

# **SYLLABUS**

**OF**

***B. TECH***

***OF***

***IV YEAR***

**B. TECH. (CBCS)**

**DEPARTMENT OF CIVIL  
ENGINEERING**

**INTEGRAL UNIVERSITY  
LUCKNOW**

# SYLLABUS AND EVALUATION SCHEME

**Branch: Civil Engineering**

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

**Year – IV, Semester – VII**

S. No.	Course Category	Code No	Name of Subject	Periods			Credits C	Evaluation Scheme				Subject Total
				L	T	P		Sessional Exam			Exam ESE	
							CT	TA	Total			
1	DC	CE401	Environmental Engineering-II	3	1	0	4	40	20	60	40	100
2	DC	CE402	Construction Technology and Management	3	1	0	4	40	20	60	40	100
3	DC	CE403	Steel Structure	3	1	0	4	40	20	60	40	100
4	DE	CE404-CE407	Department Elective-III	3	1	0	4	40	20	60	40	100
5	DE	CE410-CE413	Department Elective-IV	3	1	0	4	40	20	60	40	100
<b>PRACTICAL / DRAWING / DESIGN</b>												
6	DC	CE418	Environmental Engineering Lab-II	0	0	2	1	40	20	60	40	100
7	DC	CE419	Structural Detailing Lab	0	0	2	1	40	20	60	40	100
8	DC	CE420	Minor Project	-	-	2	1	-	-	60	40	100
9	DC	CE300*	Industrial Training	-	-	-	0	-	-	-	50	50
<b>Total</b>				<b>15</b>	<b>5</b>	<b>6</b>	<b>23</b>					<b>800</b>

\*Note: Industrial Training (CE300) is a zero credit course. Student must clear this paper with 50% marks and marks will not be included in result

**L** – Lecture; **T** – Tutorial; **P** – Practical; **C** – Credits; **CT** – Class Test; **TA** – Teacher Assessment

**Sessional Total (CA)** = Class Test + Teacher Assessment

**Subject Total** = Sessional Total (CA) + End Semester Examination (ESE)

**DC** – Departmental Core

**DE** – Departmental Elective

**OE** – Open Elective

# SYLLABUS AND EVALUATION SCHEME

**Branch: Civil Engineering**

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

**Year – IV, Semester – VIII**

S. No.	Course Category	Code No	Name of Subject	PERIODS			Credits C	EVALUATION SCHEME			Subject Total	
				L	T	P		SESSIONAL EXAM		EXAM ESE		
							CT	TA	Total			
<b>THEORY SUBJECT</b>												
1	OE	-	Open Elective - II	3	1	0	4	40	20	60	40	100
<b>PRACTICAL / DRAWING / DESIGN</b>												
2	DC	CE499	B.Tech Project	-	-	-	4	-	-	60	40	100
3	DC	CE499	B.Tech Project	-	-	-	4	-	-	60	40	100
4	DC	CE499	B.Tech Project	-	-	-	4	-	-	60	40	100
5	DC	CE451	Seminar	-	-	-	3	-	-	60	40	100
6	DC	CE452	Comprehensive Assessment	-	-	-	2	-	-	100	-	100
<b>Total</b>				<b>3</b>	<b>1</b>	<b>0</b>	<b>21</b>					<b>600</b>

**L** – Lecture; **T** – Tutorial; **P** – Practical; **C** – Credits; **CT** – Class Test; **TA** – Teacher Assessment

**Sessional Total (CA)** = Class Test + Teacher Assessment

**Subject Total** = Sessional Total (CA) + End Semester Examination (ESE)

**DC** – Departmental Core

**DE** – Departmental Elective

**OE** – Open Elective

## **List of Departmental Electives (III & IV)**

### **Departmental Elective - III**

CE404	Transportation System & Planning
CE405	Advanced Concrete Design
CE406	Environmental Pollution Control
CE407	Design of Waste Water System

### **Departmental Elective - IV**

CE410	Earthquake Resistant Design
CE411	Advanced Foundation Design
CE412	Impact of Climate Change for Civil Engineering Projects
CE413	Plastic Design of Steel Structures



## Integral University, Lucknow

<b>Effective from Session:2018-19</b>							
<b>Course Code</b>	CE401	<b>Title of the Course</b>	Environmental Engineering-II	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	IV	<b>Semester</b>	VII	3	1	0	4
<b>Pre-Requisite</b>	CE310	<b>Co-requisite</b>	NIL				
<b>Course Objectives</b>	Students will be familiar with current and emerging environmental engineering and global issues, and have an understanding of ethical and societal responsibilities. Students will have the necessary qualifications for employment in environmental engineering and related professions, for entry into advanced studies.						

Course Outcomes	
<b>CO1</b>	The learner will learn basic management skill in given environmental condition about various characteristics of sewage.
<b>CO2</b>	Learner will understand the basic water management and design criteria of sewer.
<b>CO3</b>	To understand various treatment process and engineering knowledge for filter design.
<b>CO4</b>	The learner will learn about sewage stabilization and environmental condition of sewage.
<b>CO5</b>	To learn the waste management in given environmental condition in given location.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Wastewater Quality and Quantity Estimation	Introduction to wastewater engineering, wastewater management, Wastewater Quantity Estimation, Fluctuations in Dry Weather Flow, Population Equivalent, Wastewater Characterization.	08	CO1
2	Wastewater Collection and Conveyance	Conservancy system, Waste water carriage system, wastewater flow rates, storm water flow, Hydraulic design of Sewers, construction of sewers, Sewer Appurtenances.	08	CO2
3	Wastewater Treatment	Unit operations and unit processes for wastewater treatment, Preliminary and Primary treatment: Screening, grit chamber, Sedimentation and chemical clarification. Secondary treatment: Types of biological treatment systems, theory and design of trickling filter; theory and design of Activated sludge process.	08	CO3
4	Miscellaneous Method	Oxidation ditch, aerated lagoons, waste stabilization pond, Rotating biological contactors, Up flow anaerobic sludge blanket reactor, Introduction to Duckweed pond, Vermiculture and Root zone technology.	08	CO4
5	Waste Management	Sludge characteristics, Sludge Treatment process, disposal of sludge, septic tank, solid waste disposal, composting, incineration, Introduction to sanitary landfill.	08	CO5

**Reference Books:**

Birdie G.S and Birdie J.S, Water Supply and Sanitary Engineering, Dhanpat Rai & Sons, 2010.

Duggal K N, Elements of Environmental Engineering, S Chand & Co Ltd.

