

SYLLABUS

OF

B. TECH
Civil Engineering

OF

III 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 – III, Semester – V

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	CE301	Structural Analysis-II	3	1	0	4	40	20	60	40	100
2	DC	CE303	Transportation Engineering	3	1	0	4	40	20	60	40	100
3	DC	CE306	Water Resources Engineering	3	1	0	4	40	20	60	40	100
4	DE	As per Annexure	Departmental Elective III	3	1	0	4	40	20	60	40	100
5	DE	As per Annexure	Departmental Elective IV	3	1	0	4	40	20	60	40	100
6	DC	CG301	Career Development Course	2	0	0	0	-	-	-	50	50
PRACTICAL / DRAWING / DESIGN												
7	DC	CE307	Structural Analysis Lab	0	0	2	1	40	20	60	40	100
8	DC	CE308	Transportation Engineering Lab	0	0	2	1	40	20	60	40	100
9	DC	CE338	Building Planning and Drawing	0	0	2	1	40	20	60	40	100
Total				17	5	6	23					850
** 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; 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

Departmental Elective – III

CE331 Advance Design of Reinforced Concrete Structures

CE361 Design of Reinforced Concrete Building and Practices*

Departmental Elective – IV

CE335 Advance Geotechnical Engineering

CE362 Foundation Engineering Practices*

*Courses offered by L&T EduTech

STUDY AND EVALUATION SCHEME

Branch: B.Tech Civil Engineering Program

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

Year – III, Semester – VI

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	CE310	Environmental Engineering-I	3	1	0	4	40	20	60	40	100
2	DC	CE313	Traffic Engineering	3	1	0	4	40	20	60	40	100
3	DC	CE318	Estimating and Costing	3	1	0	4	40	20	60	40	100
4	DC	As per Annexure	Departmental Elective V	3	1	0	4	40	20	60	40	100
5	DE	As per Annexure	Departmental Elective VI	3	1	0	4	40	20	60	40	100
6	ESA	CS203	Cyber Law & Information Security	3	1	0	3	40	20	60	40	100
7	DC	CG302	Career Development Course	2	0	0	0	-	-	-	50	50
PRACTICAL / DRAWING / DESIGN												
8	DC	CE326	Engineering Geology Lab	0	0	2	1	40	20	60	40	100
9	DC	CE327	Environmental Engineering Lab-I	0	0	2	1	40	20	60	40	100
10	DC	CE329	Survey Camp	0	0	0	2	0	0	100	0	100
11	DC	CE352	Comprehensive Annual Assessment-II	0	0	0	1	0	0	100	0	100
Total				20	6	4	28					1050
** 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; 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 – V

CE314 Open Channel Flow

CE315 Matrix Methods of Structural Analysis

CE316 Sustainable Techniques

CE363 Heavy Lifting Techniques & Machinery*

CE364 Building Information Modelling in Architecture, Engineering and Construction*

Departmental Elective – VI

CE321 Design of Hydraulic Structures

CE322 Maintenance & Rehabilitation of Structures

CE323 Occupational Health and Safety Engineering

CE324 Principles of Town Planning and Architecture

CE365 Formwork Engineering Practices*

*Courses offered by L&T EduTech



Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	CE301	Title of the Course	Structural Analysis – II	L	T	P	C
Year	III	Semester	V	3	1	0	4
Pre-Requisite	CE212	Co-requisite	NIL				
Course Objectives	<ul style="list-style-type: none"> To analyze the indeterminate structures using different methods. To apply the Muller Breslau principle for drawing the ILD of Indeterminate structures. To analyze the suspension bridges. To apply the methods of analyzing of indeterminate structures by matrix method. To give a basic idea of Plastic Theory. 						

Course Outcomes	
CO1	To impart various methods of analyzing the indeterminate structures.
CO2	To enable the student how to draw the influence line diagrams of indeterminate structures and their applications.
CO3	To enable him to analyze the cables and suspension bridges.
CO4	This unit enables to understand the method of analyzing the indeterminate structures using matrix method.
CO5	To enable the student to have the basic knowledge of plastic theory.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Analysis of Linear and Two dimensional Structures	Analysis of fixed beam, continuous beam and simple frames with or without translation of joints. Slope deflection method, Moment distribution method, strain energy method.	08	CO1
2	Two Hinged Arches & Influence Line Diagram for Indeterminate Structures	Muller-Breslau's principle and its application for drawing influence line for Indeterminate beams. Analysis of two hinge arches, Influence line diagram for maximum bending moment, shear force and thrust.	08	CO2
3	Analysis of Suspension Cable & Bridge Girders	Suspension bridges, Analysis of cable with concentrated and continuous loadings, Analysis of two and three hinge stiffening girder, Influence line diagram for maximum bending moment and shear force in the stiffening girders.	08	CO3
4	Matrix Methods of Structure Analysis	Basics of force and displacement matrix, matrix method for the analysis of beams and frames.	08	CO4
5	Plastic Analysis of Structures	Basics of plastic analysis, Application of static and kinematics theorem, Plastic analysis of beams and frames.	08	CO5

Reference Books:
Theory of Structures by Pundit and Gupta, Vol. I & II, McGraw Hill Publication, New Delhi, First Edition, 2000
Basic structural analysis by CS Reddy, TMH publishing Company Ltd. New Delhi, 3rd Edition, 2010
Theory of Structures by S. Ramamrutham and R. Narayan, Dhanpat Rai Publishing Company, Delhi, 2nd Edition 2015
Analysis of statically indeterminate structures P. Dayaratnam. Affiliated East-West press Pvt. Ltd.
Indeterminate structural Analysis C.K.Wang, McGraw Hill Publications, 5th Edition 2014
Theory of structures Vol. II Vazirani and Ratwani, Sixteenth edition (2017)
e-Learning Source:
https://nptel.ac.in/courses/105104102/

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

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



Integral University, Lucknow

Effective from Session: 2021-22							
Course Code	CE303	Title of the Course	Transportation Engineering	L	T	P	C
Year	III	Semester	V	3	1	0	4
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	<ul style="list-style-type: none"> To introduce Transportation Engineering To develop understanding of Highway design and Traffic Engineering To develop understanding of Railway Engineering To develop knowledge of Airport design and basics of Harbor engineering 						

Course Outcomes	
CO1	Students who successfully complete this module will be able to understand factors influencing highway geometric design and will be able to perform horizontal & vertical alignment of the highway. They will also be able to apply basic science principles in determining stopping & overtaking sight distance.
CO2	Students who successfully complete this module can identify factors affecting pavement design. The student will develop ability to comprehend data from India Roads Congress codes for pavement design and stress calculations in the same.
CO3	Students are expected to identify parameters defining traffic state of transportation systems and design traffic signals, perform level of service analysis, collect & process traffic data and determine capacity of road segments.
CO4	Students develop understanding of the basic working of railway track system. They can also perform geometric design and capacity analysis of railway permanent way.
CO5	Students develop a basic understanding of factors affecting airport and runway design. They can also perform basic layout of Harbor components.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction and Geometric Design of Highways	Modes of Transportation, History of road development road types and patterns. Introduction to highway alignment and engineering surveys; Geometric design of highways –cross-sectional elements, sight distances, horizontal and vertical alignments.	08	CO1
2	Pavement Design and Highway Materials	Design factors for flexible and rigid pavements; Design of flexible pavement by CBR method; Design of rigid pavement: Westergaard's theory, load and temperature stresses, critical combination of stresses, joints. Highway materials - desirable properties and quality control tests; Design of bituminous paving mixes.	08	CO2
3	Traffic Engineering	Traffic flow studies, speed studies, travel time: delay study and O-D study, PCU, peak hour factor, Microscopic and macroscopic parameters of Traffic flow, Fundamental relationships, Traffic Simulation: An introduction to microsimulation; Control devices, signal design by Webster's method; Types of intersections and channelization; Highway capacity and level of service.	08	CO3
4	Railway Engineering	Introduction to Railways: Permanent way, capacity of railway track, cross-section of subgrade. Track geometry, gradient, horizontal curves, vertical curves, superelevation and safe speed on curve, widening of tracks, cant deficiency, negative superelevation and compensation for curvature on gradients, tractive resistant and tractive power. Point and crossing: Element of a turnout, detail of a switch and crossing numbers and angles of crossings, design of a turnout.	08	CO4
5	Airport and Harbour	Aircraft characteristics affecting airport planning, Site selection and design, airport layout, runway orientation, wind rose diagram. Airport runway length and corrections, taxiway and exit taxiway design. Harbours, layout and port facilities, Break waters, Jetties, wharves, navigation aids.	08	CO5

Reference Books:
SK Khanna & CG Justo, Highway Engineering, Nem Chand and Brothers, Roorkee, 4th Reprint 2015
Satish Chandra and M.M Agarwal, Railway Engineering, Oxford University Press, Delhi, 4th Edition 2014
L.R. Kadiyali, Highway Engg., Kanna Tech Publications, Delhi 6th Edition, 2014
Specification for Roads & Bridges by Ministry of Road Transport & Highways and Indian Road Congress, 2014
e-Learning Source:
http://nptel.ac.in/downloads/105101008/
http://nptel.ac.in/downloads/105101008/
http://nptel.ac.in/courses/105107123/

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

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



Integral University, Lucknow

Effective from Session: 2018-19							
Course Code	CE306	Title of the Course	Water Resources Engineering	L	T	P	C
Year	III	Semester	V	3	1	0	4
Pre-Requisite	CE201	Co-requisite	NIL				
Course Objectives	Students are expected to realize the importance of water resources and its application in Civil engineering.						

