given traverse using prismatic/Surveyor compass and plotting of the traverse.	02	2
3	Experiment-3	To find out the reduced levels using Dumpy level and Auto level by different methods.	02	3
4	Experiment-4	To draw the longitudinal and cross sectional profiles along a given route by using Dumpy and Auto Level.	02	4
5	Experiment-5	To perform fly leveling with a Dumpy and Auto level.	02	5
6	Experiment-6	To find out the height of the building using Digital Theodolite.	02	6
7	Experiment-7	To find out the coordinates and calculate the area of a given land using Total Station.	02	7
8	Experiment-8	Determination of elevations of a given area Total Station.	02	8
9	Experiment-9	Layout of a building plan on a ground using Total Station.	02	9
10	Experiment-10	Measurement of a horizontal angle by reiteration method using transit theodolite.	02	10

Reference Books:

Lab Manual Provided by the Department

Kanetkar, T. P., “Surveying and Levelling” Vol I and II, Pune Vidyarthi Griha Prakashan, Pune, India.

Punmia, B. C., “Surveying Vol I and II” Laxmi Publications, Delhi, India.

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	0	0	0	1	0	0	0	3	1	0	1	1	2
CO2	2	1	0	0	1	0	0	0	3	1	0	2	1	2
CO3	2	2	0	0	2	0	0	0	3	2	0	2	1	2
CO4	2	3	0	0	2	0	0	0	3	2	0	2	1	2
CO5	2	2	0	0	2	0	0	0	3	2	0	2	1	2
CO6	2	2	0	0	3	0	0	0	3	2	0	2	1	2
CO7	2	2	0	0	3	0	0	0	2	2	0	2	1	2
CO8	2	1	0	0	3	0	0	0	3	2	0	2	1	3
CO9	2	1	0	0	3	0	0	0	3	2	0	2	1	3
CO10	2	1	0	0	2	0	0	0	3	2	0	2	1	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	CE238	**Title of the Course**	Geotechnical Engineering Lab	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	0	0	2	1
Pre-Requisite	------	**Co-requisite**	------				
Course Objectives							

Course Outcomes	
CO1	Students will find role of basic properties of soil in simple and complex applications.
CO2	Students will able to analyze soil behavior and its mechanism.
CO3	Students will able to obtain the compressibility, permeability parameters and CBR value of soil.
CO4	Students will able to determine compaction and shear strength parameters of soil.
CO5	Students will learn how to report the results of a laboratory experiment at a professional standard.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Experiment-1	Determination of water content of a given moist soil sample by (i) oven drying method, (ii) pycnometer method.	02	1
2	Experiment-2	Determination of specific gravity of a given soil sample by (i) density bottle, (ii) pycnometer method.	02	2
3	Experiment-3	Determination of in situ dry density of soil mass by (i) core-cutter method, (ii) sand replacement method.	02	3
4	Experiment-4	Determination of relative density and grain size distribution of a given soil sample by sieve analysis and sedimentation (hydrometer) analysis.	02	4
5	Experiment-5	Determination of consistency limits (liquid, plastic and shrinkage limits) of the soil sample used in experiment no. 5 (grain-size analysis).	02	5
6	Experiment-6	Determination of compaction characteristics (OMC & MDD) of a given soil sample.	02	6
7	Experiment-7	Determination of permeability of a remolded soil sample by constant head &/or falling head method.	02	7
8	Experiment-8	Determination of consolidation characteristics of a remolded soil sample by an oedometer test.	02	8
9	Experiment-9	Determination of shear strength characteristics of a given soil sample from Tri-axial Shear Test.	02	9
10	Experiment-10	Determination of shear strength characteristics of a given soil sample from Direct Shear Test.	02	10

Reference Books:

Lab Manual Provided by the Department

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

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	1	-	1	-	-	-	-	-	-	-	-	-
CO2	3	1	1	-	-	-	-	-		-	-	-	-	-
CO3	3	2	1	-	-	-	-	-	-	1	-	-	-	-
CO4	3	2	1	-	1	-	-	-	-	-	-	-	-	-
CO5	3	1	1	-	-	-	-	-		-	-	-	-	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	CE208	**Title of the Course**	Material Testing Lab	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	0	0	2	1
Pre-Requisite	------	**Co-requisite**	------				
Course Objectives	The objective of this course is to understand the characteristics and behavior of brick and steel used in buildings and infrastructure.						