Garg S K, Environmental Engineering Vol II, Khanna Publishers, 2010

Fair, Gayer and Okun, Water and Waste water Engineering Vol. II, John Wiley. 3rd Edition 2011.

Metcalf and Eddy, Waste Water Engineering, Treatment, Disposal & Reuse, Tata McGraw Hill. 2002.

**e-Learning Source:**

<https://nptel.ac.in/courses/105105178>

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
	<b>CO1</b>	3	2	3	0	0	0	3	0	0	0	0	0	2
<b>CO2</b>	3	2	3	0	0	0	3	0	0	0	0	0	1	2
<b>CO3</b>	3	2	3	0	0	0	3	0	0	0	0	0	1	1

<b>CO4</b>	3	0	0	0	0	0	3	0	0	0	0	0	3	2
<b>CO5</b>	3	0	0	0	0	0	3	0	0	0	0	0	2	3

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

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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## Integral University, Lucknow

Effective from Session:2015-16							
<b>Course Code</b>	CE402	<b>Title of the Course</b>	Construction Technology and Management	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	IV	<b>Semester</b>	VII	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
<b>Pre-Requisite</b>	NIL	<b>Co-requisite</b>	NIL				
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To make the students aware regarding general construction practices used in past and in upcoming future.</li> <li>To impart the practical knowledge of Construction Management tools and methods used in Project monitoring and Control.</li> <li>To make them aware about the construction safety and its guidelines to ensure safe construction environment.</li> <li>To develop problem solving skills to overcome practical/situation based site execution problems in construction industry.</li> <li>To enhance the skills by using operation, maintenance and productivity ethics for Equipment end use.</li> </ul>						

CourseOutcomes	
<b>CO1</b>	To make students familiar with the past and recent trends of construction industry using project management tools.
<b>CO2</b>	Understand the information based on construction activity monitoring and to analyses the problems using Network diagram techniques.
<b>CO3</b>	To make the students aware about the globally recognized guidelines, theories for safety and other economic benefits.
<b>CO4</b>	Learner will be able to understand the problems associated with contract administration & bidding due to poor management of construction projects.
<b>CO5</b>	To facilitate the need to understand the productivity of construction equipment based on various construction works.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Fundamentals of Construction Management	Introduction, Problems in Construction Industry, History of Construction Management. Construction Projects & its Classifications .Project Cycle, Project Parameters, Organizations in Construction Industry, Planning, Scheduling, Monitoring and Management Information System.	08	CO1
2	Network Techniques & Analysis	Basic Concepts , Application of PERT, CPM, GERT, AOA & AON Networks and its applications , Critical Path, Bar Charts, Milestone Chart, Time Estimates, Preparation of Network Diagrams, Crashing, Cost Planning, Resource Allocation, Resource Planning, Line of Balance Techniques.	08	CO2
3	Construction Safety & Engineering Economics	Introduction, Hazards in Construction Projects, Cause of Accidents, Classifications of Construction Accidents, General Safety Programme, and Accident Report, Safety Precautions at Construction Site. Engineering Economics- Time Value of Money, Cash Flow Diagrams, Payback Period, Replacement Analysis, Concept of Depreciation and its methods, Break even chart Analysis.	08	CO3
4	Contract Management	Introduction, Indian Contract Act, Labour Laws, Prequalification of Contracts, Selection of Contractor, Classification of Contracts, Conditions of Contract, Prerequisites of Tendering, Tender Document, Tender Notice, Security Deposit , Earnest Money Deposit, Evaluation of Tenders, Contract Negotiation, Award of Contract, Termination of Contract, Settlements of Disputes, Arbitration and Conciliation Act, Commissioning and Closure of Project.	08	CO4
5	Construction Equipment Management	Introduction, Procurement of Equipment, Selection of Equipment, Productivity, Operational Cost, Owning and Hiring Cost, Work motion Study, Equipment Maintenance, Time Concepts for use, Depreciation, earth moving Equipments, Hauling and Hoisting Equipments, Concrete Production Equipments, Operational Use of equipments.	08	CO5

### Reference Books:

Dr. U.K.Shrivastava "Construction Planning and Management",Galgotia Publications.; 3rd Edition 2005.

Kumar Neeraj Jha, " Construction Project Management ", Pearson New Delhi; 1st Edition 2005.

K.G.Krishnamurthy and S.V.Ravindra "Construction and Project Management" CBS Publishers and Distributers Pvt.ltd.; 2ndEdition 2017.

IS 456-2000 Indian Standard "Construction Planning, Equipment and Methods", Mc Graw Hill; 7th Edition 2006.

**e-Learning Source:**<http://nptel.ac.in/courses/105103093/>

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	0	0	0	0	0	3	0	0	0	0	0	3	2
CO5	3	0	0	0	0	0	3	0	0	0	0	0	2	3

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

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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## Integral University, Lucknow

Effective from Session:2015-16							
<b>Course Code</b>	CE403	<b>Title of the Course</b>	Steel Structures	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	IV	<b>Semester</b>	VII	3	1	0	4
<b>Pre-Requisite</b>	CE204	<b>Co-requisite</b>	Nil				
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>◆ Learner will understand the types and requirement of connections in steel members, then they should be able to design connection given conditions by following guide line of code IS: 800 of code IS: 800 □</li> <li>◆ Learner will understand the behavior &amp; significance of different parameter of compression member, and should be able to design of compression member by following guide line of Indian codes. □</li> <li>◆ Learner will understand the behavior &amp; mode of failures of tension member, then they be should able to design of tension member by following guide line of Indian codes. □</li> <li>◆ Learner will understand the behavior flexural member, then they be should able to design members by following guide line of Indian codes. □</li> <li>◆ Learner will understand the behavior and requirement Industrial building, then they be should able to design of elements of industrial building by following guide line of Indian codes.</li> </ul>						

Course Outcomes	
<b>CO1</b>	Learner should be able to design the various steel structural connections as per conditions and requirements.
<b>CO2</b>	Learner should be able to apply the principles, procedures and codal requirements to the analysis and design compression members by knowing its loading conditions.
<b>CO3</b>	Learner should be able to apply the principles, procedures and codal requirements to the analysis and design tension members for given loading conditions
<b>CO4</b>	Learner should be able to Apply the principles, procedures and codal requirements to the analysis and design flexure members for given loading conditions.
<b>CO5</b>	Learner should be able to define the requirement of industrial structure and also able design its components for given requirements