Course Outcomes	
CO1	Students are able to understand about various types and forms of precipitation and its measurement, Evaporation and Evapotranspiration estimation methods.
CO2	Students are able to understand the concept of runoff, hydrographs, unit hydrograph and S- hydrograph.
CO3	Students are able to understand about peak flood estimation, its return period prediction, flood control management.
CO4	Students are able to understand the Ground water, zones of ground water and yield determination of wells.
CO5	Students are able to understand the concept of irrigation, its types, merits & demerits, water requirement of crops, soil moisture.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Hydrology	Hydrologic cycle, Precipitation types and forms, rainfall and its measurement, rain gauges, rain gauge network, presentation of rainfall data, computation of mean rainfall using arithmetic mean, Thiessen polygon and Isohyetal methods , estimation of missing rainfall Infiltration – process, infiltration indices and Horton’s equation; Evaporation and Evapotranspiration – Pan evaporation, empirical equations for estimating evaporation and evapotranspiration.	08	CO1
2	Runoff and Hydrographs	Runoff- definition, types, catchment characteristics, factors affecting runoff, methods of runoff estimation, flow duration curve and flow mass curve, stage-discharge relationship and rating curve Hydrograph Analysis: Flood hydrograph, Components of hydrograph, base flow separation, direct runoff hydrograph, Unit hydrograph theory, derivation of unit hydrograph and its duration, S-hydrograph and instantaneous unit hydrograph, Derivation of unit hydrograph for ungauged catchments using Snyder’s method.	08	CO2
3	Analysis of Floods	Peak discharge estimation methods, Concepts of return period, flood frequency analysis, Gumbel’s and Log-Pearson Type-III distributions, Flood Routing: Concepts of flow routing, hydraulic and hydrologic routing, Reservoir routing, Channel routing, Muskingum method of channel routing and flood forecasting. Flood control management.	08	CO3
4	Ground Water Hydrology	Zones of ground water ,types of aquifers, aquiclude, aquifuge, aquitard, confined and unconfined aquifers, perched aquifer, aquifer properties-specific storage, specific capacity, transmissivity, Theims and Dupit theory for yield calculation in Confined and unconfined aquifers, Darcy’s law, types of wells, interference of wells, well losses, recuperation test for yield determination from an open well.	08	CO4
5	Irrigation Engineering	Irrigation: necessity, Types of irrigation , advantages and disadvantages of irrigation, irrigation efficiencies, Consumptive use and its determination, water requirement of various crops, Duty, Delta, Base period and crop period, relationship between base period, duty and delta. Soil moisture: Hygroscopic water, capillary water, gravity water, saturation capacity, field capacity, permanent wilting point.	08	CO5

Reference Books:
Subramanya K., Engineering Hydrology, Tata McGraw Hill (2016)
S.K Garg, Irrigation Engineering and Hydraulic structures, Khanna publishers(2016)
P. Jaya Rami Reddy , A Textbook of Hydrology, Laxmi Publications; Third edition (2016)
Punmia B.C. & Lal P.B., Irrigation and Water Power, Laxmi Publications(2016)
e-Learning Source:
https://gradeup.co/well-hydraulics-and-aquifers-i-ed587c01-975d-11e6-bf75-9c0e0d13dead
https://www.youtube.com/watch?v=fx1uUek3Iqg
http://nptel.ac.in/courses/105104103/1

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

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



Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	CE331	Title of the Course	Advance Design of Reinforced Concrete Structures	L	T	P	C
Year	III	Semester	V	3	1	0	4
Pre-Requisite	CE234	Co-requisite	NIL				
Course Objectives	To bring about an exposure to advanced topics in structural design comprising of Torsional Effect on Beams, Stair case, Flat and Circular Slabs, water tanks, RC retaining walls and prestressed concrete.						

Course Outcomes	
CO1	Students will be able to design beams and slab under torsional forces.
CO2	Students will be able to design flat slab and circular slabs.
CO3	Students will be able to design circular and rectangular tanks.
CO4	Students will be able to understand concept of retaining wall and its design.
CO5	Students will be able to understand the concept of prestressing and their advantages and disadvantages.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Torsional Effect on Beams and Design of Stair case	Effect of torsion on beam, concept of equivalent shear and moments. Design of beam under torsion. Structural behavior of stairs, Effective span, distribution and estimation of loads, Design of Dog-legged stairs and stairs spanning horizontally.	08	CO1
2	Flat and Circular Slabs	Nature of stresses in flat slabs. Design of flat slab with and without drops by direct method, reinforcement in flat slab. Design of Circular slab with various edges and loading condition.	08	CO2
3	Water Tanks	Design criteria, material specifications and permissible stress for tanks, design of circular and rectangular tanks situated on the ground under hoop stresses, Introduction of underground and overhead tanks.	08	CO3
4	Retaining Walls	Structural behavior of retaining wall, stability of retaining wall against overturning, sliding and pressure developed under the base design of T- shaped retaining wall, design of shear key concept of counter fort retaining wall.	08	CO4
5	Prestressed Concrete	Introduction of pre-stressed concrete, advantages of pre-stressed concrete, types of pre-stressing, methods of pre-stressing, losses in pre-stress, analysis of simple pre-stressed rectangular and T-sections.	08	CO5

Reference Books:	
Ramamurtham S., “Design of Reinforced Concrete Structures”, Dhanpatrai Publishing Company, 18 th Edition 2015, Reprint 2016.	
Bhawikatty S. S. “ Advanced Concrete Design”, New Age International, 3rd Edition (2016).	
Sinha S.N. “Reinforced Concrete Design”, Tata McGraw-Hill Education, 2nd Edition (2002).	
Punmia B.C Jain A.K, “Limit State Design of Reinforced Concrete”, Laxmi Publications 11th Edition (2022).	
Jain A.K., “Reinforced concrete design, limit state Method”, Nem Chand & Bros.; 7th Edition (2012).	
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/courses/105105104/	

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

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



Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	CE335	Title of the Course	Advance Geotechnical Engineering	L	T	P	C
Year	III	Semester	V	3	1	0	4
Pre-Requisite	CE231	Co-requisite	----				
Course Objectives	<ol style="list-style-type: none"> 1. To develop an understanding to perform site investigations and to determine the soil parameters needed to carry out foundation design. 2. To apply the principles of soil mechanics to design of shallow and deep foundations including bearing capacity, stability analysis of slopes and settlement calculations. 3. To compute the lateral earth pressure, select size of retaining walls and ensure safety against external forces and moments. 						

Course Outcomes	
CO1	Students will able to understand various Types of foundation.
CO2	Students will able to understand about In Situ .test (field test of soil)
CO3	Students will able to understand about various analysis and design of foundation.
CO4	Students will able to understand reason behind. the structure and foundation failure.
CO5	Students will able to understand about behavior/nature of the earth retaining structures.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Soil Exploration and Site Investigation	Introduction, Planning and stages in sub-surface exploration, depth and spacing of exploration, Disturbed and undisturbed soil samples, Area ratio, External and internal clearance, Methods of exploration, Geophysical methods: Seismic refraction and Electrical resistivity method. Boring: Auger boring, Wash boring and Rotary drilling. Types of soil sample: Disturbed and undisturbed soil samples, Features of sampler affecting soil disturbance. Characterization of ground, site investigations, Standard Penetration Test, Static and Dynamic cone penetration test, ground water level etc. Preparation of Bore log report.	08	CO1
2	Shallow Foundation and Bearing Capacity	Introduction- contact pressure distributions, Bearing capacity of footing, types of shear failure, correction for size, shape, depth, compressibility, etc., ultimate and allowable stresses, Terzaghi's, Meyerhof's, Hansen, Skempton's and BIS methods, Effect of rising and lowering of water table on bearing capacity, Plate load test, Standard and Cone penetration tests for determining allowable bearing pressure, Total and Differential settlements as per IS Code, causes and methods of minimizing settlement, Introduction to Floating foundation.	08	CO2
3	Deep Foundations	Pile foundations: Introduction to pile foundation, factors influencing the selection of pile, Load carrying capacity of Single Pile by static formula and dynamic formulae (Engineering News and Hileys), Feld's rule, Capacity from in-situ penetration tests, piles load test; Negative skin friction; under reamed pile foundations; Pile groups – Necessity, Efficiency, Group capacity and settlements. Well Foundation: Types of casissons and their construction; Different shapes of wells, component parts and forces, sinking of wells and remedial measures for tilts and shifts.	08	CO3
4	Stability of Slopes	Types of slopes, Types of slope failures, limit equilibrium methods of slices and simplified Bishop Method, factor of safety, friction circle method, Taylor stability number method, Stabilization of soil slopes.	08	CO4
5	Earth Pressures and Retaining Structures	Earth pressure theories, Plastic equilibrium, Coulomb's and Rankine's approaches, pressure distribution diagram for lateral earth pressures against retaining walls for different conditions in cohesion less and cohesive soils, smooth and rough walls, inclined backfills, depth of tension cracks, retaining structures, gravity cantilever, counter fort, reinforced earth, etc., design and check for stability, Rebhann's and Culmann's graphical constructions of active pressure for cohesionless soil.	08	CO5

Reference Books:

Bowles .J.E, "Foundation analysis and design", McGraw Hill, 5th Edition, 2001.

Murthy .V.N.S, "Textbook of Soil Mechanics and Foundation Engineering", CBS Publishers and Distributors, New Delhi, 1st Edition, 2009.

Garg, S.K., "Soil Mechanics and Foundation Engineering", Khanna Publishers, New Delhi, India. Khanna (2003).

Arora, K. R., "Soil Mechanics and Foundation Engineering", Standard Publishers, New Delhi, India. STANDARD PUBLISHER DIST. (2009).

Punmia, B.C., "Soil Mechanics and Foundation Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 1995. Prentice Hall India Learning Private Limited (2011).

e-Learning Source:

<https://nptel.ac.in/courses/105105185/>

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

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



Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	CE361	Title of the Course	Design of Reinforced Concrete Building and Practices	L	T	P	C
Year	III	Semester	V	3	1	0	4
Pre-Requisite	CE234	Co-requisite	-----				
Course Objectives	The course will present concepts and practical aspects of design & construction of reinforced concrete buildings.						