Course Outcomes	
CO1	Learners should be able to understand various basic functions building materials.
CO2	Learners will be able to perform test on building materials.
CO3	Learners will be able to understand the properties of Steel

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Experiment-1	Water Absorption Test of Bricks	4	CO1, CO2
2	Experiment-2	Dimension Test of Bricks	4	CO1, CO2
3	Experiment-3	Compressive Strength Test of Bricks	4	CO1, CO2
4	Experiment-4	Efflorescence Test of Bricks	4	CO1, CO2
5	Experiment-5	Hardness Test of Steel Sample	4	CO3, CO2
6	Experiment-6	Impact Test of Steel Sample	4	CO3, CO2
7	Experiment-7	Torsion Test of Steel Sample	4	CO3, CO2
8	Experiment-8	Tensile Strength Test of Steel Sample	4	CO3, CO2

Reference Books:

Lab Manual Provided by the Department

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

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	0	0	0	3	3	0	0	0	0	0	0	3	3	3
CO2	0	0	0	2	3	0	0	0	0	0	0	3	2	3
CO3	0	0	0	3	2	0	0	0	0	0	0	2	3	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	CE209	**Title of the Course**	Hydraulic & Hydraulic Machines	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	3	1	0	4
Pre-Requisite	CE201	**Co-requisite**	CE314				
Course Objectives	• Students are expected to realize the importance of Hydraulics & Hydraulic Machines and its application in the field of Civil Engineering						

Course Outcomes	
CO1	Students will learn basic concept of open channel flow and its types.
CO2	Students will learn about different equation and their application related to non-uniform flow.
CO3	Students will learn about basic principle of Gradually Varied flow GVF and its applications.
CO4	Students will learn about the condition and criteria of flow through hydraulic jump.
CO5	Students will learn about the Hydraulic machines and there function, application.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Introduction & Uniform Flow	**Introduction:** Difference between open channel flow and pipe flow, geometrical parameters of a channel, continuity equation. **Uniform Flow:** Chezy's and Manning's Equations for uniform flow in open channel, velocity distribution, most efficient channel section.	08	1
2	Energy and Momentum Principles	**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	08	2
3	Non-uniform Flow in Open Channel	**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.	08	3
4	Hydraulic Jump & Hydraulic Pumps	**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. **Hydraulic Pumps:** Rotodymanic pumps, basic equations, axial and mixed flow pumps, cavitation in pumps, characteristic curves.	08	4
5	Hydraulic Turbines	**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.	08	5

Reference Books:

K. Subramanya: Flow in Open Channels, Tata McGraw Hills, 2014.

V.T. Chow: Open Channel Hydraulics, Blackburn Press, 2009.

K. Rang Araju: Open Channel Flow, McGraw Hill Education, 2001.

Madan Mohan Das: Open Channel Flow, PHI Learning Private Limited, 2008

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.

e-Learning Source:

https://nptel.ac.in/courses/105106114/

https://nptel.ac.in/courses/105107059/6

https://nptel.ac.in/courses/105103021/

https://nptel.ac.in/courses/105103096/2

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO / **CO**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	3	2	0	0	0	2	0	0	1	1	0	2	3
CO2	2	2	3	2	0	1	1	0	0	1	1	1	2	3
CO3	2	3	3	2	0	1	0	0	0	2	0	1	3	2
CO4	2	2	2	3	0	0	0	0	2	2	2	0	2	2
CO5	3	2	2	2	0	1	0	0	3	2	3	1	2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	CE210	**Title of the Course**	Advance Surveying	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	3	1	0	4
Pre-Requisite	CE202	**Co-requisite**	Nil				
Course Objectives	• To learn about the principles involved in the advanced surveying instruments. • 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. • To learn about the techniques of layout of curves in transportation • To learn about modern survey instruments like Total station, DGPS etc.						