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Attributes of Steel Structural Design	Basis for design, design philosophies, Introduction to Limit State Design, Limit state for steel design, limit state of strength, limit state of serviceability, probabilistic basis for design, design criteria, material, structural steel. Stress - Strain Curve for Mild Steel. Introduction to rolled steel sections, Loads. Riveted, Bolted, Pinned and Welded connections, Strength, Efficiency and Design of joints.	08	CO1
2	Design of Steel Compression Members	Compression members- Effective length, Slenderness ratio, Strength of Compression members, Design of Struts, Columns, Built-up Columns, Design of eccentrically loaded columns.	08	CO2
3	Design of Steel Tension Members	Tension members – Net and Gross sectional areas, Strength of members and their design. Design of slab and Gusset bases, Design of Grillage footing.	08	CO3
4	Design of Steel Beams	Beams – web crippling and web buckling, design of laterally supported beam, design of laterally unsupported beam.	08	CO4
5	Design of Industrial Building	Design of Industrial Buildings –Elements of an industrial building, Design of elements of roof trusses, i.e purlin and plate girder.	08	CO5

### Reference Books:

Subramanian, "Steel Structures- "Design and Practice", Oxford, University Press.

M.R. Shriyekar, "Limit State Design in Structural Steel", PHI, New Delhi.

Duggal S.K. "Limit State Design of Steel Structures", McGraw-Hill Education (India) Private Limited, New Delhi.

Kazmi, S.M.A and Jindal R.S "Design of Steel Structures" PHI, New Delhi, India.

I.S: 800-2007- Code of Practice for General Construction in Steel, BIS, New Delhi, I

<b>e-Learning Source:</b>
<a href="http://nptel.ac.in/courses/105106112/">http://nptel.ac.in/courses/105106112/</a>
<a href="https://youtu.be/CNE4hk_SGT0">https://youtu.be/CNE4hk_SGT0</a>
<a href="https://youtu.be/ruuKvu5QtKI">https://youtu.be/ruuKvu5QtKI</a>
<a href="https://youtu.be/utgnv9NIFQc">https://youtu.be/utgnv9NIFQc</a>

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

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

Name & Sign of Program Coordinator	Sign & Seal of HoD
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## Integral University, Lucknow

<b>Effective from Session:2015-16</b>							
<b>Course Code</b>	CE404	<b>Title of the Course</b>	Transportation Systems and Planning	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	IV	<b>Semester</b>	VII	3	1	0	4
<b>Pre-Requisite</b>	CE303	<b>Co-requisite</b>	NIL				
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>• To introduce the student to fundamentals of Transport System and it's planning.</li> <li>• To gain knowledge about transportation system planning and its economic analysis.</li> </ul>						

Course Outcomes	
<b>CO1</b>	Learner will acquire knowledge about fundamentals of transportation system, role of transportation for various aspects & hierarchy of roads in India.
<b>CO2</b>	Learner will be able to evaluate the concepts of public transport selection & will be able to primary design few transport infrastructure.
<b>CO3</b>	Learner will be able to understand the fundamentals of transportation costs, demand & supply and all effects of transportation on environmental.
<b>CO4</b>	Learner will understand basis of transport planning process & will be able to do economic evaluation of transport projects.
<b>CO5</b>	Learner will understand fundamentals about system operations & intelligent transportation systems.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Transport System and Its Development	Transport System and its Development: Transportation system, classification of transport system, urbanization and transport demand, motorization trends, urban transport problems, role of transportation: social, economic, political, and environmental; transportation today, organizations involved in transportation development in India. Hierarchy of Roads and Capacity: Hierarchy of Roads, Concept of PCU, capacity and level of service, factors affecting capacity and level of service; capacity of rural and urban roads-	08	CO1
2	Transport Facility Design	Public Transportation and Transport Facility Design: Technology in transportation, public transport systems, design of parking facilities, design of pedestrian facilities, design of cycle tracks, design of bus facilities, terminal and its functions, transit planning, transit demand, transit route network.	08	CO2
3	Transportation Cost, Demand and Supply	Transportation Cost, Demand and Supply: Transport costs: capital cost, operation and maintenance cost, vehicle operating cost (VOC), value of time (VOT), accident cost; transportation demand, supply in transportation, transportation networks and environmental impact.	08	CO3
4	Transport Planning	Transport Planning: Transportation planning surveys, transport planning process: trip generation, trip distribution, modal split and trip assignment; economic evaluation of transport plans.	08	CO4
5	Modern Transportation Techniques	System Operations and ITS: System operation and management, Intelligent Transport System (ITS), Benefits of ITS, ITS services: advanced traffic management system (ATMS), advanced traveler information system (ATIS), advanced vehicle control system (AVCS), commercial vehicle operation (CVO), advanced public transport system (APTS), emergency management system (EMS), electronic payment (EP), safety, working of ITS, application of ITS.	08	CO5

**Reference Books:**

- Traffic Engineering & Transport Planning by LR Kadyali, Khanna Publisher, Delhi, 2010.
- Theory and Applications of Economics in Highway and Transport Planning, Vinay Maitri, P.K.Sarkar, Standard Publishers Distributors, Delhi, 2008.
- Transportation Planning, Principles, Practice and Policies, P.K.Sarkar, Vinay Maitri, G.J. Joshi, Prentice-Hall India, Delhi, 2002.
- Transportation Engineering and Planning, C.S.Papacostas, P.D.Prevedouros, Prentice –Hall India, Delhi, 2005.
- 5. Highway Engineering-S.K.Khanna& C.EG. Justo, Nem Chand & Bros, Roorkee, 2014.