Course Outcomes	
CO1	Student will be familiar with Indian and International codes for reinforced concrete load and load combinations
CO2	Student will be able to categorize wind and earthquake loading conditions for reinforced concrete structure.
CO3	Student will be able to design reinforced concrete simple models using ETABS
CO4	Student will be able to design various reinforced concrete members.
CO5	Student will be able to perform Bill of quantities.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction and Codes- Design Basis Parameters and Report	Indian & International Codes for Reinforced concrete Design, Design loads, National Building Code 2016, Practical building example, drawing sizes and scale, Reading Drawings. Geometric Parameters, Occupancy Categories, Site location, Grade of concrete and steel for different elements, Exposure and cover requirements, Fire rating, Load Combinations, Serviceability Requirements, Analysis tools.	08	CO1
2	Loads - Setting the Structural Scheme	Introduction, Dead, Live and Superimposed loads, Wind loading and Calculations of - force coefficients, Wind pressure, storey forces and base shears. Earthquake loading and Calculations of - acceleration coefficient, Time period, Base shear. Loads from MEP Services and architectural considerations like façade loads. Scheme Design, Concrete floor systems, Sizing and design of various slab systems, Beams, Reinforced Concrete Columns - Location and Shape, Design Axial Load, sizing, Lateral Load Systems, IS 1893-Requirements, Shear Walls – Location and thickness. Estimating relative stiffness of core walls	08	CO2
3	Structural Models	Introduction to Analysis & Modelling, Modelling of Cantilever, Portal Frame, three bay Portal Frame, 3D structural models - Geometry, gravity loads, defining earthquake loads, defining wind loads, Modelling Shear walls, Practical Structural Model of building, Structural models of Floor System, Direct design method for Flat Slabs, Analysis of two-way slabs using moment coefficient method, Application of moment coefficient method, Estimation of deflections ETABS software demonstration for correct modelling and design of Vertical and Lateral loading systems like Shear Walls	08	CO3
4	Design of Structural Elements	Design of Beams- flexural reinforcement, shear reinforcement, Design of flat slabs- Flexural Reinforcement, shear reinforcement, Design of 2-way continuous slabs. Design of Reinforcements in Columns, Post processing, Design and arrangement of vertical reinforcement, horizontal reinforcement, Cardinal rules in scheme design of buildings. Coordination with other Engineering disciplines Design of shear walls - Seismic response, Vertical and Horizontal Reinforcement, design forces, moment capacity, boundary elements, boundary zone. Sizing of elements based on Constructability aspects like formwork, concrete placement and compaction, rebar arrangement to satisfy economy and optimum utilization.	08	CO4
5	Detailing of Structural Elements- Bill of quantities and conclusion	Development of Reinforcement, Typical details of- flat slabs, two-way continuous slabs, beams, columns and shear wall, detailing and documentation Concrete and steel indices for RC buildings, Reinforcement consumption in RC members, BoQ of building practical example.	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; 3 rd Edition 2009
B.C. Punmia and A.K. Jain “Limit State Design of Reinforced Concrete”, Laxmi Publications, 1 st Edition Reprint 2007
Sayal I.C and Goel A.K., “Reinforced Concrete Structures” S Chand & Company; 4th Edition 2007

e-Learning Source:<http://nptel.ac.in/courses/105105105/><http://nptel.ac.in/downloads/105105104/>

Link provided by L&T Edutech

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

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



Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	CE362	Title of the Course	Foundation Engineering Practices	L	T	P	C
Year	III	Semester	V	3	1	0	4
Pre-Requisite	CE231 & CE234	Co-requisite	NIL				
Course Objectives	<p>The course aims to help learners understand:</p> <ul style="list-style-type: none"> • The basics of geotechnical engineering • Foundation types and its applications • Design principles and construction methodologies of different type of foundations. 						

Course Outcomes	
CO1	Learner will be able to perform the sub soil exploration with the knowledge of IS Code provisions.
CO2	Learner will be able to prepare, interpret and analyze soil report.
CO3	Learner will be able determine bearing capacity, settlements using various IS code methods.
CO4	Learner will be able to analyze and design Raft, Piles and Special foundations as per IS Code specifications.
CO5	Learner will be able to analyze and implement soil pressure for retaining walls.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction and IS Code provisions	Introduction to Indian standard codes for laboratory and Field testing with overview of testing equipment, Standard penetration tests, Dynamic cone Penetration tests, Plate load tests, Drilling and boring methods, Stages of investigation, Soil and Rock sampling methods and Real-time soil profile reports.	08	CO1
2	Preparation and interpretation of geotechnical reports	Data interpretation and soil classification, Rock Classification, liquefaction of soil- Case studies from construction projects, Evaluation and Mitigation, Selection of foundation-Factors governing selection and preparation of a geotechnical report, Analysis and preparation of soil profile. Case studies.	08	CO2
3	Bearing capacity of shallow foundations	Types, Advantages and limitations of shallow foundations, General considerations to shallow foundations- Isolated, combined, raft foundation. Bearing capacity of shallow foundation- in soil using IS 6403 Part 2, Bearing capacity of shallow foundation in rock, Calculation of bearing capacity based on SPT, PLT and SCPT values. Bearing capacity calculations and Settlement analysis in cohesive and cohesionless soils. Overview of software for settlement calculations. Methods to reduce total and differential settlements.	08	CO3
4	Raft, Piles, Special foundations	Introduction, construction and types of raft foundations, Concept of proportioning footings and contact pressure distribution, Code provisions, application of software. Need for special foundations, Machine and Floating foundations, Well foundations and Modulus of subgrade reactions, Example problems. Design requirements of grade slabs for point loads, line loads and uniformly distributed loads, Design of joints and case studies and foundation drawings. Code provisions and construction procedures and workmanship of Bored Cast in-situ piles, Precast Piles, Under Reamed Piles and Precast driven piles, Materials, equipment and stresses, Case studies. Computation of vertical and lateral capacity of piles and pile group efficiency. Testing on piles, Pile integrity tests and Overview of software for pile foundation	08	CO4
5	Retaining walls, earth pressure theories	Types of retaining structures, Forces on Retaining walls- Active, Passive and at rest conditions, Types of earth pressures & drainage types, Code provisions as per IS 14458 Part I, Rankine and Coulomb's active and passive earth pressure theory. Effect of Uniform surcharge and line load & Other methods, Frictional circle method, Drainage of Backfill materials, Introduction to Mechanically stabilized earth or mechanically reinforced walls, Overview of Other Retaining Structures, Applications & Stability of Retaining walls.	08	CO5

Reference Books:
Bowles .J.E, "Foundation analysis and design", McGraw Hill, 5th Edition, 2001.
Murthy .V.N.S, "Textbook of Soil Mechanics and Foundation Engineering", CBS Publishers and Distributors, New Delhi, 1st Edition, 2009.
Garg, S.K., "Soil Mechanics and Foundation Engineering", Khanna Publishers, New Delhi, India. Khanna (2003)
e-Learning Source:
https://nptel.ac.in/courses/105105185/
Link provided by L&T Edutech

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

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



Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	CG301	Title of the Course	Career Development Course	L	T	P	C
Year	III	Semester	V	2	0	0	0
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	The primary purpose of an aptitude test is to determine your capability. Instead of looking at what you know, it looks at your learning capacity, and your ability to work with new information in an effective manner. This gives a strong indication of how well you're likely to perform in a particular setting, be it educational or professional.						

Course Outcomes	
CO1	Analyzing power needed to solve problems.
CO2	Analytical and Mental Ability for Solving problems.
CO3	Information processing capabilities, creative thinking ability, and evaluation skills.
CO4	Awareness on various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
CO5	Basic numerical ability to solve everyday tasks in a more effective manner.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction on Logical Reasoning	Coding Decoding, Alphabet (Analogy, Classification, Series), Numbers (Analogy, Classification, Series), Blood Relationship Test, Direction Sense Test.	05	CO1
2	Logical Reasoning	Calendar (Standard Table, Forward Stepping Table, Backward Stepping Table), Clock (Problem on Angle, Time Variation and Incorrect clock), Sitting Arrangement, Venn diagram, Syllogism and Set theory.	05	CO2
3	Non Verbal Reasoning	Figure Counting (Square Counting, Rectangle Counting and Triangle Counting), Non-Verbal (Series, Analogy and Classification), Cube & cuboids (Small cubes with 0, 1, 2 & 3 face colored), Dice.	05	CO3
4	Introduction on Quantitative Aptitude	Number System, HCF LCM, Simplification, Square Roots and Cube Roots, Decimal / Fractions.	05	CO4
5	Numerical Aptitude	Average, Ratio and Proportion, Percentage, Profit and Loss, Surds and Indices, Logarithms, Problem on Ages.	04	CO5

Reference Books:
Multidimensional Reasoning, By Dr Lal, Mishra, Upkar Publication
Books on Puzzles, By Dr. Sakuntala Devi.
M Tyra, "Magical Book on Quicker math's", BSC Publishing Co. Pvt. Ltd
Arun Sharma, "Quantitative Aptitude for Cat", Mc Graw Hill Education
RS Aggarwal, "Quantitative Aptitude", S Chand
e-Learning Source:
https://www.indiabix.com/

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

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



Integral University, Lucknow

Effective from Session: 2021-22							
Course Code	CE307	Title of the Course	Structural Analysis Lab	L	T	P	C
Year	III	Semester	V	0	0	2	1
Pre-Requisite	CE212	Co-requisite	CE-301				
Course Objectives	To share the road influence over a structure. To share the critical loads over structure such as beam and columns.						

Course Outcomes	
CO1	The students will aware about the influences over a beam due to load when applied (externally).
CO2	The students will aware about the critical load to secure the structural member such as beam and column.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Experiment 1	To determine flexural Rigidity (EI) of a given beam.	02	CO1
2	Experiment 2	To verify Maxwell’s Reciprocal Theorem.	02	CO1
3	Experiment 3	To find horizontal thrust in a three hinged arch and to draw influence line diagrams for Horizontal Thrust and Bending Moment.	02	CO1
4	Experiment 4	To find horizontal thrust in a two hinged arch and to draw influence line diagrams for Horizontal Thrust and Bending Moment.	02	CO1
5	Experiment 5	To find carry over factor for the beam with far end fixed.	02	CO1
6	Experiment 6	To find deflection of curved members	02	CO1
7	Experiment 7	To find bar forces in a three member structural frames with pin jointed bar.	02	CO2
8	Experiment 8	To find Critical loads in Struts with different end conditions.	02	CO2
9	Experiment 9	To find forces in elastically Coupled Beam.	02	CO2
10	Experiment 10	To find deflections in beam having unsymmetrical bending.	02	CO2
11	Experiment 11	To determine the fatigue strength of mild steel specimen.	02	CO2

Reference Books:

Theory of Structures by Pundit and Gupta, Vol. I & II, McGraw Hill Publication, New Delhi, First Edition, 2000

Basic structural analysis by CS Reddy, TMH publishing Company Ltd. New Delhi, 3rd Edition, 2010

Theory of Structures by S. Ramamrutham and R. Narayan, Dhanpat Rai Publishing Company, Delhi, 2nd Edition 2015

Analysis of statically indeterminate structures P. Dayaratnam. Affiliated East-West press Pvt. Ltd.

Indeterminate structural Analysis C.K.Wang, McGraw Hill Publications, 5th Edition 2014

Structural Analysis (Matrix Approach) by Pundit and Gupta, McGraw Hill Publication, New Delhi. 2nd edition, 2008.

Theory of structures Vol. II Vazirani and Ratwani, Sixteenth edition (2017)

Fundamentals of Structural Mechanics and Analysis by M.L Gambhir, PHI Learning Private Limited, New Delhi.