Course Outcomes	
CO1	The students have the ability to prepare a small scale maps.
CO2	The students have the ability to make control points of long observation and to measure them accurately.
CO3	The students have an ability to calculate the errors and correct them by applying different numerical methods.
CO4	The students will be able to make different types of curves used on highways and railway project.
CO5	The students will be able to tell about the general requirements and specifications of various civil engineering projects.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Plane Table Survey	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 problem.	08	1
2	Triangulation and Trilateration	Introduction, classification of triangulation system, triangulation figures, station marks and signals, intervisibility and height of stations, satellite station, problems on reduction to center, base line measurement and its extension.	08	2
3	Theory of Errors	Types of errors, treatment of random errors, Basic terms, laws of weights with examples, Theory of least squares, Rules for giving weights and distribution of errors to the field observations, Determination of the most probable values of quantities by normal equation method & method of differences.	08	3
4	Curves	Classification of curves, Elements of simple circular curve, Designation of curve by radius and degree of curves. Method of Setting out simple circular curve by offset from long chord method and Rankine's method of deflection angles. Simple Numerical problems on above topics Transition curve, introduction and advantages superelevation, length of transition curve Vertical curve and its types, sight distance.	08	4
5	Project Surveys	General requirements for engineering project surveys, Setting out of building. Hydrographic surveying: Introduction to Hydrographic surveying, Sounding, methods of locating soundings. Special Survey Instruments: Introduction and uses of Electromagnetic Distance Measurement (EDM), Total station, Differential Global Positioning System (DGPS).	08	5

Reference Books:
Agor, R., "Surveying", vol. II & III Khanna Publications, Delhi, 1995.
Arora, K. R., "Surveying", vol. II & III Standard Publishing House, Delhi, 1993.
Bannister, A. and Baker, R., "Solving Problems in surveying". Longman Scientific Technical, U.K, 1994.
Kennie, T.J.M. and Petrie,G., "Engineering Surveying Technology", Blackie & Sons Ltd., London, 1990.
e-Learning Source:
https://nptel.ac.in/courses/105107158/

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO / **CO**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	1	1	2	1	1	0	0	3	1	2	2	2	3
CO2	2	2	1	2	1	1	0	0	3	2	1	1	3	2
CO3	2	2	1	1	0	0	0	0	1	1	1	1	2	2
CO4	3	2	1	1	1	1	0	0	3	2	1	2	2	2
CO5	2	1	0	0	1	1	0	0	1	1	2	1	2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2019-20							
Course Code	CE212	**Title of the Course**	Structural Analysis - I	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	3	1	0	4
Pre-Requisite	CE204	**Co-requisite**	Nil				
Course Objectives	● To impart knowledge about classification of structures, then they should be able classify structure as well as able to calculate degree of determinacy by knowing its form and end condition. ● To impart concept of truss, then they should be able classify truss as well as able to analyse simple and compound truss for given loads. ● To impart concept of rolling load, then they able to formulate and analyse beams/girder and arches as well as able to draw shear force, bending moment and influence lines diagram for determinate structure. ● To impart concept of arches, so that they should able to classify, analyse and compute bending moment and shear forces for three hinged arches. ● To impart principle of Strain energy, then they should able to know the significances and applications of different strain energy methods. After completing they should able to calculate deflection in determinate structures for given load conditions. ● To impart concept of unsymmetrical bending, then learner should able to analysis unsymmetrical beams by knowing the load pattern.						

Course Outcomes	
CO1	Learners should be able to classify structure in terms of stability and determinacy. Also, able to analyze determinate truss for given load & support conditions.
CO2	Learners should be able to analyze beams/girders subjected to moving load as well as draw the influence lines for reactions, shears, and bending moments by knowing loading conditions.
CO3	Learner should able to analyze and draw the influence lines for reactions, radial shears, normal thrust and bending moments for three hinged arches by knowing its shapes and loading conditions
CO4	Learner should know the principle and significance of strain energy methods as well as able to calculate deflections in statically determinate structures by applying strain energy methods for given loading conditions.
CO5	Learner should able to analysis unsymmetrical beams by knowing the load pattern.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Classification of Structures	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.	08	CO1
2	Rolling Loads	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	08	CO2
3	Arches	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.	08	CO3
4	Strain Energy	Strain Energy of deformable systems, Maxwell's reciprocal & Betti's theorem, Castigliano's first theorem, unit load methods for determinate structures.	08	CO4
5	Unsymmetrical Bending	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.	08	CO5

Reference Books:

Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.

Reddy, C.S., "Basic Structural Analysis", Tata McGraw Hill.

Jain, O.P. and Jain, B.K., "Theory & Analysis of Structures". Vol. I & II Nem Chand.