**e-Learning Source:**

<https://nptel.ac.in/courses/105106058/>

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

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

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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## Integral University, Lucknow

<b>Effective from Session:2015-16</b>							
<b>Course Code</b>	CE405	<b>Title of the Course</b>	Advanced Concrete Design	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	IV	<b>Semester</b>	VII	3	1	0	4
<b>Pre-Requisite</b>	CE311	<b>Co-requisite</b>	Nil				
<b>Course Objectives</b>	Students are expected to realize the importance of design of heavy RCC structure and their application in civil engineering						

CourseOutcomes	
<b>CO1</b>	Natures of stresses in spherical domes, Analysis of spherical domes, Design of reinforced concrete domes under uniformly distributed load and point load at crown, using IS:456-2000 guide lines. Nature of stresses in Curved beams, Design philosophy, Design of reinforced concrete curved beam using IS:456-2000 guide lines
<b>CO2</b>	Nature of stresses in reinforced concrete overhead tank, Design philosophy, IS Code guide lines, Design of rectangular and cylindrical water tank using IS-3370 design charts
<b>CO3</b>	Elements of Intze tank, Effect of continuity, Design of top dome, Top ring beam, Cylindrical wall, Bottom ring beam, Conical dome, Bottom dome , Bottom circular beam at junction of tank and supporting columns, Design of supporting columns with bracings and raft foundation, Reinforcement detailing of different elements of Intze tank.
<b>CO4</b>	Dead load, Live load, Wind load and Earthquake loads, Analysis of building frames by substitute frames,portal and cantilever methods, Design of building frames.
<b>CO5</b>	guidelines as per IS-800, Design of encased columns. Types of bridges, Economic span, Load, forces and permissible stresses, General design requirements, Design of deck slab using effective width concept, Introduction to Pigeaud's and Courban's theory, Design concept of encased columns, Guide

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	RC Domes and Curved Beams	Natures of stresses in spherical domes, Analysis of spherical domes, Design of reinforced concrete domes under uniformly distributed load and point load at crown, using IS:456-2000 guide lines. Nature of stresses in Curved beams, Design philosophy, Design of reinforced concrete curved beam using IS:456-2000 guide lines.	08	CO1
2	RC Overhead Tank	Nature of stresses in reinforced concrete overhead tank, Design philosophy, IS Code guide lines, Design of rectangular and cylindrical water tank using IS-3370 design charts	08	CO2
3	Intze Tank	Elements of Intze tank, Effect of continuity, Design of top dome, Top ring beam, Cylindrical wall, Bottom ring beam, Conical dome, Bottom dome , Bottom circular beam at junction of tank and supporting columns, Design of supporting columns with bracings and raft foundation, Reinforcement detailing of different elements of Intze tank.	08	CO3
4	Building Frames	Dead load, Live load, Wind load and Earthquake loads, Analysis of building frames by substitute frames ,portal and cantilever methods, Design of building frames.	08	CO4
5	RC Bridges and Composite members	lines as per IS-800, Design of encased columns. Types of bridges, Economic span, Load, forces and permissible stresses, General design requirements, Design of deck slab using effective width concept, Introduction to Pigeaud's and Courban's theory, Design concept of encased columns, Guide	08	CO5

**Reference Books:**

N .Krishna Raju "Advance concrete design", CBS Publishers, 3rd edition,2015

D.J. Victor "Essential of Bridge Engineering" , Oxford & IBH Publishing company, 6th edition 2017

B.C. Punmia and A.K.Jain "Limit State Design of Reinforced Concrete", Laxmi Publications, 1<sup>st</sup> Reprint2017.

IS:3370(Part-1,2,3,4) -1965-Code of practice for concrete structures for the storage of liquids.

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

IS:11682-1985-Criteria for design of RCC staging for overhead water tank.

**e-Learning Source:**

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

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

<http://onlinecourses.nptel.ac.in>

<http://m.youtube.com/channel>

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

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

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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## Integral University, Lucknow

<b>Effective from Session:2015-16</b>							
<b>Course Code</b>	CE406	<b>Title of the Course</b>	Environmental Pollution Control	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	IV	<b>Semester</b>	VII	3	1	0	4
<b>Pre-Requisite</b>	CE310, CE401	<b>Co-requisite</b>	NIL				
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>Impart knowledge on fundamental aspects of air pollution &amp; control, solid waste management and noise pollution.</li> <li>To introduce some basics of sanitation methods essential for protection of community health.</li> </ul>						

CourseOutcomes	
<b>CO1</b>	Realize the importance of ecosystem, its elements and biodiversity for maintaining ecological balance.
<b>CO2</b>	Identifying air pollution sources, effects, its measurement and control devices.
<b>CO3</b>	Identifying the sources of water pollution and classify the pollutants and analyze the waste water sample.
<b>CO4</b>	Identify the type of land pollution and understand solid waste management.
<b>CO5</b>	Identifying noise pollution sources, effects, its measurement, prevention and control.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Impact of man on environment	Environment and its Components, Biosphere, Hydrologic Cycle, Nutrient Cycles, Anthropogenic Activities, Consequences of Population Growth, Energy Problem, Pollution of Air, Water and Land. Environmental Protection Act.	08	CO1
2	Air Pollution	Sources and Effects, Meteorological Aspects, Air Pollution Sampling and Measurement, Control Methods and Equipment, Control of Specific Air Pollutants, Air (Prevention and Control of Pollution) Act. National Ambient Air Quality Standards.	08	CO2
3	Water Pollution	Sources and Classification of Water Pollutants, Wastewater Sampling and Analysis. Water (Prevention and Control of Pollution) Act, Water Quality Criteria, WHO Drinking Water Specifications, BIS Drinking Water Specification (IS 10500: 2012)	08	CO3
4	Land Pollution	Definition, Major Types of Land Pollution, Solutions for Land Pollution, Solid Waste Management, Generation, Storage, Collection, Transport, Processing and Disposal. Land Filling with Solid Waste, Solid Waste Management Rules, 2016.	08	CO4
5	Noise Pollution	Definition, Human Diseases Caused by Noise Pollution, Effects of Noise Pollution on Wildlife and Marine Life, Preventive Measures, The Noise Pollution (Regulation And Control) Rules 2000, Noise Level Calculations.	08	CO5

<b>Reference Books:</b>	
Birdie G.S and Birdie J.S, Water Supply and Sanitary Engineering, Dhanpat Rai & Sons, 2010.	
Duggal K N, Elements of Environmental Engineering, S Chand & Co Ltd.	
Fair, Gayer and Okun, Water and Waste water Engineering Vol. II, John Wiley. 3rd Edition 2011.	
Metcalf and Eddy, Waste Water Engineering, Treatment, Disposal & Reuse, Tata McGraw Hill. 2002.	
<b>e-Learning Source:</b>	
<a href="https://onlinecourses.nptel.ac.in/noc22_ch45/preview">https://onlinecourses.nptel.ac.in/noc22_ch45/preview</a>	

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

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

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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## Integral University, Lucknow

<b>Effective from Session:2015-16</b>							
<b>Course Code</b>	CE407	<b>Title of the Course</b>	Design Of Wastewater System	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	IV	<b>Semester</b>	VII	3	1	0	4
<b>Pre-Requisite</b>	CE310	<b>Co-requisite</b>	NIL				
<b>Course Objectives</b>	To understand the basic concept and procedure of designing of various wastewater treatment processes.						