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

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



Integral University, Lucknow

Effective from Session: 2016-17							
Course Code	CE308	Title of the Course	Transportation Engineering Lab	L	T	P	C
Year	III	Semester	V	0	0	2	1
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	To provide practical knowledge about tests conducted on road aggregates. To provide skills so that learner can conduct tests on bitumen and bitumen mixes.						

Course Outcomes	
CO1	Learner will be able to determine the whether suitability of road aggregates as per Indian Codes.
CO2	Learner will be able to determine properties of Bitumen as well as bitumen mixes by performing tests on them and ascertain their suitability for varies field conditions.
CO3	Learner will be able to perform traffic volume survey and traffic speed survey on field.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Road Aggregate Tests	To determine Crushing strength of a given Aggregate sample. To determine Aggregate Impact Vale of a given Aggregate sample. To determine Abrasion Value of a given Aggregate sample. To determine Angularity of a given Aggregate sample.	08	CO1
2	Bitumen Test	To determine Penetration Point of a given Bituminous sample. To determine Softening Point of a given Bituminous sample. To determine Flash and Fire Point of a given Bituminous sample. To determine Stripping Value of a given Bituminous sample. To determine Ductility of a given Bituminous sample.	08	CO2
3	Traffic Surveys	To Perform Traffic Volume Study at a given Stretch of Road. To Perform Traffic speed study given point of Road.	04	CO3

Reference Books:
SK Khanna & CG Justo, Highway Engineering, Nem Chand and Brothers, Roorkee, 4th Reprint 2015.
e-Learning Source:
https://www.iitk.ac.in/ce/test/IS-codes/is.1201-1220.1978.pdf
https://law.resource.org/pub/in/bis/irc/irc.gov.in.037.2019.pdf
https://law.resource.org/pub/in/bis/irc/irc.gov.in.058.2015.pdf
https://www.iitk.ac.in/ce/test/IS-codes/is.2386.1.1963.pdf

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

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



Integral University, Lucknow

Effective from Session: 2012-23							
Course Code	CE338	Title of the Course	Building Planning and Drawing	L	T	P	C
Year	III	Semester	V	0	0	2	1
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	To make the students understand the basic concept of engineering drawings with the help of Drawing sheets and Auto CAD System.						

Course Outcomes	
CO1	Students will be able to understand the basics used in civil Engineering drawings.
CO2	Students will be able to know the making of drawings on software.
CO3	Students will be able to read and draw the civil components of buildings

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Experiment 1	Symbols Used in Civil Engineering Drawing (Drawing Sheet).	2	CO1
2	Experiment 2	Brick Masonry Bonds (Drawing Sheet).	2	CO1
3	Experiment 3	Introduction to AutoCAD drawing (pentagon, lines, circles, concentric circles, arc), format of civil engineering drawings and for writing details of organization in drawing.	2	CO1
4	Experiment 4	Staircase (Plan and Sectional Elevation) in AutoCAD Drawing.	2	CO2
5	Experiment 5	Two storied residential building plan including all details with suitable symbols and scales in AutoCAD Drawing.	2	CO2
6	Experiment 6	Two storied residential building elevations and sections including all details with suitable symbols and scales in AutoCAD Drawing.	2	CO2
7	Experiment 7	Electrical Drawing of a Building in AutoCAD.	2	CO3
8	Experiment 8	Plumbing and Sanitary Drawing of a Building in AutoCAD.	2	CO3

Reference Books:
Lab Manual Provided by the Department.
Bhavikatt S. S.”Building Planning and Drawing” I K International Publication Pvt. Ltd.
Rangwala, ”CIVIL ENGINEERING DRAWING” K.K. Publication India.
Verma B.P,” Civil Engineering Drawing & House Planning” Khanna Publishers.

Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	0	0	0	0	0	0	0	0	0	0	0	3	2
CO2	0	0	0	0	5	0	0	0	0	0	0	0	3	2
CO3	1	0	0	0	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: 2015-16							
Course Code	CE310	Title of the Course	Environmental Engineering-I	L	T	P	C
Year	III	Semester	VI	3	1	0	4
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	To educate the students about the basic principles of water treatment processes and air pollution engineering.						

Course Outcomes	
CO1	Learners will be able to explain about importance and necessity for planned water supplies, determine variations in demand, design periods, forecast Population and assess drinking water quality parameters according to IS-10500:2012.
CO2	Learners will be able to comprehend the fundamental of water treatment, suggest design criteria for Screens, plain sedimentation tank and clariflocculators.
CO3	Learners will be able to illustrate filtration its mechanism, compare Slow Sand, Rapid Sand And Pressure Filter. They will be able to explain the process of disinfection, its methods, kinetics, and calculate doses for softening process for water treatment.
CO4	Learners will be able to have comprehensive understanding of Distribution System, Detect of Leakage in the Distribution Pipes, Analyze the Pipe Network by using Hardy-Cross Method and Equivalent Pipe Method. They will also be able to suggest various appurtenances used in the Distribution System. Plumbing System, House Water Connection.
CO5	Learners will be able to explain about air pollution its causes, consequences, control methods of Particulate & Gaseous Pollutants.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Water Quality Assessment	Importance and necessity for planned water supplies, various types of Water demands, Per capita demand, Variations in demand, Design Periods & Population Forecast, Sources of water, Intakes for collecting surface water. Guideline Specification For Drinking Water Quality- IS-10500:2012, Indicator Organism.	08	CO1
2	Sedimentation and Coagulation	Water Treatment Concept, Screening, Settling operation, Plain Sedimentation. Coagulation and its Mechanism, Coagulants, Flocculation, Mechanism of Flocculation. Sedimentation aided with coagulation.	08	CO2
3	Water Filtration and Softening	Filtration: Theory, Types Of Filter, Mechanism and Operation Of Slow Sand, Rapid Sand And Pressure Filter. Disinfection: Methods of Disinfection, Kinetics of disinfection, Chlorination and Practices of Chlorination. Softening and its Methods, Calculation of Doses.	08	CO3
4	Storage and Distribution of Water	Distribution System, Methods Of Distribution, Layouts Of Distribution Networks, Detection of Leakage in the Distribution Pipes, Pipe Network Analysis- Hardy-Cross Method, Equivalent Pipe Method. Appurtenances in The Distribution System. Plumbing System, House Water Connection, Different Cocks and Pipe Fittings.	08	CO4
5	Air Pollution Engineering	Air Pollution: Natural And Man-Made Air Pollution, Causes And Effect Of Air Pollution, Air Pollution Control Methods, Control Of Particulate Pollutants, Control Of Gaseous Pollutants.	08	CO5

Reference Books:

S. K. Garg, Water Supply Engineering: Environmental Engineering v. 1, 29th Edition, Khanna Publication, 2013

Howard S. Peavy, Donald R. Rowe, George Tchobanoglous, Environmental Engineering, 1st Edition, McGraw Hill Education; 2013.

Gilbert M. Masters, Wendell P. Ela, Introduction to Environmental Engineering and Science, 3rd Edition, Publisher: Prentice Hall, ISBN-13: 978-0-13-148193-0, ISBN-10: 0-13-148193-2

K.V.S.G. Murali Krishna, Air Pollution and Control, Laxmi Publications, 1st Edition, 2017.

Standard Methods for the Examination of water and wastewater: AWWA, APHA, WPCF 2012.

I.S. 10500: 2012, Drinking Water Standards, 2012.

e-Learning Source:

<https://nptel.ac.in/courses/105105201>

Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO														
CO1	3	2	3	0	0	0	3	0	0	0	0	0	2	1
CO2	3	2	3	0	0	0	3	0	0	0	0	0	1	2
CO3	3	2	3	0	0	0	3	0	0	0	0	0	1	1
CO4	3	2	3	0	0	0	3	0	0	0	0	0	3	2
CO5	3	2	3	0	0	0	3	0	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	CE313	Title of the Course	Traffic Engineering	L	T	P	C
Year	III	Semester	VI	3	1	0	4
Pre-Requisite	CE303	Co-requisite	NIL				
Course Objectives	<ul style="list-style-type: none"> To study the fundamentals of traffic engineering. To gain knowledge about traffic intersection and its control measures. To study various types of traffic surveys. 						

Course Outcomes	
CO1	Learner will be able to understand fundamentals of traffic engineering and hierarchy of roads in India.
CO2	Learner will be able to understand traffic flow theories & regulations related to traffic and able to evaluate a given area for compliances.
CO3	Learner will be able understand basis of traffic surveys & be able to traffic surveys and its analysis.
CO4	Learner will be able to design signalized intersections meeting Indian code requirements and they will be acquainted with traffic control measures.
CO5	Learner will learn about traffic management measures & understand road safety aspects and be able to select the desired type of control at intersection under given traffic conditions.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Traffic Engineering Principles	Traffic on road, mixed traffic, concept of PCU, Traffic Engineering- scope and objectives, road user and vehicle characteristics, Traffic characteristics, Hierarchy of Roads, Typical road cross sections, fundamental definitions, traffic flow parameters, time-space diagram, speed-flow-density relationship, capacity and level of service, factors effecting level of service.	08	CO1
2	Traffic Flow Theory and Regulation	Traffic stream and its components, stream parameters, Interrupted and un-interrupted traffic flow, trajectory diagrams, shock wave theory and its application, queuing theory and its application. Regulation of speed, regulation of vehicles, regulation concerning drivers, regulation concerning traffic, parking regulations, general rules, enforcement of regulations.	08	CO2
3	Traffic Survey and Studies	Traffic Volume study-need, methods, format preparation, analysis and presentation; Origin Destination study-need, methods, format preparation, zoning, analysis and presentation; Speed and Delay Study- need, methods, format preparation, analysis and presentation; Parking Study- need, type of surveys, format preparation, demand estimation, type of parking facilities; Road Network Inventory Survey- need, format preparation and data collection.	08	CO3
4	Traffic Operation and Control	Traffic control devices, Traffic Signs - principles, types and design considerations; Road Markings-principles, type and design; Traffic Signals - types, optimal cycle length and signal settings, warrants, designing of traffic signals by Webster's method and IRC method, signal approach dimensions; Street Lighting; Street Furniture.	08	CO4
5	Traffic Management, Road Safety and Intersections	Traffic management measures, Intersections-at grade and grade separated intersections, rotary intersections and channelization. Accident situation in India, collection of accident data, collision and condition diagram, road and its effect on accidents, vehicles and its effect on accidents, drivers, pedestrian safety, cyclist safety, legislations, enforcement, educations and awareness, road safety audit.	08	CO5

Reference Books:

Traffic Engineering & Transport Planning by LR Kadyali, Khanna Publisher, Delhi, 2010.
 Transportation Engineering and Planning, C.S.Papacostas, P.D.Prevedouros, Prentice –Hall India, Delhi, 2005
 Highway Engineering-S.K.Khanna & C.EG. Justo, Nem Chand & Bros, Roorkee, 2014.
 Transportation Engineering, an Introduction, C Jotin Khisty,B.Kent Lall, Prentice-Hall India, Delhi.
 Transportation Planning, Principles, Practice and Policies,P.K. Sarkar, Vinay Maitri, G.J. Joshi, Prentice-Hall, India, Delhi.

e-Learning Source:

<https://nptel.ac.in/courses/105101008/>
<https://nptel.ac.in/courses/105105107/>

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

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



Integral University, Lucknow

Effective from Session: 2019-20							
Course Code	CE314	Title of the Course	Open Channel Flow	L	T	P	C
Year	III	Semester	VI	3	1	0	4
Pre-Requisite	CE209	Co-requisite	NIL				
Course Objectives	<ul style="list-style-type: none"> To learn open channel flow, to give idea on different types of flow and channels and hydraulic design principles of channels To give the idea about gradually varied flow GVF and types of equation used in different types of flow To introduce the basic principles and assumptions in analysis of flow profile and numerical analysis To give the idea about rapidly varied flow RVF and condition of formation of different types of hydraulic jump. To give the idea of design of hydraulic channel in non-linear alignment and design of culvert. 						