Jain, A.K., "Advanced Structural Analysis", Nem Chand & Bors, Roorkee, India 1996.

e-Learning Source:

https://nptel.ac.in/downloads/105101085/

https://nptel.ac.in/downloads/105105109/

https://nptel.ac.in/youtube.com/watch?v=qhEton-EEOw

https://nptel.ac.in/courses/105105166/

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO / **CO**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	0	1	0	0	0	0	0	1	0	1	2	2
CO2	3	3	0	1	0	0	0	0	0	1	0	1	2	2
CO3	3	3	0	1	0	0	0	0	0	1	0	1	2	2
CO4	3	3	0	1	0	0	0	0	0	1	0	1	2	2
CO5	3	3	0	1	0	0	0	0	0	1	0	1	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	CE234	**Title of the Course**	Design of Reinforced Concrete Elements	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	3	1	0	4
Pre-Requisite	CE204	**Co-requisite**	Nil				
Course Objectives	To understand the Basic concept and procedure of Designing Reinforced Concrete Structural Elements.						

Course Outcomes	
CO1	Student will be able to design singly and doubly reinforced beam of different spans by working stress method.
CO2	Student will be able to design singly and doubly reinforced beam of different spans by limit stress method.
CO3	Student will be able to design one way and two-way slab and stair.
CO4	Student will be able to design axially loaded short column with tide and helically reinforced.
CO5	Student will be able to design isolated and combined footing by limit state method

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Attributes of Structural Design	Properties of Materials: Cement, Concrete and Steel. Design philosophy of RCC Structures. Working stress & Limit state method of design. Assumption, Design of Rectangular Singly and Doubly reinforced section by Working stress design method. Concept of shear strength of beam. Codal provisions for shear.	08	CO1
2	Limit State Design of Beams	Assumption in Limit state design method, Nature of bond between Steel and Concrete, Concept of development length and Anchorages. Codal recommendations. Design of rectangular Singly and Doubly reinforced beam including design for shear by limit state method.	08	CO2
3	Limit state design of slab	Design of One way solid slabs, Simply supported and Continuous. Two way slabs: Simply supported and continuous. Types of RCC stairs, loads and load effects on stairs, Introduction to Short term, long term deflections & Cracks in RCC.	08	CO3
4	Limit State design of compression member	Classification of compression members, Codal Provisions relating to Design of RC columns, Effective length of RC Column, Minimum Eccentricity, Design of Axially loaded (tied and helically reinforced) short columns by Limit state method.	08	CO4
5	Limit State Design of Isolated and Combined footing	Classification of foundations. Pressure distribution beneath footings,Punching shear Codal provision, Design of isolated and combined footing by limit state method, Introduction to Raft foundation.	08	CO5

Reference Books:

A.K. Jain "Reinforced concrete design, limit state Method", Nem Chand & Bros.; 7th Edition 2012.

S.Unnikrishna. and Devdas Menon, "Reinforced concrete design", McGraw Hill Education; 3rd Edition 2009.

B.C. Punmia and A.K. Jain "Limit State Design of Reinforced Concrete", Laxmi Publications,1st Edition Reprint 2007.

Sayal I.C and Goel A.K., "Reinforced Concrete Structures" S Chand & Company; 4th Edition 2007.

IS 456-2000 Indian Standard "Plain & Reinforced Concrete-code of practice", BIS, New DelhI.

e-Learning Source:

http://nptel.ac.in/courses/105105105/

http://nptel.ac.in/downloads/105105104/

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	2	3	1	2	2	0	3	1	2	1	0	3	2
CO2	3	2	3	1	2	2	0	3	1	2	1	0	3	2
CO3	3	2	3	1	2	3	1	3	2	1	1	1	3	2
CO4	2	2	3	2	3	3	1	3	2	2	1	1	3	2
CO5	2	2	3	2	3	2	1	3	2	2	1	0	3	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	ES202	**Title of the Course**	Disaster Management	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	3	1	0	4
Pre-Requisite	-----	**Co-requisite**	-----				
Course Objectives	• To Study the types of Disasters and its profile in India. • Knowledge of causes and impacts of Disasters, and Case studies of National and Global Disasters. • To learn about risk reduction approaches of Disasters with safety issues in mitigating Industrial disasters • Basic concepts of Disaster Management Cycle and its Risk Reduction Measures. • To know the National Acts and policies for mitigating disasters. Role of Army, Police, Community, Corporate, Media etc. for post Disaster Management.						