Course Outcomes	
CO1	To give the basic knowledge about the characteristics of wastewater and oxygen requirement of organic material for the decomposition.
CO2	To give the basic idea about the primary treatment of the wastewater.
CO3	To give the knowledge of secondary treatment of wastewater and design process of activated sludge units.
CO4	To give the idea of design of trickling filter and calculation of efficiency of the trickling filters.
CO5	To learn about the waste stabilization pond, Oxidation ditches and Rotating Biological Contactors.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Wastewater Characteristics	Wastewater Characteristics: Physical, Chemical and Biological characteristics, Composition and Microbiology of Wastewater, BOD kinetics and COD.	08	1
2	Wastewater Treatment	Primary Treatment: Theory and design of Screens, Grit chamber, Sedimentation Tank, Unit operation and processes, Process flow sheets of wastewater treatment plant.	08	2
3	Activated Sludge Process	Secondary Treatment: Theory, Design and Construction of Biological Treatment Processes, Activated Sludge Process, Design of different Units and Modifications, Extended Aeration Systems.	08	3
4	Trickling Filter	Secondary Treatment: Theory, Design and Construction of Trickling Filter, Types of Trickling Filter, Efficiency Calculation of Trickling Filter, Recirculation of Treated Sewage. SBR Technology: Methodology and Operation.	08	4
5	Miscellaneous Method	Waste Stabilization Ponds, Aerated Lagoon, Oxidation Ditches, and Rotating Biological Contactors (RBC).	08	5

**Reference Books:**

Birdie G.S. and Birdie J.S, "Water Supply and Sanitary Engineering", Dhanpat Rai & Sons, 2010.

Duggal K. N, "Elements of Environmental Engineering", S Chand & Co Ltd..

Garg S. K, "Environmental Engineering Vol II", Khanna Publishers, 2010

Fair, Gayer and Okun, "Water and Waste water Engineering Vol. II", John Wiley. 3rd Edition 2011.

**e-Learning Source:**

<http://nptel.ac.in/courses/105105048/>

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

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

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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## Integral University, Lucknow

<b>Effective from Session:</b>							
<b>Course Code</b>	CE410	<b>Title of the Course</b>	Earthquake Resistant Design	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	IV	<b>Semester</b>	VII	3	1	0	4
<b>Pre-Requisite</b>	NIL	<b>Co-requisite</b>	NIL				
<b>Course Objectives</b>	To introduce the students to the basics of structural dynamics and to design Earthquake Resistant Structures. The students are familiarized with the codal provisions as well as the aseismic design methodology.						

Course Outcomes	
<b>CO1</b>	Develop an understanding of structural dynamics and determine the response of the structural system under free and forced vibration of a single degree of freedom system.
<b>CO2</b>	Develop an understanding of two degree & multiple degree of freedom system in dynamic analysis and determination of base shear using codal provision.
<b>CO3</b>	Knowledge of various codal provision regarding irregularities in RCC structure. The learner will be able to design earthquake-resistant masonry buildings.
<b>CO4</b>	Knowledge of various codal provisions and modern techniques in earthquake-resistant design.
<b>CO5</b>	Attainment of knowledge of soil structure interaction and design of machine foundation.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Basics of Structural Dynamics	Wind and earthquake loading on structures, structural idealization for dynamic analysis. Free and forced vibration of single-degree freedom system.	08	1
2	Base Shear Determination	Two-degree and multi-degree freedom systems, seismic response of the buildings, calculation of time period, base shear, seismic coefficient method, and response spectrum method.	08	2
3	Earthquake Resistant Design of Structures	Effect of structural irregularities on the performance of RC building. Earthquake Resistant Design of Masonry building.	08	3
4	Design of Shear Wall	Design of shear wall. Ductility requirement of RCC frame. Modern techniques in seismic design.	08	4
5	Design of Machine Foundation	Structural design of machine foundation. Dynamics of soil–structure interaction. Earthquake-induced liquefaction of soil.	08	5

**Reference Books:**

- Earthquake- Resistant Design of Structures-S.K. Duggal.
- Basics of Structural Dynamics and Aseismic Design.- S.R. Damodarasamy and S. Kavitha.
- Structural Dynamics-Theory and Computation- Mario Paz.
- Introduction to Structural Dynamics- J.M.Biggs
- IS-13920-1993- Ductile detailing of Reinforced Concrete Structures subjected to Seismic forces.
- IS-1893-(Part I)-2016 Criterion for Earthquake Resistant Design.

**e-Learning Source:**

- <https://nptel.ac.in/courses/105105104/40>
- <https://www.nicee.org/EQTips.php>

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
<b>CO1</b>	3	2	1	1	1	1	1	1	0	0	0	1	1	2
<b>CO2</b>	3	2	1	1	1	3	1	1	0	0	0	1	1	2
<b>CO3</b>	2	2	1	1	1	3	1	1	0	0	0	1	1	2
<b>CO4</b>	2	2	2	1	2	3	1	2	0	0	0	1	1	2
<b>CO5</b>	2	1	2	1	1	1	1	1	0	0	0	1	1	2

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

Name & Sign of Program Coordinator	Sign & Seal of HoD
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## Integral University, Lucknow

<b>Effective from Session: 2015-16</b>							
<b>Course Code</b>	CE411	<b>Title of the Course</b>	Advanced Foundation Design	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	IV	<b>Semester</b>	VII	3	1	0	4
<b>Pre-Requisite</b>	CE312	<b>Co-requisite</b>	NIL				
<b>Course Objectives</b>	To apply the principles of soil mechanics to design shallow and deep foundations including bearing capacity and analysis						

Course Outcomes	
<b>CO1</b>	Student will be able to determine bearing capacity of different types of soils.
<b>CO2</b>	Student will be able to design the different types of footing.
<b>CO3</b>	Student will be able to design piles for deep foundations.
<b>CO4</b>	Student will be well versed with hydraulic designing of well foundations.
<b>CO5</b>	Student will be able to design foundation of machinery structures.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction	Introduction, Basic definitions, Gross & Net footing pressure, Rankine's analysis, Terzaghi's analysis, Prandtl's analysis, Terzaghi's bearing capacity theory	08	1
2	Shallow Foundations	Bearing capacity of foundation, types of shears Failure, Terzaghi's, Meyerhof's, Hansen, Skempton's & IS methods, Effect of water Table, Plate Load Test.	08	2
3	Pile Foundations	Load capacity of pile foundations Various factors affecting load carrying capacity of piles, Static and Kinematics analysis of pile groups in sand & clays, Settlement of pile groups, Efficiency, Pile load tests Laterally loaded and battered piles.	08	3
4	Well Foundation	Elements of well foundation, shapes, depth of scour, well sinking, tilts, shift and their prevention, Cofferdams and its types.	08	4
5	Machine Foundation and its Design	Machine foundation and its types, basic terms and definitions, general design criteria of machine foundation, natural frequency of natural soil system, vibration isolation and control.	08	5

**Reference Books:**

Dr. K K Arora -"Soil Mechanics & Foundation Engineering", Standard Publisher Distributors.7<sup>th</sup> Edition Reprint 2015.

Dr Alam Singh -"Soil engineering in Theory 7 Practices", Volume-2, CBS Publishers & Distributors 2nd Edition Reprint 2009.

Gopal Ranjan & A S Rao -"Basics & Applied Mechanics 2nd Edition, New Age International (P) Ltd Publishers,2nd edition Reprint 2012.

**e-Learning Source:**

<https://nptel.ac.in/courses/105108069/>

[https://nptel.ac.in/content/syllabus\\_pdf/105108069.pdf](https://nptel.ac.in/content/syllabus_pdf/105108069.pdf)

[https://nptel.ac.in/content/storage2/nptel\\_data3/html/mhrd/ict/text/105105039/lec5.pdf](https://nptel.ac.in/content/storage2/nptel_data3/html/mhrd/ict/text/105105039/lec5.pdf)

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

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

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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## Integral University, Lucknow

<b>Effective from Session:2015-16</b>							
<b>Course Code</b>	CE412	<b>Title of the Course</b>	Impact of Climate Change for Civil Engineering Projects	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	IV	<b>Semester</b>	VII	3	1	0	4
<b>Pre-Requisite</b>	CE201/CE306	<b>Co-requisite</b>	NIL				
<b>Course Objectives</b>	To identify the factors influencing the global and regional climate systems and develop strategies for adaptation and mitigation measures for sustainable development						

CourseOutcomes	
<b>CO1</b>	Students are able to understand Basic meteorology, Earth's Climate System, Green House Gases and Global Warming.
<b>CO2</b>	Students are able to understand the Impact of climate change on hydrological cycle and impact on water quality and quantity.
<b>CO3</b>	Students are able to understand the Climate change dilemma for engineering, and statistical methods for risk assessment and management.
<b>CO4</b>	Students are able to understand The Montreal Protocol, effect of climate change on a Global Scale and in India, and impacts on urban water systems
<b>CO5</b>	Students are able to understand the Climate Change Adaptation and Mitigation Measures in various sectors like Water, Transport, and Energy.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction to Weather and Climate	Basic meteorology, measurement of meteorological parameters, Earth's Climate System, Climate Classification , The general circulation ,Trade Winds and the Hadley Cell , The Westerlies , Cloud Formation and Monsoon Rains(focus on Indian Monsoon) , Storms and Hurricanes , The Hydro-logical Cycle , El Nino and its Effect , Solar Radiation ,The Earth's Natural Green House Effect , Green House Gases and Global Warming ,Carbon Cycle.	08	CO1
2	Climate Change Impacts on Water Resources	Impact on hydrological cycle ,floods, droughts, coupling of hydroclimate variability with human systems, impact on water quality and quantity ,Climate change projections, Water management approaches to climate change adaptation and mitigation	08	CO2
3	Incorporating Climate Science in Engineering Practice	Climate change dilemma for engineering, Uncertainty and statistical methods for risk assessment, Risk management, Engineering standards and regulations, Guiding principles	08	CO3
4	Climate Change Impacts in Civil Engineering	The Montreal Protocol – UNFCCC – IPCC –Evidences of Changes in Climate and Environment – on a Global Scale and in India, Impacts on buildings and other structures, impacts on transportation, impacts on urban water systems, coastal management, air quality and energy supply ,adaptation and mitigation strategies for sustainable development of infrastructure.	08	CO4
5	Climate Change Mitigation Strategies	Climate Change Adaptation And Mitigation Measures in various sectors - Water – Transport – Energy – Key Mitigation Technologies and Practices – Energy Supply – Transport – Buildings – Industry – Carbon sequestration – Carbon capture and storage (CCS)- –Carbon Trading examples of future Clean Technology – Biodiesel – Natural Compost – Eco- Friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels – Solar Energy – Wind –Hydroelectric Power ,green concrete	08	CO5

**Reference Books:**

John M Wallace, Peter V Hobbs "Atmospheric science-, An introductory survey ", Academic press.; 2nd Edition 2006

J.Rolf Olsen, "Adopting infrastructure and civil engineering practice to a changing climate ", American Society of Civil Engineers(ASCE) , 2015

Dash Sushil Kumar, "Climate Change – An Indian Perspective", Cambridge University Press India Pvt. Ltd, 2007

**e-Learning Source:**

<https://ascelibrary.org/doi/pdf/10.1061/9780784479193>

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

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

Name & Sign of Program Coordinator	Sign & Seal of HoD
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## Integral University, Lucknow

<b>Effective from Session:</b>							
<b>Course Code</b>	CE413	<b>Title of the Course</b>	Plastic Design of Steel Structures	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	IV	<b>Semester</b>	VII	3	1	0	4
<b>Pre-Requisite</b>	NIL	<b>Co-requisite</b>	NIL				
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>Understand the concept of reserve strength of steel and the basics of plastic analysis theory.</li> <li>Understanding the methods of plastic analysis and analysing the beams and frames.</li> <li>Identifying the factors affecting the plastic moment capacity of the section</li> <li>Plastic design of beams and frames.</li> <li>Design of steel structures using minimum weight design.</li> </ul>						

Course Outcomes	
<b>CO1</b>	Learner will be able to understand the concept of reserve strength of steel and the basics of plastic analysis theory.
<b>CO2</b>	Learner will be able to understand the methods of plastic analysis and do the analysis of beams and frames.
<b>CO3</b>	Learner will be able to identify the factors affecting the plastic moment capacity of the section.
<b>CO4</b>	Learner will be able to do the plastic design of beams and frames.
<b>CO5</b>	Learner will be able to design the steel structures using minimum weight design method.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Plastic Behavior of Structural Steel	General Introduction, basic hypothesis, stress-strain relation for mild steel, the scope of plastic analysis, redistribution of moments, the concept of shape factor and load factor, the scope of plastic collapse- basic theorems.	08	1
2	Plastic Analysis Methods	The procedure of plastic analysis: Introduction, Static and Kinematic methods, Plastic hinge concept, Plastic collapse load, method of combining mechanisms: Analysis of beams and frames, plastic moment distribution method.	08	2
3	Plastic Moment's Factors	Factors affecting fully plastic moments: Introduction, variations of lower yield stress, the effect of shear force, effect of normal force, interaction formula.	08	3
4	Plastic Design of Beam/Frame	Plastic Design: Introduction, design consideration, Design of simple, fixed, and continuous beams, analysis and design of the portal and Gable frames, design of two bay and two-story frames.	08	4
5	Miscellaneous Methods	Minimum Weight Design: Assumptions, Geometrical analog and Minimum weight theorem, applications, Methods of solution.	08	5

**Reference Books:**

S.K. Duggal, Design of Steel Structures, Tata Mc Graw Hill publishing co. India.

Arya Ajmani, Design of Steel Structures, Wiley Eastern, New York.

Vazirani & Ratwani Steel Structures, Khanna Publishers Delhi.

B. G. Neal, Plastic Methods of Structural Analysis, Chapman and Hall Ltd. Great Britain

L.S. Negi, Design of Steel Structures, Tata Mc Graw Hill publishing co. India.

**e-Learning Source:**

<https://nptel.ac.in/courses/105106113/7>

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
<b>CO1</b>	1	1	0	0	0	0	0	0	0	0	0	1	0	1
<b>CO2</b>	2	2	0	0	0	0	0	0	0	0	0	1	0	2
<b>CO3</b>	2	2	0	0	0	0	0	0	0	0	0	1	0	2
<b>CO4</b>	2	2	1	0	0	1	0	0	0	0	0	1	0	1
<b>CO5</b>	2	2	1	0	0	1	0	0	0	0	0	1	0	1

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

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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## Integral University, Lucknow

<b>Effective from Session:2015-16</b>							
<b>Course Code</b>	CE418	<b>Title of the Course</b>	Environmental Engineering Lab-II	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	IV	<b>Semester</b>	VII	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>
<b>Pre-Requisite</b>	CE310	<b>Co-requisite</b>	CE401				
<b>Course Objectives</b>	To impart the experimental knowledge of wastewater quality assessment to be applied in environmental engineering						

Course Outcomes	
<b>CO1</b>	Learners will be able to determine, explain, analyze and compare various characteristics of domestic and industrial wastewater according to the guidelines prescribed by IS code
<b>CO2</b>	Learners will be able to explore the real wastewater treatment plant for site visit

Experiment No.	Content of Experiment	Contact Hrs.	Mapped CO
1	Determination of total suspended and dissolved solids.	02	CO1
2	Determination of BOD of sample.	02	CO1
3	Determination of COD of sample.	02	CO1
4	Determination of Kjeldahl nitrogen.	02	CO1
5	Determination of fluorides.	02	CO2
6	Determination of rate kinetics constant of aerobic reactions.	02	CO2
7	Field visit of water / wastewater treatment plant.	02	CO2

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
<b>CO1</b>	0	0	0	3	3	0	3	3	3	3	0	3	2	2
<b>CO2</b>	0	0	0	3	3	0	3	3	3	3	0	3	2	2
<b>CO3</b>	0	0	0	3	3	0	3	3	3	3	0	3	2	2
<b>CO4</b>	0	0	0	3	3	0	3	3	3	3	0	3	2	2
<b>CO5</b>	0	0	0	3	3	0	3	3	3	3	0	3	2	2

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

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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## Integral University, Lucknow

<b>Effective from Session: 2015-16</b>							
<b>Course Code</b>	CE419	<b>Title of the Course</b>	Structural Detailing Lab	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	IV	<b>Semester</b>	VII	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
<b>Pre-Requisite</b>	NIL	<b>Co-requisite</b>	NIL				
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To have a knowledge to understand the basics of drawing.</li> <li>To impart the knowledge of various sections used in steel design.</li> <li>To enable the student to draw the various elements of the steel sections.</li> </ul>						

Course Outcomes	
<b>CO1</b>	To learn preparation of working drawings of Rolled sections and connections (welded and bolted).
<b>CO2</b>	To learn preparation of working drawing of Built-up columns and beams.
<b>CO3</b>	To learn preparation of working drawing of Gusset bases.
<b>CO4</b>	To learn preparation of working drawing of Grillage footing.
<b>CO5</b>	To learn preparation of working drawing of Roof trusses.
<b>CO6</b>	To learn preparation of working drawing of RC retaining walls.
<b>CO7</b>	To learn preparation of working drawing of RC water tanks.

Unit No.	Experiment No.	Content of Unit	Contact Hrs.	Mapped CO
1	Experiment 1	Rolled sections and connections (welded and bolted).	02	CO 1
2	Experiment 2	Built-up columns and beams.	02	CO 2
3	Experiment 3	Gusset bases.	02	CO 3
4	Experiment 4	Grillage footing	02	CO 4
5	Experiment 5	Roof trusses	02	CO 5
6	Experiment 6	RC retaining walls	02	CO 6
7	Experiment 7	RC water tanks	02	CO 7

**Reference Books:**

Subramanian, "Steel Structures- "Design and Practice", Oxford, University Press

M.R. Shriyekar, "Limit State Design in Structural Steel", PHI, New Delhi

Kazmi, S.M.A and Jindal R.S "Design of Steel Structures" PHI, New Delhi, India

I.S: 800-2007- Code of Practice for General Construction in Steel, BIS, New Delhi, India

I.S: 808-1989- Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections, BIS, New Delhi, India

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

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														
<b>CO1</b>	1	0	0	0	0	0	0	0	1	1	1	0	0	0
<b>CO2</b>	1	0	0	0	0	0	0	0	1	1	1	0	0	0
<b>CO3</b>	1	0	0	0	0	0	0	0	1	1	1	0	0	0
<b>CO4</b>	1	0	0	0	0	0	0	0	1	1	1	0	0	0
<b>CO5</b>	1	0	0	0	0	0	0	0	1	1	1	0	0	0
<b>CO6</b>	1	0	0	0	0	0	0	0	1	1	1	0	0	0
<b>CO7</b>	1	0	0	0	0	0	0	0	1	1	1	0	0	0

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

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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## Integral University, Lucknow

<b>Effective from Session: 2015-16</b>							
<b>Course Code</b>	CE420	<b>Title of the Course</b>	Minor Project	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	IV	<b>Semester</b>	VII	-	-	2	1
<b>Pre-Requisite</b>	Nil	<b>Co-requisite</b>	Nil				
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To enable students to work as a team and to select B.Tech project topic.</li> </ul>						

<b>Course Outcomes</b>	
<b>CO1</b>	Skill to work in a team and to select the best topic as per the ability and strength of a team to carry out the literature review work.

<b>Unit No.</b>	<b>Title of the Unit</b>	<b>Content of Unit</b>	<b>Contact Hrs.</b>	<b>Mapped CO</b>
-	-	<p>The students group are expected to fix their topics, do the literature survey, field measurements, if any, methodology, and submit the minor project report in the seventh semester.</p> <p>The project work can be an investigative/experimental/analytical analysis of a technical problem in the various field of Civil Engineering such as planning, designing, material testing, computer application based problems etc.</p>	-	CO1

**Reference Books:**

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**e-Learning Source:**

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

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

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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## Integral University, Lucknow

<b>Effective from Session:2015-16</b>							
<b>Course Code</b>	CE300	<b>Title of the Course</b>	Industrial Training	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	IV	<b>Semester</b>	VII	-	-	-	<b>0</b>
<b>Pre-Requisite</b>	Nil	<b>Co-requisite</b>	Nil				
<b>Course Objectives</b>	The aim of this course is exposed the learner to the real world situation and provide an opportunity to apply classroom knowledge						

Course Outcomes	
<b>CO1</b>	Learner will able be to apply engineering knowledge learned in classroom to the real situations.
<b>CO2</b>	Learner will able be to show the knowledge of advanced tools and techniques and exposure to professional engineering practices.
<b>CO3</b>	Learner will able be to follow the role and responsibilities as well as code of ethics that engineers should uphold.
<b>CO4</b>	Learner will able be to show awareness about general workplace behaviour and build interpersonal and team skills.
<b>CO5</b>	Learner will able be to prepare professional work, reports and presentations.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
-	-	Industrial training under for at least 1 month to acquire field knowledge or develop any employability skills.	Minimum 1 months industrial training	CO1, CO2, CO3, CO4 and CO5

**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 CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
	<b>CO1</b>	0	0	0	0	3	0	0	0	3	3	1	2	3
<b>CO2</b>	0	0	0	0	3	0	0	0	3	3	1	2	3	3
<b>CO3</b>	0	0	0	0	0	0	0	3	3	3	1	2	3	3
<b>CO4</b>	0	0	0	0	0	0	0	3	3	3	1	2	3	3
<b>CO5</b>	0	0	0	0	3	0	0	3	3	3	1	2	3	3

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

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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## Integral University, Lucknow

<b>Effective from Session:2015-16</b>							
<b>Course Code</b>	CE499	<b>Title of the Course</b>	B.Tech Project	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	IV	<b>Semester</b>	VIII	-	-	-	1
<b>Pre-Requisite</b>	Nil	<b>Co-requisite</b>	Nil				
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To enable students to work as a team to develop the methodology for the project.</li> <li>To develop the capability to apply the engineering principles to carry out the project work.</li> <li>To define the conclusion of the project undertaken with in depth understanding of the topic.</li> </ul>						

Course Outcomes	
<b>CO1</b>	Ability to work as a team to plan the execution of the undertaken project.
<b>CO2</b>	Capability to use the engineering knowledge and principles on an undertaken project as required.
<b>CO3</b>	Capacity to complete the undertaken project on time with effective communication to deliver the project successfully.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
-	-	The project work can be an investigative/ experimental/ analytical analysis of a technical problem in the various field of Civil Engineering such as planning, designing, material testing, computer application based problems etc. The assessment for the project will be done internally as well as externally as per the procedure stated by the department. The students are also required to submit a detailed project report at the end of the eight semester.	-----	CO1, CO2, and CO3

<b>Reference Books:</b>	
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<b>e-Learning Source:</b>	
-	

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	0	1	2	2	2	3	3	3	3	3	3
CO2	3	3	3	3	3	2	2	3	3	3	3	3	3	3
CO3	0	0	0	0	2	1	1	3	3	3	3	3	3	3

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

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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## Integral University, Lucknow

<b>Effective from Session:2015-16</b>							
<b>Course Code</b>	CE451	<b>Title of the Course</b>	Seminar	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	IV	<b>Semester</b>	VIII	-	-	-	3
<b>Pre-Requisite</b>	Nil	<b>Co-requisite</b>	Nil				
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To understand organization of topic for presentation and research.</li> <li>To learn the skill set required to perform research.</li> </ul>						

<b>Course Outcomes</b>	
<b>CO1</b>	Skill to search on any topic to extract the information.
<b>CO2</b>	Ability to organize – deliver presentation and report on any topic.

<b>Unit No.</b>	<b>Title of the Unit</b>	<b>Content of Unit</b>	<b>Contact Hrs.</b>	<b>Mapped CO</b>
1	-	Select any topic related to civil engineering, investigate the topic and accumulate the knowledge. Organize the information collected and deliver the presentation along with report.	-	CO1 and CO2

<b>Reference Books:</b>
-
<b>e-Learning Source:</b>
-

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

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

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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## Integral University, Lucknow

<b>Effective from Session:</b> 2015-16							
<b>Course Code</b>	CE452	<b>Title of the Course</b>	Comprehensive Assessment	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>Year</b>	IV	<b>Semester</b>	VIII	-	-	-	2
<b>Pre-Requisite</b>	Nil	<b>Co-requisite</b>	Nil				
<b>Course Objectives</b>	<ul style="list-style-type: none"> <li>To test the learner's knowledge, skills and understanding of civil engineering at undergraduate level.</li> </ul>						

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

<b>Unit No.</b>	<b>Title of the Unit</b>	<b>Content of Unit</b>	<b>Contact Hrs.</b>	<b>Mapped CO</b>
1	-	Complete syllabus of 4 <sup>th</sup> year B.Tech Civil Engineering	-	CO1

<b>Reference Books:</b>
-
<b>e-Learning Source:</b>
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<b>Course Articulation Matrix: (Mapping of COs with POs and PSOs)</b>														
<b>PO-PSO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	<b>PO9</b>	<b>PO10</b>	<b>PO11</b>	<b>PO12</b>	<b>PSO1</b>	<b>PSO2</b>
<b>CO</b>														
<b>CO1</b>	3	3	3	3	0	3	0	3	0	0	0	3	3	1

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

<b>Name &amp; Sign of Program Coordinator</b>	<b>Sign &amp; Seal of HoD</b>
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