Course Outcomes	
CO1	To understand the basic concept of open channel flow, different types of flow, channels.
CO2	To understand the basic concept of gradually varied flow and its equation.
CO3	To understand the basic concept of gradually varied flow profile and numerical analysis.
CO4	To understand the basic concept of rapidly varied flow and condition of formation of different types of hydraulic jump.
CO5	To understand the basic concept of design of hydraulic channel in non-linear alignment.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to Open Channel Flow	Classifications, description, types energy and momentum equation for prismatic and non-prismatic channels. Uniform flow, critical flow, critical depth, specific energy. Use of Design charts and Semi empirical relations.	08	CO1
2	Gradually Varied Flow	Gradually varied flow, dynamic equation, flow profiles, computation, analytical and graphical methods, and transitions of sub critical and supercritical flow.	08	CO2
3	Analytical and Numerical Methods of Gradually Varied Flow	Basic principles and assumptions in analysis of flow profile, methods of numerical integration. Compound channel, Equivalent Roughness.	08	CO3
4	Rapidly Varied Flow	Characteristics of the rapidly varied flow, classification of hydraulic jump, hydraulic jump in horizontal, and sloping channels, submerged hydraulic jump, jump in gradually and suddenly expanding channels, empirical solutions.	08	CO4
5	Analysis of Flow in Channels of Nonlinear Alignment	Flow in channel of non-linear alignment and non-prismatic channel sections, design considerations for sub critical and super critical flows. Hydraulic design of culvert. .	08	CO5

Reference Books:
K.Subramanya : Flow in open channels, Tata Mcgraw Hills, 2014.
V.T.Chow : Open Channel Hydraulics,Blackburn Press, 2009.
K.RangAraju:Open channel flow,Mcgrawhill Education, 2001.
Madan Mohan Das: Open Channel Flow,PHI learning private limited, 2008.
e-Learning Source:
https://nptel.ac.in/courses/105107059/

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	1	0	2	2	1	1	2	1	1	0	2	1	0
CO2	2	1	2	1	0	1	1	1	1	2	2	2	0	0
CO3	1	0	2	1	2	1	1	1	1	2	0	2	0	0
CO4	1	2	0	2	1	2	2	1	0	1	2	1	0	0
CO5	2	2	2	2	2	2	1	1	2	1	3	2	0	0

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



Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	CE315	Title of the Course	Matrix Methods Of Structural Analysis	L	T	P	C
Year	III	Semester	VI	3	1	0	4
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	<ul style="list-style-type: none"> To understand the Basic concept of Structural analysis. To understand and analyses the structures using matrix methods. 						

Course Outcomes	
CO1	Able to determine static & kinematic determinacy and to understand the basic methods of structural analysis.
CO2	The learner is familiarized with the basic concept of matrix methods of structural analysis and is able to analysis continuous beams using matrix methods.
CO3	Able to analyses rigid joined and pin-jointed plane frames using matrix methods.
CO4	The learner is able to analysis rigid jointed plane frames by matrix methods.
CO5	Able to analyses three-dimensional structural by displacement method.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Classification of Structures	Classification of structure, equation of static equilibrium, degree of static and kinematic determinacy. Basic methods of structure analysis.	08	1
2	Introduction of Matrix Method and Analysis of Beam	Introduction of Flexibility and stiffness method. Formulation analysis of continuous beams.	08	2
3	Analysis of Pin Joined Structure	Formulation analysis of two-dimensional pin jointed frames and space frame by matrix approach.	08	3
4	Analysis Two-Dimensional Rigid Structure	Formulation analysis of two-dimensional rigid frames by flexibility and stiffness methods.	08	4
5	Analysis Three-Dimensional Structure	Analysis of three-dimension structure by displacement method.	08	5

Reference Books:
Weaver & Gere, Matrix Analysis of Framed structures. CBS Publication & Distributors Pvt. Ltd., Edition: 2nd edition (2004).
H.C. Matrix, "Introduction to Matrix Methods of structural Analysis", McGraw Hill (2012).
Pandit, G.S & Gupta., "Structural Analysis: A Matrix Approach" McGraw Hill Education (India) Pvt. Ltd., 2 nd Edition (2008).
e-Learning Source:
https://nptel.ac.in/courses/105106050/

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

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



Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	CE316	Title of the Course	Sustainable Construction Techniques	L	T	P	C
Year	III	Semester	VI	3	1	0	4
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	<ul style="list-style-type: none"> To make them aware about the ways to attain sustainable construction and to overcome sustainable challenges. To comprehend the fundamentals of energy efficiency in regards of Sustainability. To make them understand the application of advanced material used in construction industry to prepare sustainable architecture. To make them understand about the modern housing scenario to impart sustainability in construction cycle. To make them capable to perform cost analysis using latest pre-fabrication technologies. 						

Course Outcomes	
CO1	Learner will be able to understand the Importance of sustainability & their challenges in construction sector.
CO2	Learner will be able to understand the need of energy efficient buildings to overcome the aftereffects of manmade materials.
CO3	Learner will be able to choose an innovative Building material comprised of sustainable properties to attain sustainable construction.
CO4	Learner will be able to understand the housing scenario as per the land usage, financial terms and strategically approaches for Urban and rural areas.
CO5	Learner will be able to impart engineering knowledge based on Precast and Prefabrication structures using latest technology.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to Sustainability	Sustainability, challenges in sustainable construction, design construction and equipment, materials and systems, maintenance and conservation, waste materials, site waste management, re-use and recycling of materials.	08	CO1
2	Energy Efficient Buildings	Energy efficient buildings, concepts of green and sustainable buildings, natural lighting, rainwater harvesting.	08	CO2
3	Alternative Building Materials	Alternative Building Material for Low Cost Housing: Introduction, Substitute, for scarce materials, timber substitution, industrial waste, Agricultural waste, Strategies of Promotion of Alternative Building Materials.	08	CO3
4	Modern Housing Scenario	Housing scenario, status of urban and rural housing and construction land use and physical planning for housing, building bye laws, housing finance: approaches and strategies, housing for urban poor	08	CO4
5	Precast and Prefabricated Systems	Adoption of innovative cost effective construction technology, prefabrication, precast roofing/ flooring systems, walls.	08	CO5

Reference Books:
A.K Lal, Handbook of low cost housing, New Age Publishers, 4th Edition, 2010.
India Green Building Congress Recommendations, 3rd Revision, 2011.
Ajla Aksamija, "Sustainable Facades: Design Methods for High-Performance Building Envelopes", Jhon Wiley & Sons Inc, 2nd Edition, 2011.
Kibert J.Charles, "Sustainable Construction: Green Building Design and Delivery", Jhon Wiley & Sons Inc, 6th Edition, 2014.
Phillip F. Ostwald, "Construction Cost Analysis and Estimating", Prentice Hall Press, Delhi, 3rd Reprint, 2015.
e-Learning Source:
https://www.youtube.com/watch?v=WPRgRBxfbss
https://www.youtube.com/watch?v=SJ0H6kheN_c

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

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



Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	CE318	Title of the Course	Estimating & Costing	L	T	P	C
Year	III	Semester	VI	3	1	0	4
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	The student shall be able to estimate the material quantities, prepare a bill of quantities, make specifications and prepare tender documents. This also covers the rate analysis, valuation of properties and preparation of reports for estimation of various items.						

Course Outcomes	
CO1	The learner will be able to understand the measurement and specification of various items; and duties of quantity surveyor
CO2	The learner will be able to estimate the approximate and exact quantity of various items used in construction.
CO3	The learner will be able to analyses the rates of various items and prepare BOQ and bar bending schedule
CO4	The learner will be able to understand the rules of measurement and able to measure the quantity of various items.
CO5	The learner will be able to process of rent fixation and valuation of an asset.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Quantity estimation for buildings	Benefits of estimation and costing, duties of Quantity Surveyor, items of work, measurement units for various building materials as per IS:1200, deduction for opening in masonry, specifications-general and detailed, study of CPWD specifications, application of MS-Excel in estimation works.	08	CO1
2	Method of building estimate	Types of estimates, preliminary, approximate-plinth area estimate, cube rate estimate, centerline method, long and short wall method of estimates, estimate of masonry buildings.	08	CO2
3	Rate Analysis	Analysis of rates knowing cost of material, labor, equipment, overheads, profit, taxes etc., overhead cost, PWD schedule of rates, labor rates for different items of works, preparation of bill of quantity, abstract of estimated cost, bar bending schedule, contingencies and work-charged establishment.	08	CO3
4	Rules and methods of measurement	General rules and methods of measurement of works based on IS: 1200, materials, earthwork, concrete, brickwork, woodwork, plastering and pointing, painting, whitewashing, color washing, road work, sanitary and water supply work, demolition.	08	CO4
5	Valuation & Report Preparation	Necessity, valuation of building, examples of valuation, life of various items of works, fixation of rent, examples of rent fixation, plinth area required for residential buildings, technical and detailed report, principles for report preparation, report on estimate of residential building.	08	CO5

Reference Books:	
Quantity Surveying & Costing- B.N. Dutta	
Estimating and Costing- S.C. Rangawala	
Quantity surveying & Costing- Chakraborty	
e-Learning Source:	
https://nptel.ac.in/courses/105103093	
https://www.youtube.com/watch?v=D04uxZpgp6M	

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	2	0	0	3	1	1
CO2	1	0	0	1	0	0	0	0	0	2	3	1	1	3
CO3	1	2	0	1	0	0	0	2	0	0	3	1	1	3
CO4	1	0	0	0	0	0	0	2	0	0	3	1	1	3
CO5	1	1	0	0	0	0	0	0	0	2	2	1	1	3

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



Integral University, Lucknow

Effective from Session: 2019-20							
Course Code	CE321	Title of the Course	Design of Hydraulic Structures	L	T	P	C
Year	III	Semester	VI	3	1	0	4
Pre-Requisite	CE201	Co-requisite	CE306				
Course Objectives	Introduce the Student to Fundamentals of Design of Hydraulic Structures in Civil Engineering						

Course Outcomes	
CO1	Students are able to understand about various causes of hydraulic structures failures, Bligh and Khosla theories.
CO2	Students are able to understand the concept of head works and cross drainage works.
CO3	Students are able to understand about investigation and planning of dams and reservoirs.
CO4	Students are able to understand about elementary profile of gravity dams and modes of failure of gravity dams.
CO5	Students are able to understand the concept of earth dams and spillways.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Hydraulic Structures General	Failure of hydraulic structures founded on permeable soils, Bligh's creep theory, Khosla's theory of independent variables for design of impervious floors, Types of canal falls, Design of sharda type fall.	08	1
2	Head Works and Cross Drainage Works	Function, location and layout of head works, cross drainage works: necessity and types, design of siphon aqueduct.	08	2
3	Dams and Reservoirs	Investigation and planning of dams and reservoirs, zones of storage, reservoir sedimentation and its control, classification of dams.	08	3
4	Gravity Dams	Elementary profile of a gravity dam, Low and high gravity dams, Modes of failure and factor of safety, Galleries in dams, Temperature control in mass concrete.	08	4
5	Earth Dams and Spillways	Earth Dam their component and functions, causes of failure. Types of spillways, energy dissipation below spillways, spillways gates.	08	5

Reference Books:
Subramanya K., Engineering Hydrology, Tata McGraw Hill, 2014.
Punmia B.C. & Lal P.B., Irrigation and Water Power Engineering, Laxmi Publications, 2015
Asawa, Irrigation Engineering, Wiley Eastern Edition, 2013.
S.K Garg, Irrigation Engineering and Hydraulic structures, Khanna publishers, 2016.
e-Learning Source:
https://nptel.ac.in/courses/105105040/

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	2	1	1	0	0	0	0	2	2	0
CO2	2	2	3	2	2	1	2	0	1	2	0	0	0	0
CO3	3	2	2	3	1	2	0	1	2	3	1	2	0	0
CO4	2	3	2	2	3	2	1	2	1	2	2	2	0	0
CO5	2	3	2	3	2	2	1	2	2	1	2	3	0	0

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



Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	CE322	Title of the Course	Maintenance & Rehabilitation of Structures	L	T	P	C
Year	III	Semester	VI	3	1	0	4
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	To provide knowledge practices adopted for maintenance of structures.						

Course Outcomes	
CO1	To make students familiar with the importance, facets and assessment of maintenance in a damaged structure.
CO2	Understand the parameters such as strength, Durability, cracks, climate effects in concrete in accordance with Quality assurance.
CO3	To make the students aware about the advanced and globally recognized material used in repair of structures.
CO4	Learner will be able to understand the problems associated with corrosion, cracks and demolition of structures.
CO5	To facilitate the need to understand the various types of repairs of structures based on weathering effects and exposure conditions.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction	Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration	08	1
2	Quality Assurance for Concrete	Strength, Durability and Thermal properties, of concrete Cracks, different types, causes- Effects due to climate, temperature, Sustained elevated temperature, Corrosion -Effects of cover thickness and cracking	08	2
3	Advanced Materials	Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, Sulphur infiltrated concrete, Ferrocement, Fiber reinforced concrete	08	3
4	Rehabilitation Techniques	Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Guniting and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection. Engineered demolition techniques for dilapidated structures-case studies	08	4
5	Repairing of Structures	Repairs to overcome low member strength. Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure.	08	5

Reference Books:
Shetty M.S., "Concrete Technology-Theory and Practice", S. Chand and Company, 2008.
Dov Kominetzky.M.S., "Design and Construction Failures", Galgotia Publications Pvt. Ltd., 2001.
Gambhir.M.L., "Concrete Technology", McGraw Hill, 2013.
e-Learning Source:
https://nptel.ac.in/courses/105/106/105106202/
https://nptel.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	0	2	3	0	0	0	0	0	0	3	0
CO2	3	3	0	0	0	0	0	0	0	0	0	0	0	1
CO3	3	0	1	0	3	0	0	0	0	0	0	0	0	2
CO4	2	3	2	0	1	0	0	0	0	0	0	2	0	1
CO5	3	0	0	0	0	0	0	2	0	0	3	2	0	1

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



Integral University, Lucknow

Effective from Session: 2016-17							
Course Code	CE323	Title of the Course	Occupational Health and Safety Engineering	L	T	P	C
Year	III	Semester	VI	3	1	0	4
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	To educate the students on the basic principles, development and application of occupational health and safety engineering.						

Course Outcomes	
CO1	Learner will be able to understand the importance of industrial safety and promote role of safety and health training as per the guideline of OHSAS-18001.
CO2	Learner will be able to promote safety measures in construction industry in connection with excavation work, scaffolding work, welding and cutting and during transportation of men and material.
CO3	Lerner will be able to understand the effects of electrical hazard in an industry and their control.
CO4	Learner will be able to understand effects of fire hazards in mining industry and their contract using different fire extinguisher.
CO5	Learner will be Able to prepare guidelines using different preventive technique and planning for implementation of training for safety awareness.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to Occupational Health and Safety	Introduction to occupational health and safety: Occupational Health Hazards, Promoting Safety, Safety and Health training, Stress and Safety. Importance of Industrial safety, role of safety department, OHSAS 18001.	08	CO1
2	Construction Safety	Hazards in Construction Industry, Introduction of Construction industry, Scaffolding and Working plat form, Welding and Cutting, Excavation Work, Concreting and Cementing work, Transportation of men and material, Handling and Storage of compressed gas.	08	CO2
3	Electrical Safety	Electrical Hazards: Safe limits of amperages, voltages, distance from lines, etc., Joints and connections, Effects of Electrical Hazards, Effects of Current on Human Body, Control of hazards due to static electricity.	08	CO3
4	Fire Safety	Fire Hazards: Fire Types, Fire Hazard Analysis and Prevention of Fire, Fire Risk, Fire Protection and its Prevention, hazards and control in mines, Portable Fire Extinguishers, Firefighting.	08	CO4
5	Safety Guidelines and Recommendations	Construction hazards and safety guidelines; Prevention techniques for construction accidents; Site management with regard to safety recommendations; Training for safety awareness and implementation.	08	CO5

Reference Books:
B. G. Dale, Managing quality, 5 th ed., Blackwell Publishing, Oxford, 2007.
D. Reese and J. V. Eidson, Handbook of OSHA construction safety and health, 2 nd ed., CRC Press, Boca aton, 2006.
F. Harris, R. McCaffer and F. Edum-Fotwe, Modern construction management, 6 th ed., Blackwell Publishing, Oxford, 2006
K. Knutson, C. J. Schexnayder, C. M. Fiori and R. Mayo, Construction management fundamentals, 2nd ed., McGraw Hill, New York, 2008.
S. J. Holt, Principles of construction safety, Blackwell Publishing, Oxford, 2008.
R.K.Jain and Sunil S.Rao , Industrial Safety , Health and Environment Management Systems, Khanna publishers , New Delhi, 2006.
Journal of Occupational Safety and Health, ISSN 1675-5456 PP13199/12/2012 (032005)
e-Learning Source:
https://www.osha.gov/SLTC/generalshreferences/journals.html
https://www.osha.gov/

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	1	1	2	0	0	2	1	0	2	0	0	1	0
CO2	2	0	0	0	0	3	2	0	2	1	0	1	0	1
CO3	1	1	3	1	0	2	1	0	2	1	0	1	0	2
CO4	1	1	3	1	0	2	1	0	2	1	0	1	0	1
CO5	1	0	3	1	0	2	1	0	2	1	0	1	0	1

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



Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	CE324	Title of the Course	Principles of Town Planning and Architecture	L	T	P	C
Year	III	Semester	VI	3	1	0	4
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	<ul style="list-style-type: none"> To impart the knowledge how planning of towns is governed. To give the knowledge of various types of town planning can be done. To give the knowledge of various material and techniques in the development of town planning. To impart the knowledge of various elements of Architectural design. To give the knowledge and impact of Architecture effects on town planning and functioning planning of building as per Architecture. 						

Course Outcomes	
CO1	To enable the student to understand the historical aspects of Architecture planning
CO2	To enable the student the various types of town planning in the past
CO3	To enable the student , the effect of materials and techniques in the development of township
CO4	To enable the student in understanding the various elements of Architectural design and its effect on town planning
CO5	To make the student to understand the function of planning of building

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction	Principles and history of town planning, Comprehensive planning of towns: Contemporary planning concepts, Problems of urban growth. Land use classification and patterns, Housing demographic and social surveys, economic and environmental aspects. Concept of master plan, Zoning and Density	08	CO1
2	History of Town Planning	An overview of ancient human settlements, Evolution of towns: Garden city movement, Linear city and concentric city concepts, Neighborhood and Radburn, Lacite industrielle, Radiant city to present day planning, Satellite town concepts. Concept of habitat, Neighborhood planning, problems of metropolis.	08	CO2
3	Development of Town Planning	Factors influencing architectural development. Impact of development of materials and techniques through ages. Evolution of architectural forms. Brief history of architecture.	08	CO3
4	Architectural Design	Elements of Architectural Design: Line, Form, Shape, Space, texture, value and colour. Principles of Architectural Design: Balance, Rhythm, Emphasis, Proportion and Scale, Movement, Contrast, Unity, Harmony, Repetition, Hierarchy. Role of architects.	08	CO4
5	Planning of Buildings	Functional planning of buildings: Classification of buildings, General requirements of site and building. Building codes, Acts and Bye-laws, Licensing of building works. Functional planning of building such as residential, institutional, public, commercial, industrial buildings, checking for circulation, ventilation, structural, preparing sketch plan, working drawing etc.	08	CO5

Reference Books:
Sir Banister Fletcher's, A History of Architecture, CBS Publisher. 2002.
S.C. Rangwala, Town Planning, Charotar Publishing House, 2009.
G.K. Hiraskar, Fundamentals of Town Planning, Dhanpat Rai Publications, 2012.
S.C. Agarwala, Architecture and Town Planning, Dhanpat Rai & Co. 2013.
e-Learning Source:
https://nptel.ac.in/content/storage2/courses/109104047/pdf/lecture35.pdf

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

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



Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	CE363	Title of the Course	Heavy Lifting Techniques & Machinery	L	T	P	C
Year	III	Semester	VI	3	1	0	4
Pre-Requisite	CE201, CE204, & CE234	Co-requisite	-----				
Course Objectives	<ul style="list-style-type: none"> To introduce the learners to the basic engineering concepts used in heavy lifting and provide basic knowledge about the various machineries and techniques used in the industry. An understanding on how to develop lift plan including selection of suitable methods, machineries and lifting gears. 						

Course Outcomes	
CO1	Ability to classify various lifting and shifting heavy machinery.
CO2	Ability to execute the installation of cranes, tower cranes and lifting gears with safety precautions.
CO3	Ability to apply and execute the installation of hydraulic equipment's with safety precautions.
CO4	Learner will be able to design load bearing parts of shifting heavy machinery.
CO5	Learner will be able to analyze heavy machinery requirements and implement safety precautions as per the machinery.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to heavy lifting and application of Engineering Mechanics	Evolution of heavy lifts, Examples of heavy lifting in various industries, Application of engineering mechanics in heavy lifting, Machinery for heavy lifting, Mechanical advantage of lifting and shifting, Applications of reeving, Lever principle and calculation of forces on load handling elements.	08	CO1
2	Cranes and tower cranes, Lifting gears and accessories	Application of shackles, wire rope slings and lifting beams, Right use of shackle and Limitation of pre-engineered product, lifting gear, Calculate of forces on wire rope sling and sling capacity. Applications of Wire Ropes Spreader/Lifting Beam, Basic Elements of Lifting Machines, Various lifting and shifting machines & components, their classification, terminologies, application, and right usage during execution. Classification and components of tower cranes, Load charts, safety and stability of tower cranes. Case studies	08	CO2
3	Application of hydraulics and equipment for horizontal movement	Hydraulic systems and basic components, types of jacks and applications, principles and control systems. Application of Strand jacks in heavy lifts. Transportation of Over Dimensional Cargos (ODC) and Over Weight Cargos (OWC), trailer configuration based on the size & load of the consignment, the basic principle of friction & Skidding System, Components and its application in project sites, Wheel bogies & its application, Rail and Sea transport & lashing.	08	CO3
4	Design of load bearing structures and lift plan	Design Basis of Handling Provisions, Design procedure for bolted type, welded case, link plates and trunnions. Parameters affecting the Handling Provisions, Design of Lifting lugs- Bolted, welded case, link plates and trunnions Design of Load Bearing Structures and Enabling Structures, Stress limitation with respect to yield stress of steel structure, standard design procedure for Girders and Lifting beams. multilevel of spreader beam and Grillage.	08	CO4
5	Alternate methodologies and safety	Pre-cast construction with Case studies, Push Launching and float over installation with method, Hydraulic Lifting Gantries and their applications. Hydraulic Lifting Gantries, Safety Requirements for Crane and lifting operations, load test procedures and inspection check list, Importance of PPEs and signals used for crane operation, Safe methods to avoid Crane accidents	08	CO5

Reference Books:
Andra Serlin Abramson, Heavy Equipment Up Close, Sterling, 2008
Henrietta Toth, A Career as a Heavy Equipment Operator, Rosen Publishing, December 2015
Wicaksono, A. Y. (2020). Applying ISO: 31000: 2018 as risk management strategy on heavy machinery vehicle division.

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

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



Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	CE364	Title of the Course	Building Information Modeling in Architecture, Engineering and Construction	L	T	P	C
Year	III	Semester	VI	3	1	0	4
Pre-Requisite	CE338	Co-requisite	-----				
Course Objectives	<ul style="list-style-type: none"> To enable learners to understand the concept of Building Information Modeling and application of the same in the life cycle of the project. 						

Course Outcomes	
CO1	Learner will able to implement various software’s for modelling, analysis and designing.
CO2	Learner will able to identify various clash/collision points between various elements.
CO3	Learner will be able to generate drawings, details of all building elements.
CO4	Learners will be able to perform 4D and 5D BIM strategy.
CO5	Learner will be able to apprehend the future scope of BIM and Internet of Things.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction, Design Authoring and Visualization	Building Information Modelling – Introduction & Process, Evolution of BIM, BIM Model -of various buildings like Commercial & Residential, WTP, Transportation, Airports, . Isometric View – Introduction, Examples and Problems. 3D Modelling Design Authoring – Workflow, Discipline Based Modelling, Architectural, Engineering Analysis, Structural Analysis, HVAC, Electrical, Plumbing, Energy Analysis, Lighting Analysis, Design Review. Views in Model, Visualization Modes, Walkthrough & Fly through the Model, Layers & Properties, AR, VR & MR.	08	CO1
2	Interference/Clash check	Clash Check, Types of Clashes, Federated Model - Clash avoidance process, Clash Detection Process – Introduction, Clash Detection - Priority Matrix, Clash Detection – Rules, Clash Detection – Report, Clash Detection – Grouping, Clash Detection - Roles & Responsibilities, Clash Detection Process – Demo.	08	CO2
3	Common Data Environment & Level of Development	D drawings generation, Cloud Computing, CDE. Level of Detail & Level of Information, LOD - for all elements- Chart & Matrix	08	CO3
4	4D BIM and 5D BIM	Project Schedule, 4D BIM Modelling, Construction Analysis, 3D Control & Planning, BIM for Safety, Disaster & Risk Analysis, Digital Fabrication, Phase Planning, As-built/Record Models 5D BIM and Quantity Take off with UOM, Exercise & Demo, Quantity Take Off, 5D – Estimation and Analysis, Cost Control, Asset Information Model, COBie and Deliverables, Space Attributes, Asset Attributes and Asset requirement, Infrastructure System, Information Exchange with Facility Management.	08	CO4
5	Beyond BIM - Emerging Trends	Industrialization of Construction through BIM – DfMA, IoT in BIM, Data analytics using AI and ML, Smart Infrastructure, Digital Twin –Connected Infrastructure.	08	CO5

Reference Books:
Karen Kensek, Building Information Modeling BIM in Current and Future Practice, Wiley, 2014
Rafael Sacks, Charles Eastman, Ghang Lee, Paul Teicholz, BIM Handbook A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers, Wiley, 2018
e-Learning Source:
Link provided by Edutech L&T

Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
PO-PSO	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	3	3	0	0	0	0	0	0	3	3	3
CO3	0	0	0	3	3	0	0	0	0	0	0	3	3	3
CO4	0	0	0	3	3	0	0	0	0	0	2	3	3	3
CO5	0	0	0	3	3	0	0	0	0	0	0	3	3	3

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



Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	CE365	Title of the Course	Formwork Engineering Practices	L	T	P	C
Year	III	Semester	VI	3	1	0	4
Pre-Requisite	CE204, CE234 & CE361	Co-requisite	-----				
Course Objectives	Upon the completion of course, the learners will be able: <ul style="list-style-type: none"> To select the appropriate formwork system. To design the formwork system. Compute the bill of quantity for the formwork system. Incorporate safer design and construction aspects including assembling and dismantling to prevent formwork failures. 						

Course Outcomes	
CO1	Ability to classify various formwork system including advantages and disadvantages
CO2	Ability to plan and design traditional formwork system.
CO3	Ability to analyze the cost of formwork system and capability to optimize it.
CO4	Learner will be aware of modular formworks and scaffolding.
CO5	Ability to execute the erection of formwork including the understanding of its possible failures.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Formwork System	Classification, benefits, objectives, areas of competitiveness, selection of Formwork, formwork materials, accessories and consumables, application of Tools. Formwork for vertical and horizontal applications. Formwork for stairs. Components, assembly and de-shuttering of formwork System, Flex System, Heavy Duty Tower System, Load Bearing Tower.	08	CO1
2	Planning and Design of Formwork	Formwork planning and monitoring, basics of formwork design, design assumptions and design methods. Design of vertical formwork – wall, column and horizontal formwork – beam, slab and checks. Formwork drawing Concept and preparation Guidelines.	08	CO2
3	Formwork Cost Estimation and Optimization	Schedule of formwork, Mobilization distribution, BOQ, Quantity Calculation, Cost optimization	08	CO3
4	Modular and Special Formwork, Scaffolding	Modular and Special formwork: Advantages and Limitations, Aluminium formwork - Drawings & Components. Scaffolding: Modular scaffold Installation sequence, Tie and material specification, Ladder safety, Loading Classification, application, Components of L&T Modular Scaffolding system, Access scaffold Do's and Don'ts. Innovation and Global practices.	08	CO4
5	Formwork Building and Erection, Formwork Failures	Formwork assembly for Wall & Column Panels, Equipment and Layout, Plant and Machinery, Formwork erection and safety, Inspection and Corrections, Plant and Machinery, Code and Contractual Requirements. Formwork Failures: Causes, design deficiency, safety in formwork, prevention of formwork failures.	08	CO5

Reference Books:
D. D. D. Oberlender, Robert L. Peurifoy, Formwork for Concrete Structures, McGraw Hill LLC, 2010
Awad S. Hanna, Concrete Formwork Systems, Taylor & Francis Limited, 2019
e-Learning Source:
Link provided by Edutech L&T

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

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



Integral University, Lucknow

Effective from Session: 2020-21							
Course Code	CS203	Title of the Course	Cyber Law & Information Security	L	T	P	C
Year	III	Semester	VI	2	1	0	3
Pre-Requisite	-----	Co-requisite	-----				
Course Objectives	<ul style="list-style-type: none"> • Knowledge about cyber law, intellectual property and cybercrimes (internet security threats), trademarks and domain theft. • Knowledge on the disciplines of technology, E-business and law to allow them to minimize the occurrence and severity of information security incidents. • Knowledge about Information System and principles of Information Security (as confidentiality, integrity, and availability). • Knowledge of cryptography and techniques used to detect and prevent network intrusions. 						

Course Outcomes	
CO1	Understand key terms and concepts in cyber law, intellectual property and cybercrimes(internet security threats), trademarks and domain theft
CO2	Keep an appropriate level of awareness, knowledge and skill on the disciplines of technology, E-business and law to allow them to minimize the occurrence and severity of information security incidents.
CO3	Understand about Information System and principles of Information Security (as confidentiality, integrity, and availability)
CO4	Understand about cryptography and techniques used to detect and prevent network intrusions.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Fundamentals of Cyber Law	Jurisprudence of Cyber Law, Object and Scope of the IT Act 2000, Introduction to Indian Cyber Law, Unicitral Model Law, ISP Guideline. Intellectual property issues and cyber space, Indian perspective, Overview of Intellectual property related legislation in India, Patent, Copy Right, Trademark law, Law related to semiconductor layout & design.	08	CO1
2	E - Commerce	Security Threats to E - Commerce, Virtual Organization, Business Transactions on Web, E Governance and EDI, Concepts in Electronics payment systems, E-Cash, Credit/Debit Cards, E- Agreement, Legal recognition of electronic and digital records, E- Commerce Issues of privacy, Wireless Computing- Security challenges in Mobile devices. Digital Signatures - Technical issues, legal issues, Electronic Records, Digital Contracts, and Requirements of Digital Signature System.	07	CO2
3	Investigation and Ethics	Cyber Crime, Cyber jurisdiction, Cybercrime and evidence act, Treatment of different countries of cybercrime, Ethical issues in data and software privacy, Plagiarism, Pornography, Tampering computer documents, Data privacy and protection, Domain Name System, Software piracy, Issues in ethical hacking, Internet security threats: Hacking, Cracking, Sneaking, Viruses, Trojan horse, Malicious Code & logic bombs. Introduction to biometric security and its challenges, Fingerprints. Cybercrime forensic: CASE STUDY in Cyber Crime.	09	CO3
4	Information security	Information Systems and its Importance, Role of Security in Internet and Web Services, Principles of Information Security, Classification of Threats and attacks, Security Challenges, Security Implication for organizations, Security services - Authentication, Confidentiality, Integrity, Availability and other terms in Information Security, Information Classification and their Roles. Introduction to Cryptography, Issues in Documents Security, Keys: Public Key, Private Key, Firewalls, Basic Concepts of Network Security, Perimeters of Network protection & Network attack, Need of Intrusion Monitoring and Detection.	09	CO4

Reference Books:
Harish Chander “Cyber Law and IT Protection” , PHI Publication, New Delhi.
Merkov, Breithaupt, “ Information Security”, Pearson Education.
“Cyber Law in India” - Farooq Ahmad-Pioneer books.
K. K. Singh, Akansha Singh “Information Security and Cyber law”, Umesh Publication, Delhi.
e-Learning Source:
https://nptel.ac.in/courses/106106129

Course Articulation Matrix: (Mapping of COs with POs and PSOs)															
PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO															
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: 2023-24							
Course Code	CG302	Title of the Course	Career Development Course	L	T	P	C
Year	III	Semester	VI	2	0	0	0
Pre-Requisite	-----	Co-requisite	-----				
Course Objectives	The course on soft skills aims at preparing young minds into professionals of tomorrow and to make them aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.						

Course Outcomes	
CO1	Identify strategies to improve interpersonal relationships.
CO2	Job Application Resume writing.
CO3	Learn about positive Body language.
CO4	Students will be better prepared for before, during and after the Interview.
CO5	Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, conflict management and leadership quality.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Soft Skills: An Introduction	<ul style="list-style-type: none"> Definition and Significance of Soft Skills. Process. Importance of SoftSkill Development. Self-Discovery: Discovering the Self. Setting Goals. Beliefs, Values, Attitude, Virtue. Positivity and Motivation: Developing Positive Thinking and Attitude. Driving out Negativity;.Enhancing Self Motivation Levels 	02	CO1
2	Writing Skills	<ul style="list-style-type: none"> Netiquettes: Effective e-mail message. Writing Job Application: Cover letter, Differences between Bio-data, CV and Resume, Resume Construction.Video Resume Creating Professional Profiles on Professional Networking Sites like LinkedIn 	04	CO2
3	Body Language and Group Discussion Process	<ul style="list-style-type: none"> Forms of non-verbal communication; Interpreting body language cues; Effective use of body languageduring Interview. Group Discussion: Group Dynamics, Differences between group discussion and debate; Ensuring success in group discussions. Practice Group Discussion and feed back. 	06	CO3
4	Interview Process	<ul style="list-style-type: none"> Ensuring success in job interviews. Tips to prepare for before, during and after the Interview New Interview trends - Telephonic & Skype Interview Grooming and dress code. Common Interview Questions ,Mock Interviews / Practice Interview Sessions and Feedback. 	06	CO4
5	Corporate Etiquette and employability skills	<ul style="list-style-type: none"> Making a Great First Impression, greetings, introductions, The Art of Small Talk and Conversations Employer Expectations and Employability Skill Requirements Decision Making, Negotiation skills, Conflict Management and Leadership Skills Time Management Concept and Essential Tips 	06	CO5

Reference Books:
Managing Soft Skills for Personality Development – edited by B.N. Ghosh, McGraw Hill India,2012.
English and Soft Skills – S.P. Dhanavel, Orient Blackswan India, 2010.
The Definitive Book of Body Language. Pease, Allan and Barbara Pease. Manjul Publishing House.

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

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



Integral University, Lucknow

Effective from Session: 2022-23							
Course Code	CE326	Title of the Course	Engineering Geology Lab	L	T	P	C
Year	III	Semester	VI	0	0	2	1
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	To impart the experimental knowledge of geology in civil engineering						

Course Outcomes	
CO1	To understand the basic knowledge of types natural materials like rocks & minerals and soil.
CO2	To understand the basic concept of earthquake, type, causes and its measurement.
CO3	To understand the basic concept of Soil profile and classification, engineering properties of soil, geological problems related with tunneling.
CO4	To know the Ground water availability, zones of ground water and groundwater investigations.
CO5	To learn about dam, types, failure and its geological investigation of site.

S No.	Experiment No.	Content of Experiment	Contact Hrs.	Mapped CO
1	Experiment No. 1	Demonstration of the elementary idea about internal structure of the earth.	02	CO1
2	Experiment No. 2	Identification of the common rock forming minerals and their physical properties.	02	CO1
3	Experiment No. 3	Observation and Identification of different types of rocks.	02	CO1
4	Experiment No. 4	Demonstration and study of the theory of strike and dip.	02	CO2
5	Experiment No. 5	To Study the causes of earthquakes.	02	CO2
6	Experiment No. 6	Mechanism and classification of folds and faults	02	CO3
7	Experiment No. 7	Geological cross-sections and study of the Geological maps.	02	CO3
8	Experiment No. 8	Classification of ground water provinces in India	02	CO3
9	Experiment No. 9	Site selection for dam, reservoir and tunnel.	02	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	2	1	2	3	1	2	3	1	2	2	2	2	0
CO2	1	3	3	1	1	2	3	1	1	2	1	1	0	0
CO3	2	3	3	2	2	1	3	2	3	3	2	2	0	0
CO4	2	2	3	2	3	2	3	1	2	2	1	2	0	0
CO5	3	2	2	2	1	2	2	2	1	2	1	1	0	0

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



Integral University, Lucknow

Effective from Session: 2015-16							
Course Code	CE327	Title of the Course	Environmental Engineering Lab-I	L	T	P	C
Year	III	Semester	VI	0	0	2	1
Pre-Requisite	NIL	Co-requisite	CE310				
Course Objectives	To impart the experimental knowledge of water quality parameters assessment to be applied in environmental engineering						

Course Outcomes	
CO1	Learners will be able to determine, explain, analyze and compare various physical water quality parameters according to the guidelines for drinking water quality code IS-10500:2012.
CO2	Learners will be able to determine, explain, analyze and compare various chemical quality parameters according to the guidelines for drinking water quality code IS-10500:2012.
CO3	Learners will be able to determine, explain, analyze and compare various and biological water quality parameters according to the guidelines for drinking water quality code IS-10500:2012.

S No.	Experiment No.	Content of Experiment	Contact Hrs.	Mapped CO
1	Experiment 1	Determination of Turbidity, colour and conductivity.	03	CO1
2	Experiment 2	Determination of pH, Alkalinity and acidity.	03	CO2
3	Experiment 3	Determination of Hardness and chlorides.	03	CO2
4	Experiment 4	Determination of Residual chlorine and chlorine demand.	03	CO2
5	Experiment 5	Determination of dissolved oxygen.	03	CO2
6	Experiment 6	Determination of most probable number of coliforms.	03	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	0	3	3	3	3	0	3	2
CO2	0	0	0	3	3	0	3	3	3	3	0	3	2	2
CO3	0	0	0	3	3	0	3	3	3	3	0	3	2	2
CO4	0	0	0	3	3	0	3	3	3	3	0	3	2	2
CO5	0	0	0	3	3	0	3	3	3	3	0	3	2	2

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



Integral University, Lucknow

Effective from Session: 2016-17							
Course Code	CE329	Title of the Course	Survey Camp	L	T	P	C
Year	III	Semester	VI	3	1	0	4
Pre-Requisite	NIL	Co-requisite	NIL				
Course Objectives	The objective of the survey camp is to enable the students to get practical training in the Survey field work.						

Course Outcomes	
CO1	The learner will be able to relate theoretical knowledge of surveying to resolve real field problems.
CO2	The learner will be able to establish horizontal control and vertical control by traversing and triangulation.
CO3	The Learner will be able to prepare field survey record, and which shall include all original field observations, calculations and plots.
CO4	The learner will be able to identify errors in field measurement and apply appropriate corrections.
CO5	The learner will be able to use modern tools used in surveying.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	-	Survey camp emphasizes on field application of basis survey task include levelling, traverse survey, and curve setting. The plotting of the map of the given area along with the important features.	-	-

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

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



Integral University, Lucknow

Effective from Session: 2022-23

Course Code	CE352	Title of the Course	Comprehensive Assessment-II	L	T	P	C
Year	III	Semester	VI	-	-	-	1
Pre-Requisite	----	Co-requisite	----				
Course Objectives	<ul style="list-style-type: none"> 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.
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Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	-	Complete syllabus of 3 rd year B.Tech Civil Engineering	-	CO1

Reference Books:

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e-Learning Source:

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Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO														
CO1	3	3	3	3	0	3	0	3	0	0	0	3	3	1

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