Course Outcomes	
CO1	Students are able to learn types of disasters and its profile in India.
CO2	Students are able to understand the causes and impacts of disasters on environment.
CO3	Students are able to learn about risk reduction approaches of disasters with safety issues in mitigating industrial disasters.
CO4	To understand the concept of Disaster Management Cycle and its Risk Reduction.
CO5	Students are able to learn role of Disaster Management Act , NDRF for Disaster Management.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Introduction to Disaster	Introduction to Disasters, Concepts, Definition and types (Natural and Man-made), Disaster profile of India.	08	CO1
2	Impact of Disaster	Causes and Impacts of Disasters, Global and National Perspective, Case studies from Disasters, Large Hydro projects and its risks for Disasters.	08	CO2
3	Disaster Risk Reduction	Approaches to Disaster risk Reduction, Safety issues in mitigating Industrial disasters, Case studies, EHS etc.	08	CO3
4	Disaster Management	Disaster Management Cycle, Risk Reduction Measures (Preparedness, Mitigation, Response Reconstruction and Rehabilitation etc.)	08	CO4
5	Disaster Act. and Policies	National Acts and policies for mitigating Disasters (Disaster Management Act 2005, NDRF, National Policy for Disaster Management 2009, Role of Army and Police Force in Disaster, Role of International/National Humanitarian aid/ Relief Organizations for Disaster management, Role of Community, Corporate, Media etc. for post Disaster Management, Case Studies etc.	08	CO5

Reference Books:

Gupta Harsh K., Disaster Management, Hyderabad University Press, Publications-Meerut.

Sethi, V.K., Disaster Management, New Delhi Maxford Books.

Bhattacharya, Tushar, Disaster Science and Management, New Delhi Tata Mc Graw Hill.

Nidhi Gauba, Dhawan/ Ambrina Sardar Khan, Disaster Management and Preparedness, CBS

e-Learning Source:

https://www.youtube.com/watch?v=9WIwlljva_s

https://www.youtube.com/watch?v=uA_OLKfQpYA

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	1	1	1	1	2	3	0	2	2	1	2	1	2
CO2	2	2	2	1	2	2	3	0	2	2	2	2	1	2
CO3	3	2	2	1	2	2	3	0	2	2	1	2	1	2
CO4	2	2	3	1	2	2	3	0	2	1	1	2	1	2
CO5	1	1	2	2	1	1	3	0	2	2	1	2	1	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2016-17							
Course Code	BM226	**Title of the Course**	Human Values & Professional Ethics	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	3	0	0	0
Pre-Requisite	-----	**Co-requisite**	-----				
Course Objectives	• To understand the moral values that ought to guide the Management profession, Resolve the moral issues in the profession. • To justify the moral judgment concerning the profession. • To create an awareness on Management Ethics and Human Values. • To inspire Moral and Social Values and Loyalty. Intended to develop a set of beliefs, attitudes, and habits that engineers should display concerning morality. • To create awareness about the important global issues. Multinational corporations - Environmental ethics- computer ethics - weapons development.						

Course Outcomes	
CO1	Know about the concepts of database, their types, design concepts and ER-models.
CO2	Know about the concepts of relational databases, working with SQL for frontend development.
CO3	Know about the concepts of query optimization, transaction processing and concurrency control.
CO4	Know about the concepts of database technologies, distributed database environment.
CO5	Know about the concept of data warehouse, data cleaning and data integration.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Human Value Education	Understanding the need, basic guidelines, content and process for Value Education, Self Exploration - Its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly.	08	CO1
2	Introduction to Ethical Concept	Definition of industrial ethics and values, Ethical rules of industrial worker. Values and Value Judgments. Moral Rights and Moral rules, Moral character and responsibilities. Privacy, Confidentiality, Intellectual Property and the Law. Ethics as Law.	08	CO2
3	Professional Responsibility	The basis and scope of Professional Responsibility, Professions and Norms of Professional Conduct, Ethical Standards versus Profession, Culpable mistakes, the Autonomy of professions and codes of ethics. Employee status and Professionalism. Central Professional Responsibilities of Engineers: The emerging consensus on the Responsibility for safety among engineers, hazards and risks.	08	CO3
4	Engineers Ethics	Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles- theories about right action - Self-interest - customs and religion - uses of ethical theories. Valuing Time – Co- operation – Commitment	08	CO4
5	Global Issues	A Glimpse of Life Stories: Life story of Prophet Mohammad, Mahatma Gandhi, Swami Vivekananda, Marie Curie and Steve Jobs. Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership	08	CO5

Reference Books:

R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Value Education.

Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996

Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004

e-Learning Source:

Value Education website, http://www.uptu.ac.in . 2. Story of Stuff, http://www.storyofstuff.com

https://www.youtube.com/watch?v=nlh9V5gd8hg&list=PLbMVogVj5nJQ20ZixllzM69agBq-m8ndV

https://www.youtube.com/watch?v=9LSEBK03CiY&list=PLysZquKdjuWSv87TaE7pByn5TE_e46O2C

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO / **CO**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2
CO2	3	2	1	1	1	2	3	2	2	2	3	1	3	2	2
CO3	2	2	2	2	1	1	3	2	3	1	1	2	2	1	2
CO4	3	2	1	2	3	1	1	3	2	2	3	3	2	3	1
CO5	1	2	2	3	1	2	1	3	1	2	1	2	1	2	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	CE213	**Title of the Course**	Hydraulic & Hydraulic Machines Lab	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	0	0	2	1
Pre-Requisite	NIL	**Co-requisite**	CE209				
Course Objectives	• Students are expected to hand on experience with different hydraulic machine. • Also understand characteristics of flow and hydraulic machines						

Course Outcomes	
CO1	Students are able to learn to find the Manning's coefficient of roughness 'n' for the bed of a given flume.
CO2	Students are able to learn to study the velocity distribution in an open channel and to determine the energy and momentum correction factors.
CO3	Students are able to learn the rot dynamic pumps and their characteristics.
CO4	Students are able to calibrate a sharp-crested rectangular and triangular weirs.
CO5	Students are able to learn the characteristics of free hydraulic jump.
CO6	Students are able to learn the flow characteristics over a hump placed in an open channel.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Experiment -1	To determine the Manning's coefficient of roughness 'n' for the bed of a given flume.	02	1
2	Experiment-2	To study the velocity distribution in an open channel and to determine the energy and momentum correction factors.	02	1
3	Experiment-3	To study the flow characteristics over a hump placed in an open channel.	02	2, 6
4	Experiment-4	To study the flow through a horizontal contraction in a rectangular channel.	02	2
5	Experiment-5	To calibrate a sharp-crested rectangular and triangular weirs.	02	3
6	Experiment-6	To calibrate a broad-crested weir and study the pressure distribution on the upstream face of the weir.	02	3
7	Experiment-7	To calibrate a Venturiflume.	02	4
8	Experiment-8	To study the characteristics of free hydraulic jump.	02	4, 5
9	Experiment-9	To study the flow over a free overfall in an open channel and to determine the end depth.	02	6
10	Experiment-10	To study rotodynamic pumps and their characteristics.	02	3
11	Experiment-11	To study rotodynamic turbines and their characteristics	02	5

Reference Books:

Lab manual provided by the department

Streeter, V.L. "Fluid Mechanics", Mc Graw-Hill, N.Y, USA.

Garde, R.J. "Fluid Mechanics" RPH, Roorkee

Jain, A.K. "Mechanics of fluids", Khanna Publisher., Delhi. Additional Learning Source

Shames, "Mechanics of fluids" Mc Graw-Hill (Int. St. ed.) Auckland, NZ.

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO / **CO**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	0	0	2	0	0	0	0	0	0	0	0	2	3
CO2	3	0	0	2	0	0	0	0	0	0	0	0	2	3
CO3	2	0	0	3	0	0	0	0	0	0	0	0	2	3
CO4	2	0	0	2	0	0	0	0	0	0	0	0	2	3
CO5	3	0	0	3	0	0	0	0	0	0	0	0	2	3
CO6	2	0	0	2	0	0	0	0	2	0	0	0	2	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	CE214	**Title of the Course**	Advance Surveying Field Work	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	0	0	2	1
Pre-Requisite	NIL	**Co-requisite**	NIL				
Course Objectives	• To apply knowledge of mathematics, science, and engineering to understand the measurement techniques and equipment used in land surveying. • to make students competent enough to carry out triangulation, topographic mapping, layout of building plans & curves on ground. • To use techniques, skills, and modern engineering tools necessary for engineering practice. • To function as a member of a team.						

Course Outcomes	
CO1	Learners should be able to perform surveys by using a plane table
CO2	Learners are able to perform surveys by DGPS and are also able to analyse the data
CO3	Learners should be able to find the elevation and plot contour of an area by Digital theodolite
CO4	Learners should be able to plot circular curve on the ground by linear measurement
CO5	Learners should be able to plot circular curve on the ground by using the total station.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Experiment -1	Setting up the plane table and plotting the given area by Radiation method.	02	1
2	Experiment-2	Setting up the plane table and plotting the given area by Intersection method.	02	1
3	Experiment-3	Traversing of the given area by plane table	02	1
4	Experiment-4	To solve three point problem by mechanical method	02	1
5	Experiment-5	To find out the coordinates and calculate the area of a given land using DGPS.	02	2
6	Experiment-6	Determination of elevations of a given area by using Digital Level/Digital Theodolite and DGPS	02	3
7	Experiment-7	Layout a building plan on the ground using DGPS.	02	2
8	Experiment-8	Layout a simple circular curve on the ground using tape by perpendicular offset method	02	4
9	Experiment-9	Layout a simple circular curve on the ground using total station.	02	5
10	Experiment-10	To plot the details as well as contours (topographic mapping) of area using Digital Theodolite.	02	3

Reference Books:

Lab Manual Provided by the Department.

Kanetkar, T. P., "Surveying and Levelling" Vol I and II, Pune Vidyarthi Griha Prakashan, Pune, India.

Punmia, B. C., "Surveying Vol I and II" Laxmi Publications, Delhi, India.

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	2	0	0	0	0	0	0	0	3	2	0	1	1	2
CO2	2	1	0	0	3	0	0	0	3	2	0	1	1	2
CO3	2	0	0	0	3	0	0	0	3	2	0	1	1	2
CO4	2	0	0	0	1	0	0	0	3	0	0	1	1	2
CO5	2	2	0	0	3	0	0	0	3	0	0	1	1	2
CO6	2	0	0	0	0	0	0	0	3	2	0	1	1	2

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	CE215	**Title of the Course**	Concrete Technology Laboratory	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	0	0	2	1
Pre-Requisite	------	**Co-requisite**	------				
Course Objectives	• To understand the properties of ingredients of concrete. • To study the behavior of concrete in fresh and hardened state.						

Course Outcomes	
CO1	Able to evaluate the quality of cement for various concrete works.
CO2	Able to evaluate the quality of fine and coarse aggregates for various concrete works.
CO3	Ability to test the properties of fresh and hardened concrete.

Unit No.	**Title of the Experiments**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Cement	Normal Consistency of cement. Initial & final setting time of cement. Compressive strength of cement. Fineness of cement by air permeability method. Tensile strength.	06	CO1
2	Fine and Coarse Aggregate	Water absorption of aggregate. Sieve Analysis of Aggregate 8. Specific gravity & bulk density. Grading of aggregates. Sieve analysis of sand. Silt content of sand. Bulking of sand.	06	CO2
3	Fresh and Hardened Concrete	Slump Test. Compaction factor test. Vee Bee Consistometer test. Compressive Strength test. Flexural Strength test. Non-Destructive Test (Rebound Hammer and PUNDIT)	06	CO3

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	0	0	0	3	3	1	0	3	3	3	0	3	2	0
CO2	0	0	0	3	3	1	0	3	3	3	0	3	2	0
CO3	0	0	0	3	3	1	0	3	3	3	0	3	2	0

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	CE252	**Title of the Course**	Comprehensive Assessment-I	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	**-**	**-**	**-**	**1**
Pre-Requisite	Nil	**Co-requisite**	Nil				
Course Objectives	To test the learner's knowledge, skills and understanding of civil engineering at undergraduate level.						

Course Outcomes	
CO1	Learner should be able to demonstrate their knowledge in the field of civil engineering.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	-	Complete syllabus of 2nd year B.Tech Civil Engineering	-	CO1
Reference Books:				
-				
e-Learning Source:				
-				

	Course Articulation Matrix: (Mapping of COs with POs and PSOs)													
PO-PSO CO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	3	3	0	3	0	3	0	0	0	3	3	1

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation