

**VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE  
(VJTI)  
MATUNGA, MUMBAI 400 019**

(Autonomous Institute affiliated to University of Mumbai)



**Curriculum  
(Scheme of Instruction & Evaluation and Course contents)  
(Revision 2014)**

For  
Final Year  
of  
Four Year Undergraduate Programme Leading to  
Bachelor of Technology (B Tech) Degree in Civil Engineering

**Implemented from the batch admitted in Academic Year 2014-15**

VEERMATA JIJABAI TECHNOLOGICAL INSTITUTE

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Curriculum

(Scheme of Instruction & Evaluation and Course contents)

For

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Four Year Undergraduate Programme Leading to

Bachelor of Technology (B Tech)

In

101 Civil Engineering

## Programme Educational Objectives (PEO)

1. Develop a professional to pursue career as a Civil Engineer with adequate technical knowledge and skills while using modern tools for problem solving and exhibiting qualities of communication, team membership, and leadership.
2. Develop ability to practice ethically focusing on social relevance, environmental sustainability, optimal solutions and safety of stakeholders.
3. Develop abilities of lifelong learning to continuously strive to enhance decision making abilities to investigate, design and develop complex facilities.

## Programme Outcomes (PO)

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

### **Programme Specific Outcomes (PSO)**

1. Able to analyze various Civil Engineering structures and systems by using basic and advanced technologies.
2. Able to design civil engineering facilities and their elements and also use of modern software tools for the same.
3. Able to plan, monitor and supervise construction activities to complete civil engineering facilities satisfactorily.
4. Able to practice as construction professional through ethical practice while focusing on sustainability and economy.

**Veermata Jijabai Technological Institute**  
**B Tech. Civil Engineering**  
**Scheme of Instruction and Evaluation**

**SEMESTER VII**

Scheme of Instruction					Scheme of Evaluation					
SN	Course Code	Course Title	L	T	P	Credits	TA	IST	ESE	ESE hours
1	SE4001T	Design of Steel Structures	3	0	0	3	10	30	60	3
2	SE4001P	Design of Steel Structures Laboratory	0	0	2	1	100% CIE			
3	CE4001S	Transportation Engineering	3	0	0	3	10	30	60	3
4	CE4002T	Water and Wastewater Engineering	3	0	0	3	10	30	60	3
5	CE4002P	Water and Wastewater Engineering Laboratory	0	0	2	1	100% CIE			
6		Elective – II	3	0	0	3	10	30	60	3
7		Open Elective	4	0	0	4	10	30	60	3
8	CE4901D	Project I	0	0	4	2	100% CIE			
9	CE4003L	Industry Internship	0	0	4	2	100% CIE			
10	CE4004L	Development Engineering	0	0	2	1	100% CIE			
		<b>TOTAL</b>	<b>16</b>	<b>0</b>	<b>14</b>	<b>23</b>				
		Total contact hrs.		<b>30</b>						

Abbreviations: **L**: Lecture, **T**: Tutorial, **P**: Practical, **TA**: Teacher Assessment / Term work Assessment, **IST**: In Semester Tests (comprise of average of two In semester tests), **ESE**: End Semester Written Examination, **CIE**: Continuous In-semester Evaluation

**Veermata Jijabai Technological Institute**  
**B Tech. Civil Engineering**  
**Scheme of Instruction and Evaluation**

**SEMESTER VIII**

Scheme of Instruction					Scheme of Evaluation					
S N	Course Code	Course Title	L	T	P	Cr edits	TA	IST	ESE	ESE hours
1	SE4002S	Earthquake Engineering	3	0	0	3	10	30	60	3
2	SE4003L	Structural Design Laboratory	0	0	2	1	100% CIE			
3	CE4005S	Construction Entrepreneurship	3	0	0	3	10	30	60	3
4	CE4006T	Construction Management	3	0	0	3	10	30	60	3
5	CE4006P	Construction Management Laboratory	0	0	2	1	100% CIE			
6		Program Elective course III	3	0	0	3	10	30	60	3
7		Program Elective course IV	3	1	0	4	10	30	60	3
8	CE4902D	Project II	0	0	8	4	100% CIE			
9	CE4007A	Laws for Civil Engineers	2	0	0	0				
		TOTAL	17	1	12	22				
		Total contact hrs.		30						

Abbreviations: **L**: Lecture, **T**: Tutorial, **P**: Practical, **TA**: Teacher Assessment / Term work Assessment, **IST**: In Semester Tests (comprise of average of two In semester tests), **ESE**: End Semester Written Examination, **CIE**: Continuous In-semester Evaluation

## List of Electives:

### Semester VII Elective II

Sr No	Course Code	Course Title
1	CE4101S	Terrain Data Analysis
2	CE4102S	Environmental Management
3	CE4103S	Water Resources System Planning & Management
4	CE4104S	Rehabilitation of Buildings
5	CE4105S	Advanced construction Techniques
6	SE4101S	Introduction to Non linear Analysis
7	SE4102S	Soil Dynamics and Machine Foundation

### Semester VII Open Elective

Sr No	Course Code	Course Title
1	CE4106S	Sustainable Development
2	CE4107S	Risk and value management

### Semester VIII Elective III

Sr No	Course Code	Course Title
1	CE4108S	Solid and Hazardous waste Management
2	CE4109S	Watershed Management
3	CE4110S	Pavement Management System
4	CE4111S	Pavement Design and Construction
5	SE4103S	Design of Prestressed Concrete Structures
6	SE4104S	Geo-synthetic Engineering

### Semester VIII Elective IV

Sr No	Course Code	Course Title
1	CE4112S	Unit Operations & Processes in Environmental Engineering
2	CE4113S	Transportation Planning & Traffic Engineering
3	CE4114S	Project Appraisal
4	CE4115S	Environmental Impact Assessment
5	SE4105T	Introduction to Finite Element
6	SE4106T	Advanced Design of Steel structures

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VII</b>
<b>Course Code</b>	<b>SE4001T</b>	
<b>Course Title</b>	<b>Design of Steel Structures</b>	
<b>Prerequisites</b>	<b>Structural Analysis I and II</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Describe the design philosophy, behavior of steel structure and failure mechanism.
2. Describe the mechanism and behavior of various connection types under different loading conditions for analysis and design of connections.
3. Analyze and design structural roofing and flooring system.
4. Analyze and design columns and column bases under axial and axial-bending loading conditions.

### **Course Contents**

#### **1 Bolted and Welded Connections**

Introduction to riveted connection, design of bolted and welded connections, axially and eccentrically loaded joints, simple connection of bracket plates to columns, beam to beam and beam to column connections, design of framed, unstiffened and stiffened seat connections.

#### **2 Roofing System**

Imposed loads on flat and sloping roofs and floors, wind loads on sloping roofs and vertical cladding including effect of degree permeability and wind drag, analysis of pin-jointed trusses under various loading cases, computation of design forces in members, design and detailing of connections and supports, wind bracing for roof system.

#### **3 Flooring System**

Concept of floor system with secondary beams, main beams and columns, design of simply supported beams using rolled steel sections, design of built-up sections.



## **4 Columns and Bases**

Design of columns under axial loads using single or multiple rolled steel sections, design of lacing and battens, columns subjected to axial load and bending, design of slab and Gusseted base, composite columns.

### **Text Books :**

- 1 S.K. Duggal, Limit State Design of Steel Structures, Tata McGraw Hill Education Private Limited, 2014.
- 2 V.L. Shah and V. Gore, Limit State Design of Steel Structures IS:800-2007, Structures Publication, 2010.

### **Reference Books :**

- 1 S.S. Bhavikatti, Design of Steel Structures, I.K. International Publishing House Limited, 2010.
- 2 N. Subramanian, Design of Steel Structures, Oxford University Press, 2010.
- 3 IS 800 (2007), General Construction in Steel- Code of Practice, Ced 7: Structural Engineering and Structural Section, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.
- 4 IS 875- Part 1 (1987): Dead Loads, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.
- 5 IS 875- Part 2 (1987): Imposed Loads, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.
- 6 IS 875- Part 3 (1987): Wind Loads, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.
- 7 IS 875- Part 4 (1987): Snow Loads, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.
- 8 IS 875- Part 5 (1987): Special Loads and Combinations, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VII</b>
<b>Course Code</b>	<b>SE4001P</b>	
<b>Course Title</b>	<b>Design of Steel Structures Laboratory</b>	
<b>Prerequisites</b>	<b>Design of Steel Structure, Structural Analysis I and II</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Identify and compute the design loads on various steel structural systems.
2. Apply principles, procedure and relevant codal provisions for the analysis and design of various steel structural systems.
3. Use computer software for analysis and design of steel structures.
4. Prepare detailed structural drawings based on design

### **Course Contents**

- 1 Design of roof truss system.
- 2 Design of columns and columns bases.
- 3 Design of structural steel flooring system.
- 4 Design of bolted and welded connections.

### **Text Books :**

- 1 S.K. Duggal, Limit State Design of Steel Structures, Tata McGraw Hill Education Private Limited, 2014
- 2 V.L. Shah and V. Gore, Limit State Design of Steel Structures IS:800-2007, Structures Publication, 2010.

### **Reference Books :**

- 1 S.S. Bhavikatti, Design of Steel Structures, I.K. International Publishing House Limited, 2010.
- 2 N. Subramanian, Design of Steel Structures, Oxford University Press, 2010
- 3 IS 800 (2007), General Construction in Steel- Code of Practice, Ced 7: Structural Engineering and Structural Section, Published by Bureau of Indian Standard Manak Bhavan, VJTI B.Tech. – Civil Engineering– 2014-15 Page | 10

New Delhi.

- 4** IS 875- Part 1 (1987): Dead Loads, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.
- 5** IS 875- Part 2 (1987): Imposed Loads, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.
- 6** IS 875- Part 3 (1987): Wind Loads, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.
- 7** IS 875- Part 4 (1987): Snow Loads, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.
- 8** IS 875- Part 5 (1987): Special Loads and Combinations, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VII</b>
<b>Course Code</b>	<b>CE4001S</b>	
<b>Course Title</b>	<b>Transportation Engineering</b>	
<b>Prerequisites</b>	<b>Pavement Engineering</b>	

## **Course outcomes**

After completion of course students will be able to

1. Describe the terminology of infrastructure services like railway, docks and harbour and airport facilities.
2. Describe and sketch railway, docks and harbor and airport components.
3. Analyze the factors influencing the site selection for railway, docks, harbour and airport facilities.
4. Design the components of railway, docks and harbor and airport
5. Propose appropriate method of construction & maintenance required for railway, docks and harbour and airport facilities.

## **Course Content**

### **1 Introduction**

Role of transportation in society, Objectives of transportation system, different types of modes, planning & co-ordination of different modes for Indian conditions, modern transportation system.

### **2 Railway Engineering**

Merits of rail transportation, railway gauges and gauge problems

Cross section of permanent way and track components: Sleepers-functions and types, sleeper density, ballast functions and different ballast materials, ballast less track.

Rails: Coning of wheels and tilting of rails, rail cross sections, wear and creep of rails, rail fastenings.

Geometric design: Gradients, transition curves, widening of gauges on curves, cant and cant

deficiency.

Point and crossing: Design of turnouts and description of track junctions.

Yards: details of different types of railway yards and their functions.

Signalling and interlocking: classification of signals, interlocking of signals and points, control of train movements.

Construction and maintenance of railway track, methods of construction, material requirements, special measures for high speed track, maintenance of tracks and traffic operations

### **3 Airport Engineering**

Aircraft characteristics and their influence on airport planning.

Airport planning: topographical and geographical features, air traffic characteristics, and development of new airports, factors affecting airport site selection.

Airport obstruction: Zoning laws, classification of obstruction, imaginary surfaces, approach zones, turning zones.

Airport layout: runway orientation, wind rose diagrams, and basic runway length. Correction of runway length, airport classification, geometric design, airport capacity, runway configuration, taxiway design, geometric standards, exit taxiways, holding aprons, location of terminal buildings, aircraft hangers and parking.

Airport marking and lighting: marking and lighting of runways, taxiways and approach areas

Terminal area and airport layout: Terminal area, planning of terminal building, Apron: size of the gate position, number of gate position, aircraft parking system; Hanger: general planning considerations, blast considerations.

Air traffic control: Air traffic control aids, Enroute aids, landing aids.

Airport Drainage: requirement of airport drainage, design data, surface drainage design, subsurface drainage design

### **4 Water Transportation**

Harbours: Selection of site, entrance and channel requirement, ship characteristics and their influence on ports management and operations, harbour maintenance.

Harbour layout: harbour works, break waters, jetties, wharves, piers, berthing facilities, types and construction, dolphins. Navigational aids: buoys and lighthouses etc.

Port facilities: docks, transit sheds and warehouses, general layout, containers and container yard, layout and handling equipment

### **Text Books :**

- 1 Saxena S.C. and Arora S. P., A course of railway engineering, DhanpatRai and sons, New Delhi
- 2 Khanna and Arora, Airport planning & design, Nemchand Bros, Roorkee
- 3 Agarwal, M. M. (1991). Indian Railway Track, Sachdeva Press, Mayapuri, New Delhi
- 4 Bindra S.P., Docks & Harbour engineering, DhanpatRai and sons.

### **Reference Books :**

- 1 Robert, Horonjeff & Mcklerey William, J Sproule, Seth B. Young, Planning & design of Airport, Mc Graw Hill, New Delhi, 2010.
- 2 Quinn A D, Design and construction of ports and marine structures, McGraw Hill, Inc, USA 1961

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VII</b>
<b>Course Code</b>	<b>CE4002T</b>	
<b>Course Title</b>	<b>Water and Wastewater Engineering</b>	
<b>Prerequisites</b>	<b>Environmental Engineering</b>	

## Course outcomes

After completion of course students will be able to

1. Describe sources of water and suitability of water for portability.
2. Design unit operations and unit processes in water and wastewater treatments.
3. Select unit operations and unit processes together to plan and design scheme to meet Specific treatment objectives.
4. Examine wastewater with relation to disposal / reuse / recycle standards.

## Course Contents

### 1 Introduction

Importance of environmental sanitation, Impact of human upon the environment, Impact of environment upon the human

### 2 Sources and characteristics of water and wastewater

Physical, Chemical, Bacteriological properties, Quality of water and wastewater at source, Drinking water standards, Aerobic and anaerobic decomposition of wastewater

### 3 Treatment of water

Aeration, Sedimentation: factors affecting efficiency, design values of various parameters, tube settlers, Coagulation and flocculation: Mechanisms, common coagulants, rapid mixing and flocculating, devices, G and GT values, jar test, coagulant aids- polyelectrolyte etc.

Filtration: classification, slow and rapid sand filters, dual media filters, sand, gravel and under drainage system, mode of action, cleaning, limitations, operational difficulties, performance, basic design consideration, pressure filters: construction and operation.

Water softening: lime soda and base exchange methods, principle reactions, design considerations

Disinfection: chlorination, chemistry of chlorination, kinetics of disinfection, chlorine

demand, free and combined chlorine, break point chlorination, superchlorination, dechlorination, chlorine residual, use of iodine, ozone, ultraviolet rays, and chlorine dioxide as disinfectant, well water disinfection

Treatments for removal of dissolved solids: Reverse osmosis, Distillation, Electrodialysis

#### 4 **Miscellaneous treatment:**

Removal of iron and manganese, taste, odor and color,  
Principles and methods of de-fluoridation and desalination

#### 5 **Wastewater treatment and disposal**

Wastewater treatment: Objectives of sewage treatment, methods of treatment and various flow sheets for preliminary, primary, and clarifiers, disposal of screenings and grits.

Biological treatment methods: principles, activated sludge process, sludge volume index, operational problems in activated sludge process, trickling filter.

Sludge digestion: principles of anaerobic digestion, quantity and characterization of sludge, design of sludge digestion of tank, disposal of digested sludge, drying beds

Disposal of wastewater: Discharge of raw and treated sewage on land and water, Standards of disposal of raw and treated sewage on land and water, limits of dilution, Self-purification of streams and oxygen economy.

#### 6 **Low cost sanitation**

Septic tanks, up flow anaerobic filter- principles, operation and suitability, design values, Disposal of treated effluent.

#### 7 **Reuse and recycle of treated waste water**

Gardening, sewage farming, W.C. Flushing, reuse in industry.

### **Text Books :**

- 1 Sewage disposal and air pollution engineering, S.K Garg ; Khanna publication. 2005
- 2 Water supply engineering, S.K Garg ; Khanna publication. 2005

### **Reference Books :**

- 1 Water supply and sewerage, T. J McGhee, McGRAW Hill International editions, 1991
- 2 Environmental engineering, Peavy, Rowe, Tchobanglous.; McGRAW Hill international editions, 1985
- 3 Relevant Indian Standards Specifications
- 4 CPHEEO manual on water supply and treatment, Ministry of urban development, May 1999.
- 5 CPHEEO manual on sewerage and sewage treatment, Ministry of urban development, Dec 1993.



<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VII</b>
<b>Course Code</b>	<b>CE4002P</b>	
<b>Course Title</b>	<b>Water and Wastewater Engineering Laboratory</b>	
<b>Prerequisites</b>	<b>Environmental Engineering</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Perform tests and analyze results of water and wastewater samples
2. Assess the accuracy and precision of analytical results
3. Use advanced water and wastewater characterization tools

### **Course Contents :**

List of experiments in water and wastewater samples

- 1 Alkalinity
- 2 Hardness
- 3 pH
- 4 Turbidity
- 5 Jar test
- 6 Residual chlorine
- 7 Chlorides
- 8 Solids: suspended solids, dissolved solids, total solids, volatile solids
- 8 Dissolved oxygen
- 9 Chemical oxygen demand
- 10 Biochemical oxygen demand
- 11 Sludge volume index
- 12 Most probable number

- 13 Demonstration of water quality modeling software
- 14 Demonstration of Spectrophotometer and Mercury analyzer
- 15 Demonstration of BOD track
- 16 Demonstration of water quality sampling kits

### **Text Books :**

- 1 Standard methods for the examination of water and waste water, American public health association, 2011.

### **Reference Books :**

- 1 Water supply and sewerage, T. J McGhee, McGRAW hill international editions, 1991
- 2 Environmental engineering, Peavy, Rowe, Tchobanglous.; McGRAW Hill international editions, 1985
- 3 Relevant Indian Standards Specifications
- 4 CPHEEO manual on water supply and treatment, Ministry of urban development, May 1999.
- 5 CPHEEO manual on sewerage and sewage treatment, Ministry of urban development, Dec 1993.

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VII</b>
<b>Course Code</b>	<b>CE4101S</b>	
<b>Course Title</b>	<b>Terrain Data Analysis (Elective II)</b>	
<b>Prerequisites</b>	<b>Geomatics</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Interpret images for terrain data analysis
2. Understand range of land forms and their analysis
3. Carry out spatial analysis of landforms with non-spatial data.
4. Generate thematic map for decision making on Civil Engineering project activities.

### **Course Contents:**

#### **1 Terrain Attributes and Their Significance**

Topographic Relief, Slope and Aspects, Land use , Drainage- density, Pattern texture etc, Geology, lithology and Structure of soil and their Properties

#### **2 Sources of Terrain Data:**

Field Surveys, Topographic and other maps, Arial Photographs, satellite Images

#### **3 Digital Terrain Modeling and Analysis:**

Sources, Representation and interpolation

#### **4 Products of Digital Elevation Models( DEMs) and their use:**

Profiles, Sections, Contours, Slope, Shape and 3-D Views

#### **5 Applications of DEMs:**

Alignment Selection, Earth Works, Water resources potential, soil erosion potential Etc.

#### **6 Meteorological / Hydrological data:**

Rainfall, Humidity, Sunshine, Wind speed etc, Flow and sediment measurement, underwater survey.

**7 Data Base Development :**

Principles, Programming and utilization

**8 Compilation of Thematic maps:**

Visual Interpretation and Digital analysis, Digitization and Rasterisation, information analysis systems: Principles and applications

**Text Books:**

- 1 Lo C P, Yeung A K W, Concepts and Techniques of Geographic Information Systems, 2<sup>nd</sup> edition, Prentice Hall India.
- 2 Kang-tsung Chang, Introduction to Geographic Information Systems, Tata McGraw Hill, 2007

**Reference Books:**

- 1 Concept and Techniques of Geographic Information Systems - C.P. LO Albert K.W.Yeung, Edition 2002, Prentice – Hall of India, New Delhi.
- 2 Principles of Geographical Information Systems for Land Resources Assessment, Burrough P.A. , Edition 1986 Oxford science Publications, U.K.

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VII</b>
<b>Course Code</b>	<b>CE4102S</b>	
<b>Course Title</b>	<b>Environmental Management (Elective II)</b>	
<b>Prerequisites</b>	<b>Environmental Engineering</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Use the principles of environmental management to carry out policy analysis and prepare environment management plan.
2. Apply various methods of environmental impact assessment and environmental audit.
3. Apply the tools and develop strategies to have an environmentally sustainable project.
4. Prepare and assess disaster management plan for infrastructural projects.

### **Course Contents:**

#### **1 Environment legislation in India and Global scenario**

Government Agencies & Programs; Environmental Protection Act 1986; Ministry of Environment & Forest – Function of State Pollution Control Board & CPCB, US EPA (Environmental Protection Agency)

#### **2 Environmental Impact Assessment**

Introduction – Concept of EIA- Scope and object of EIA ,Organization responsible for EIA – Site selection and area classification-

Description of the environmental setting – Inclusion or Exclusion of environmental Items – Some suggested approaches for developing a list of environmental Factors – Informational Sources for Environmental factors.

Various steps of EIA – Content of EIA – Assessment methodology- Ad-hoc, EIA for Building and Construction, Hydroelectric projects, Mining, Power plant Roads and airports.

Environmental Impact Assessment Notification (2006): Procedure for Environmental Clearance, List of the projects requiring Environmental Clearance, Composition of Expert Committee for Impact Assessment, Public hearing Committee, Procedure for public hearing

- Project clearance.

### **3 Environmental audit, Environmental economics and Sustainable environment**

Definition and principle

### **4 Environmental Safety, Health and Safety**

Public health: communicable diseases, mode of transmission (epidemic and endemic diseases).

Occupational health and safety. Occupational health and hazards-physicalchemical and biological. Occupational diseases- prevention and control.

Industrial safety and management techniques:

Industrial safety standards and regulations. Accidents-definitions-prevention and control.

Safety management system- concepts of safety management systems- EMS; ISO 14000, 14001 and 18001, OSHA.

### **5 Disaster Management**

Disaster – Introduction –Types of natural calamities, major and minor calamities – impact of calamities.

Natural disaster – cyclone – Tsunami – flood – Landslides – earth quake.

Manmade disaster – Wars – Biological war (introduction of pathogens) –misuse of atomic bombs –major accidents from industries e.g. Bhopal. Lov canal disaster – London Smog.

Environmental Disaster – Assessment, Planning – mitigation program –preparedness – resettlement rehabilitation – role of NGOs, GOs

### **Text Books :**

- 1 Environmental Audit (An Overview) by A.K. Mhaskar
- 2 Canter, L. W.; Environmental Impact Assessment. McGraw-Hill, NewYork.

### **Reference Books :**

- 1 The Environmental (Protection) Act, 1986, Universal Law Publishing Co.Pvt. Ltd. New Delhi
- 2 Be wise Building wise By Mhaskar&Kulkarni, Published by Avis India, Pune
- 3 Environmental Impact Assessment – Principles and Applications; Erickson, P.A.;McGraw-Hill, New York.
- 4 Environmental Impact Analysis Hand Book, Rau, J.G. and Wooten, D.C; McGraw Hill, USA

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VII</b>
<b>Course Code</b>	<b>CE4103S</b>	
<b>Course Title</b>	<b>Water Resources Systems Planning and Management (Elective-II)</b>	
<b>Prerequisites</b>	<b>Engineering Hydrology ,Water Resource Engineering</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Construct and analyze watershed model and solve watershed management problem
2. Optimize the water resource system
3. Simulate water resources system

### **Course Contents :**

#### **1 Environmental and Water Resources Problem**

Watershed

Watershed-element and types, Watershed hydrology, Hydrological cycle, Precipitation, water losses , Runoff , Rainfall-Runoff analysis, Watershed problem

#### **2 Water Resources Management**

Erosion control and watershed development: their benefit towards conservation of national water wealth. Rain water harnessing and recharge of ground water: role of society and people's participation for sustainable water resource development. Mitigation strategies for flood damage: structural and non-structural measures

#### **3 Watershed Management techniques**

Spatial Decision Support Systems (SDSS) for land and water management at the watershed scale, Integrated Watershed Management , On-site and off-site management structures for soil and water conservation.

Community Watershed Management

#### **4 Optimization**

Optimization Multi - objective optimization, Review of probability theory, Uncertainty and reliability analysis, Stochastic optimization - Chance constrained LP, Stochastic DP with applications, Surface water quality control;

#### **5 Simulation**

Simulation – Reliability, Resiliency and Vulnerability of water resource systems, Multipurpose reservoir operation for hydropower, flood control and irrigation, Groundwater Systems, Water quality modeling, River basin Planning and management, Advanced topics.

#### **6 Soft computing techniques**

Soft computing techniques ANN Genetic algorithms, Multi criteria decision making, Decision Support Systems, Expert Systems

#### **Text Books :**

- 1 G L Asawa, Irrigation Engineering, Wiley eastern
- 2 S K Garg, Irrigation Engineering & Hydraulic Structures, Khanna Publishers

#### **Reference Books :**

- 1 J D Zimmerman, Irrigation, John Wiley & Sons
- 2 P N Modi, Irrigation Engineering & Hydraulic Structures, Standard Book house
- 3 V.P. Singh, Elementary Hydrology, Prentice Hall of India Pvt. Ltd. , 1994



<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VII</b>
<b>Course Code</b>	<b>CE4104S</b>	
<b>Course Title</b>	<b>Rehabilitation of Buildings (Elective II)</b>	
<b>Prerequisites</b>	<b>Construction Techniques</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Conduct POE and identify various types of distresses in buildings.
2. Identify the effects due to climate, temperature, chemicals, wear and erosion on structures.
3. Justify appropriate materials and techniques for repairs and rehabilitation

### **Course Contents:**

#### **1 Buildings**

Post occupancy evaluation of buildings, deformation and common defects in buildings.

#### **2 Concrete behavior**

Embedded metal corrosion. Disintegration mechanisms, moisture effect, exposure to aggressive chemicals, thermal effects, load effects, faulty workmanship.  
Models for deterioration

#### **3 Basics of cracking problems**

Structural & Non structural cracks, crack type, important characteristics & possible reasons.

#### **4 Condition survey**

Objective, preliminary inspection, visual inspection, Field & laboratory testing

#### **5 Non destructive evaluation**

Rebound Hammer, UPV, Infra red Thermography, carbonation test, Half cell potential, cover meter

#### **6 Various materials for repair**

Properties, Cement, aggregate, wire mesh, admixtures, bonding agents, corrosion protection, repair mortar, protective coating, polymer modified mortar.

## 7 **Structural appraisal & Structural monitoring**

Principles of appraisal, data collection, types of deficiencies/disorders.

## 8 **Various techniques of rehabilitation**

Repairs to corrosion infected members, damaged water proofing, junction of beam, column, wall, jacketing, fiber wrapping technique Different types of shoring, under pinning

## 9 **Maintenance of buildings**

Routine maintenance, Preventive measures, Remedial maintenance

### **Text Books:**

- 1 Repairs, Rehabilitation & Restoration of structures. By Dr. K.Saxena .Anuvi Chemicals Ltd.
- 2 Repairs, Rehabilitation & water proofing to RCC structures. By J J Shah. 2<sup>nd</sup> Edition.

### **Reference Books:**

- 1 Concrete technology, theory and practice, M.S. Shetty, S.Chand Publication, 2008.
- 2 Published books in the relevant areas to be supplemented by latest journal articles and papers, seminar and conference proceedings, in-house publications, monographs etc

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VII</b>
<b>Course Code</b>	<b>CE4105S</b>	
<b>Course Title</b>	<b>Advance Construction Techniques (Elective II)</b>	
<b>Prerequisites</b>	<b>Construction Techniques</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Gain knowledge for choosing the appropriate construction technique for a particular construction project.
2. Select the appropriate construction material, equipment's for a particular construction project.
3. Integrate knowledge for development of intelligent building using smart material.

### **Course Contents:**

- 1** Large and heavy engineering projects: characteristics and complexities, methods statement for major activities like excavation, concreting, steel fabrication and erection for projects like earthen dams, hydropower projects, nuclear power plant, refineries and other industrial projects etc.
- 2** Excavation for heavy engineering projects  
  
Excavation in various types of soils, selection of equipment, safety measures in excavation, drainage in excavation
- 3** Concrete construction for heavy engineering projects  
  
Selection of equipment for batching, mixing, transporting, placing and compacting for various types of jobs, safety measures during concreting, Special concretes and mortars: preplaced aggregate concrete, roller compacted concrete, grouting
- 4** Prefabricated construction  
  
Planning for pre-casting, selection of equipment for fabrication, transport and erection, quality measures, safety measures during erection

- 5** Formwork  
Requirement of formwork, loads carried by formwork, types of formwork such as timber formwork, Steel formwork, patent formwork, modular shuttering, slip forms, steel scaffolding.
- 6** Steel construction  
Planning for field operations, selection of equipment and erection tools, tools and methods of welding, tools and methods of cutting and joining , bridge erection, quality measures, safety measures during fabrication and erection
- 7** Specific issues related to planning, site layouts, equipment selection and pre-project activities for large size construction projects like earthen dams, concrete dams, thermal power stations, nuclear power stations, light houses, airports and ports, bridges
- 8** Information related to special equipments and their applications to  
Off-shore construction, underground utility construction
- 9** New materials and equipment for construction
- 10** Case studies of heavy construction projects

### **Text book:**

1. Heavy Construction, Vazirani and Chandola, Khanna Publications

### **Reference Books:**

1. Thomas baron, Erection of steel structures
2. Stubbs, handbook of heavy construction  
Journals of Civil Engineering and Construction Engineering

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VII</b>
<b>Course Code</b>	<b>SE4101S</b>	
<b>Course Title</b>	<b>Introduction to Non-Linear Analysis (Elective-II)</b>	
<b>Prerequisites</b>	<b>Engineering Mechanics, Strength of material/Mechanics of Solids, Structural Analysis -I and II</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Consider nonlinear behavior in structural stability analysis.
2. Apply stability principles for simple and complex buckling analysis of structures.
3. Apply plastic analysis techniques to simple and complex structures
4. Design simple and complex structures using plastic design methods.

### **Course Contents:**

#### **1 Introduction to Elastic Stability**

Geometric non linearity: basic concept. Analysis of beam column with various end conditions, use of trigonometric series.

#### **2 Introduction to Torsional Buckling**

Pure torsion of thin walled beams of open cross section warping and warping rigidity, Torsional buckling of columns, combined buckling by torsion and flexure. Lateral torsional buckling of beams, Indian codal provisions regarding buckling of steel members (columns and beams).

#### **3 Introduction to Plastic Analysis**

Concepts of plastic analysis of structures, Stress strain relations of steel and concrete. Concept of Redistribution of Moments, Plastic modulus, Shape factor, Plastic hinge, rotation capacity for steel and concrete plastic hinges, Fully plastic moment, moment curvature relations for rigid, semi rigid and ductile joints, Effect of Axial Force and Shear Force on the fully plastic moment of a cross section, Various types of failure mechanisms, Statical and Mechanism method for calculation of collapse loads, Lower and upper bound

theorems.

#### 4 **Determination of Collapse Loads for Steel Structures**

Determination of Collapse loads for single and multiple span beams, carrying various types of loads, single/multi bay multi storied rigid jointed portal frames and single bay gable frames. Incremental Load Method for pin jointed and rigid jointed frames

#### 5 **Determination of Collapse Loads for Concrete Structure**

Collapse load analysis of single/multiple span beams by Cambridge Method. Yield Line Analysis of Slabs

### **Text Books :**

- 1 M. Sathyamoorthy, Nonlinear Analysis of Structures, CRC Press, Boca Raton, Florida, 1997.
- 2 D.G. Fertis, Nonlinear Mechanics, CRC Press, Boca Raton, Florida, 1998.

### **Reference Books :**

- 1 J.N. Reddy, Nonlinear Finite Element Analysis, Oxford University Press, 2008.
- 2 S. Chandrasekaran, L. Nunziante, G. Serino and F. Carannante, Seismic Design Aids for Nonlinear Analysis of Reinforced Concrete Structures, Taylor and Francis, 2010

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VII</b>
<b>Course Code</b>	<b>SE4102S</b>	
<b>Course Title</b>	<b>Soil Dynamics and Machine Dynamics (Elective-II)</b>	
<b>Prerequisites</b>	<b>Soil Mechanics, Geotechnical Engineering</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Apply theory of vibrations to solve dynamic soil problems
2. Calculate the dynamic properties of soils using laboratory and field tests
3. Analyze and design behavior of a machine foundation resting on the surface, embedded foundation and foundations on piles by elastic half space concept.
4. Analyze and design vibration isolation systems

### **Course Contents:**

#### **1 Introduction**

Vibration of elementary systems-vibratory motion-single degree freedom system-free and forced vibration with and without damping

#### **2 Waves and Wave Propagation**

Wave propagation in an elastic homogeneous isotropic medium- Raleigh, shear and compression waves-waves in elastic half space

#### **3 Dynamic Properties of Soils**

Elastic properties of soils-coefficient of elastic, uniform and non-uniform compression - shear-effect of vibration dissipative properties of soils-determination of dynamic properties of soil- codal provisions

#### **4 Machine Foundation**

Types, Design criteria, Permissible amplitudes and Bearing pressure, Degrees of freedom - Analysis under different modes of vibration of block foundation Design criteria - dynamic loads - simple design procedures for foundations under reciprocating machines - machines producing impact loads - rotary type machines.

## 5 Vibration Isolation

Vibration isolation technique-mechanical isolation-foundation isolation-isolation by location-isolation by barriers- active passive isolation tests

### Text Books:

- 1 Swamisaran, “Soil Dynamics and Machine Foundations”, Galgotia Publications Pvt. Ltd., 1999
- 2 S.Prakesh and V.K Puri, Foundation for machines, McGraw-Hill 1993
- 3 Srinivasulu, P and Vaidyanathan, Hand book of Machine Foundations, McGraw-Hill, 1996
- 4 Kramar S.L, “Geotechnical Earthquake Engineering”, Prentice Hall International series, pearson Education (Singapore) Pvt. Ltd
- 5 KameswaraRao, “Dynamics Soil Tests and Applications”, Wheeler Publishing, New Delhi, 2003

### Reference Books:

- 1 Kameswara Rao, “Vibration Analysis and Foundation Dynamics”, Wheeler Publishing, New Delhi, 1998.
- 2 IS code of Practice for Design and Construction of Machine Foundations, McGraw-Hill, 1996.
- 3 Moore P.J., “Analysis and Design of Foundation for Vibration”, Oxford and IBH, 1995.
- 4 Barkan, “Dynamics of Bases and Foundations”, 2nd Edition McGraw Hill Publishing, 1970
- 5 Richart, Hall and Woods, “Vibration of Soils and Foundations”, Prentice Hall, 1981.  
ShamsherPrakash, “Soil Dynamics”, 3rd Edition, John Wiley, 2000



<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VII</b>
<b>Course Code</b>	<b>CE4106S</b>	
<b>Course Title</b>	<b>Sustainable Development (Open Elective)</b>	
<b>Prerequisites</b>		

### Course Outcomes:

After completion of course students will be able to

1. Describe sustainable development and development processes and relate impact of various levels of development
2. Formulate the methodology for assessment of sustainability of project using various indicators.
3. Apply environmental legislations to various developments processes and projects

### Course Contents

- 1 **Development:** Goals and means of development, sustainable development, Comparing levels of development, gross domestic product and gross national product, Global Development level
- 2 **Population:** World population growth, economic, growth Rates; health and longevity, global trends, Population age structures, burden of infectious disease, lifestyle challenges
- 3 **Industrialization and Post-industrialization era:** Major structural shifts, knowledge revolution, implications for development sustainability
- 4 **Environmental episodes:** Ozone depletion, global warming, green house effect, Bhopal gas tragedy etc
- 5 **Pollutions:** Basics, major sources, permissible standards and controls of Urban air pollution, water pollution, Solid and hazardous waste disposals
- 6 **Climate Change :** The Risk of Global Climate Change
- 7 **Environmental legislation:** legislative provisions and measures towards sustainability
- 8 **Indicators of Development Sustainability:** Composition of National wealth, Accumulation of National Wealth as an Indicator of Sustainable Development,

### **Text Books:**

- 1 Beyond Economic Growth: An Introduction to Sustainable Development by Tatyana P. Soubbotina; Second Edition, WBI Learning Series
- 2 An Introduction to Sustainable Development by Peter P. Roger ,Kazi F. Jalal, John A. Boyd  
Publisher: Earthscan 2008

### **Reference Books:**

- 1 Sustainable Development: Linking Economy, Society, Environment : by Tracey Strange, Anne Bayley.
- 2 Sustainable Development and Sustainability Transition Studies Series: Springer Briefs in Environment, Security, Development and Peace ; Series Ed.: Brauch, Hans Günter.
- 3 Mapping Sustainability Transitions: Networks of Innovators, Techno-economic Competences and Political Discourses @ 2016 Authors: Marletto, G., Franceschini, S., Ortolani, C.,Sillig, C. ; SpringerBriefs in Business.

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VII</b>
<b>Course Code</b>	<b>CE4107S</b>	
<b>Course Title</b>	<b>Risk and value management (Open Elective)</b>	
<b>Prerequisites</b>		

### **Course Outcomes:**

After completion of course students will be able to

1. Articulate and relate risk and value issues of a project
2. Provide an assessment of risks along the risk management matrix
3. Prepare disaster recovery plans
4. Formulate and conduct value engineering study

### **Course Contents:**

#### **1 Project Risks**

Definition, dynamic and static risk, uncertainty and risk,

Risk and construction project time, money and technology, the people and the risks, processes and risks, risks and clients, consultants and contractors, risk allocation in contracting

#### **2 Human Aspects**

Personnel attitude towards risk, perceptions and risks, individuals and groups , communication in risk management, concept of utility and risks.

#### **3 Risk management system**

Risk identification, sources of risks, risk classification, types, impact and consequences of risk, risk analysis, Sensitivity analysis, breakeven analysis ,scenario analysis, risk response: retention, reduction, transfer, avoidance.

#### **4 Qualitative and quantitative methods in risk management**

Qualitative risk assessment , risk register, probability – Impact matrix, project appraisal, cost benefit analysis, Monte- Carlo technique, portfolio theory , Delphi method, influence diagrams , decision trees

#### **5 Disasters**

Natural and manmade, possible effects, Disaster recovery plan Disaster recovery plan: basic requirements, documenting disaster recovery plan, rehearsing the disaster recovery plan, example disaster recovery plan

#### **6 Value Engineering**

Value, Reasons of poor value in constructed facilities, habits, road blocks and attitudes

#### **7 Value management**

Value Engineering job plan, function analysis, purpose and implications of life cycle costs, Impact of energy on cost of constructed facilities

#### **Text Books:**

- 1 N J Smith , Managing Risk in Construction Projects
- 2 L W Zimmerman and G D Hart, value Engineering, CBS Publishers.

#### **Reference Books:**

- 1 R Flagnan R and G Norman, Risk management and Construction, Blackwell Scientific
- 2 Thompson P A and Perry J G, Engineering Construction Risks- A guide to Project risk analysis and risk management, Thomas Telford

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VII</b>
<b>Course Code</b>	<b>CE4901D</b>	
<b>Course Title</b>	<b>Project I</b>	
<b>Prerequisites</b>		

### **Course Outcomes:**

After completion of course students will be able to

1. Review available knowledge with reference to specific problem
2. Formulate problem and define systematic approach to arrive at solution.
3. Collect data, analyze and arrive at solution to a defined problem

### **Course Contents:**

Every student has to work on a one year project in the last year under the guidance of a Guide allotted by the department. A project can also be done in a group of not more than four students. In case of a group project, role of every individual should be clearly defined.

The project may be related to theoretical analysis, fabrication of a model and experimental work, etc. Through the project, students have to exhibit both the analytical and practical skills.

The evaluation shall be done at the end of seventh semester. Students are expected to define the problem and its scope, complete literature survey and finalize methodology for data collection. They are also expected to give critical comments, necessity of work, scheme of experiments etc.

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VII</b>
<b>Course Code</b>	<b>CE4003L</b>	
<b>Course Title</b>	<b>Industry Internship</b>	
<b>Prerequisites</b>		

### **Course Outcomes:**

After completion of course students will be able to

1. Relate engineering knowledge and civil engineering works
2. Use Standard practices in civil engineering projects
3. Write technical report
4. Work as an individual and team.

### **Course Contents**

Student will undergo internship for summer vacation for minimum of 30 days in any of the Civil engineering firms to have an exposure to practical aspects of structural engineering, geotechnical engineering, environmental engineering, transportation engineering, water resources engineering, construction engineering and management etc.

Student will submit a report and give presentation based on internship. The internship report shall cover the following:

Introduction, Brief History of the Organization, Summary of the Project Assignment, Technical and practical information gained during the summer training period, Planning, Designing, check lists, Quality practices, safety measures, record keeping etc. (This must constitute the major part of the report), Conclusion and Recommendations , Photo gallery, References, Appendices.

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VII</b>
<b>Course Code</b>	<b>CE4004L</b>	
<b>Course Title</b>	<b>Development Engineering</b>	
<b>Prerequisites</b>		

### **Course Outcomes:**

After completion of course student will be able to:

1. Formulate and analyze problems in rural area.
2. Apply modern techniques for planning, development and report preparation
3. Use the tools and processes required for feasibility analysis.

### **Course Contents**

#### **1 Introduction to Development Engineering**

Introduction to development engineering; need of development engineering; core disciplines and concept; major issues in development; urban development; rural development; socioeconomic development; scientific social research, formulation of research problem, field work and data collection, report drafting

#### **2 Design of Sustainable Communities**

Concept and development of sustainable communities; Sustainable design principles, building regulations, codes and standards, approval process; green buildings- green building techniques energy solutions, site solutions, exterior and interior solutions, Certification. Development Indices.

#### **3 Planning and Development of Rural Areas**

District administration, District Planning, introduction to various sectors of rural areas such as drinking water, waste water treatment, electricity, public transport, irrigation, sanitation and cooking energy; issues and challenges associated with these sectors; People's participation and role in development of rural areas; various schemes and policies floated by state and central government - phases in the schemes; life cycle costing of these schemes. Introduction to the village-level census data. Engineering content in various amenities indices. Comparison plots and correlation plots.

#### **4 A Sectoral Engineering System**

The geography of area and its irrigation systems. Listing stakeholders, i.e., villages-farmers, people with and without land, local industrial workers, agriculture-cash crops and traditional crops, irrigation department and the market. History of irrigation for the region.

Protective vs. command irrigation and its consequences. Developing a methodology for assessment. An example of a design document Socio-Technical challenges-increasing irrigated area, drip irrigation and better farm practices. Groundwater regulation. Field Visit to an irrigation system. Meeting with an NGO, farmers, a state officer and an elected representative.

- 5 **Geoinformatics:** Loading QGIS and a district data-set. Using a given data-set. Writing queries and manipulating appearances, Types of objects and manipulating objects. Linking Census data to GIS. Basic analysis and representation Introduction to a case-study. Basics of spatial planning queries such as computing net supply and net demand.
- 6 **Tools and processes of feasibility analysis:**  
Demonstrate use of tools of market survey, demand forecasting, technology comparisons, environmental analysis, cash flow, risk analysis, return of investment

### **Reference Books:**

1. Chand, M. and Puri, U.K.(1983), 'Regional Planning in India', Allied Publishers, New Delhi.
2. Kaiser, E. J., et.al. (1995), 'Urban Landuse Planning', 4th (ed) Urbana, University of Illinois Press.
3. Sundaram, K.V. 1985 'Geography & Planning', Concept Publishing Co., New Delhi.
4. Ayyar, C.P.V. (1987), 'Town Planning in Early South India', Mittal Publications, Delhi.
5. Reeder, L. Hoboken, NJ, (2010), 'Guide to green building rating systems', John Wiley & Sons, Inc., 2010.
6. Longley, P. A., Michael F. Goodchild, Maguire, D.J., Rhind, D. W. (2005), 'Geographic Information Systems and Science', Second Edition 2005: John Wiley & Sons, New York.
7. Desai, V. (2005), 'Rural Development of India', Himalaya publishing house, Mumbai.
8. Rau, S.K. (2001), 'Global Search for Rural Development', NIRD, Hyderabad.
9. Institute of Town Planners, India, Ministry of Urban Affairs & Employment, Government of India, New Delhi, UDPFI Guidelines , 1996.
10. Miles R. Simon, 1970, 'Metropolitan Problems' Methuen Publications, Canada.
11. B.I.S., 1980, "National Building Code of India", ISI, New Delhi.
12. Prasanna Chandra, Projects Planning, analysis, selection, financing, implementation and review, Tata McGraw Hill, Sixth Edition.
13. IS 15883 Project Management.



<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VIII</b>
<b>Course Code</b>	<b>SE4002S</b>	
<b>Course Title</b>	<b>Earthquake Engineering</b>	
<b>Prerequisites</b>	<b>Structural Analysis I and II, Design of Reinforced Concrete Structures</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Apply the principles dynamics for analysis of civil engineering systems
2. Use procedure of dynamic analysis of SDOF and MDOF systems in frequency domain
3. Use procedure of dynamic analysis of SDOF and MDOF systems in time domain
4. Apply the principles of structural dynamics to structural design.
5. Design multistoried building structures safe and serviceable under earthquakes

### **Course Contents:**

#### **1 Fundamental of structural Dynamics**

Definitions of basic problems in dynamics, static v/s dynamic loads, different types of dynamic loads, undamped vibration of SDOF system, natural frequency and periods of vibration, damping in structure, response to periodic loads. Direct determination of frequencies and mode shapes, orthogonality principle, approximate methods for determination of frequencies and mode shapes, modal error of , forced vibration of MDOF system, modal analysis, applications to multistoried rigid frames subject to lateral dynamic loads

#### **2 Seismological Background**

Seismicity of a region, earthquake faults and waves, structure of earth, plate tectonics, elastic-rebound theory of earthquake, Richter scale, measurement of ground motion, seismogram

#### **3 Characterization of Ground Motion**

Earthquake response spectra, factors influencing response spectra, design response spectra for elastic systems, peak ground acceleration, response spectrum shapes, deformation, pseudo-velocity, pseudo-acceleration response spectra, peak structural response from the

response spectrum, response spectrum characteristics

#### **4 Deterministic earthquake response**

Types of earthquake excitation, lumped SDOF elastic systems, translational excitation, unimped MDOF elastic systems, translational excitation time history analysis, multistoried buildings with symmetric plans, multistoried buildings with un-symmetric plans, torsional response of symmetric plan building, distributed-parameter elastic systems, translational excitation, combining maximum modal responses using mean square response of a single mode, SRSS and CQCC combination of modal responses

#### **5 I. S. code method of seismic analysis and design**

Seismic co-efficient method and its limitation, response spectrum method, I. S. code provision for seismic analysis of buildings. Seismic design considerations, allowable ductility demand, ductility capacity, reinforcement detailing for members and joints

#### **6 Review of damages during past earthquakes and remedial measures**

Case studies of damage and remedial action taken for past earthquakes in India and abroad

### **Text Books:**

- 1 A.K. Chopra, Dynamics of Structures, Prentice Hall, India

### **Reference Books :**

- 1 R.R. Craig, Fundamentals of Structural Dynamics, John Wiley and Sons, 2006.
- 2 Clough and Penzien, Dynamics of Structures , Tata McGraw Hill
- 3 John M. Biggs, Structural Dynamics, Tata McGraw Hill
- 4 N.M. Newmarks and E. Rosenbluth, Fundamentals of earthquake engineering, Prentice Hall.
- 5 D. Key and Thomas Telford, Earthquake Design Practice for building, London, 1988
- 6 R.L. Wiegel, Earthquake Engineering, 2nd Edition, Prentice Hall, London, 1989
- 7 J.A. Blume, Design of Multistoried Buildings for Earthquake Ground Motions, Portland Cement Association, Chicago, 1961
- 8 Pankaj Agarwal and Manish Shrikhande, Earthquake Resistant Design of Structures, Prentice Hall of India Private Limited, 2006
- 9 IS 1893- Part 1 (2002), General Provisions and Buildings, Criteria for Earthquake Resistant Design of Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.
- 10 IS 1893- Part 4 (2002), Industrial Structures Including Stack- Like Structures, Criteria for Earthquake Resistant Design of Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VIII</b>
<b>Course Code</b>	<b>SE4003L</b>	
<b>Course Title</b>	<b>Structural Engineering Design Laboratory</b>	
<b>Prerequisites</b>	<b>Structural Analysis I and II, Design of Reinforced Concrete Structures</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Plan and design multistoried building structures to resist all types of applicable loads.
2. Design elevated water towers of various shapes and configurations.
3. Apply pre-stressed concrete design principles in design of pre-stressed concrete girders.

### **Course Contents:**

#### **1 Design and Drawing of G+7 Storied Residential Building (limit state method of design)**

Design and Drawing of G+7 Storied Residential Building for gravity and lateral loads (Wind and Earthquake) as per relevant I.S Codes.

A design report and at least three A1 (imperial) size drawings sheets covering the above design shall be submitted as term work.

#### **2 Design of Pre-stressed Concrete Girders**

Design of Pre tensioned and Post tensioned pre-stressed concrete girders.

A design report and at least one A1 (imperial) size drawings sheets covering the design of at least one pre-stressed concrete large span girder shall be submitted as term work

#### **3 Design of water tanks: (working stress method)**

Design of Circular and rectangular overhead water tanks both by ARE coefficient and approximate methods, supporting structure for overhead water tanks.

A design report and at least one A1 (imperial) size drawings sheets covering the design of at least one overhead water tank shall be submitted as term work

### **Text Books:**

- 1 Jain and Jaikrishna, Plain and Reinforced Concrete, Vol. I, Nemchand Brothers.
- 2 Shah and Karve, Limit State Design - Reinforced Concrete Structures Publications.
- 3 Krishna Raju, Pre-stressed Concrete, Tata McGraw Hill

### **Reference Books:**

- 1 P. Dayaratnam, Design of Reinforced Concrete Structures, Oxford & IBH..
- 2 T.Y. Lin, Design of Prestressed Concrete Structures, John Wiley and Sons Inc., 1981
- 3 P.D.Arthur and V.Ramkrishnan, Ultimate Strength Design for Structural Concrete, Wheeler &Co. Pvt Ltd
- 4 B.P. Huges, Limit State Theory for Reinforced Concrete Design, Pitman

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VIII</b>
<b>Course Code</b>	<b>CE 4005S</b>	
<b>Course Title</b>	<b>Construction Entrepreneurship</b>	
<b>Prerequisites</b>		

### **Course Outcomes:**

After completion of course students will be able to

1. Describe economics of construction environment
2. Prepare and submit bids for participating in bidding process
3. Define policies regarding planning & organizing resources.
4. Identify the risks and define strategy to manage risk and safety.

### **Course Contents:**

- 1 **Indian construction industry and project environment**  
Projects in construction and the unique features, Role of a Project Manager, Project stakeholders and governance, project delivery methods, enterprise environmental factors.
- 2 **Business Terminologies**  
Types of entities, Special Purpose Vehicle, Partner, Company, Sole Proprietorship firm, Trust, Society, Articles of Association and MOA, BOT, Joint venture
- 3 **Construction enterprise organization**  
Forms of business organization, structure of construction organization, organisation structures for managing projects., management levels, organizational influences on construction project management.
- 4 **Construction economics**  
Economic decision making, time value of money, evaluating alternatives,  
  
Investment criteria: Net present value, benefit cost ratio, internal rate of return, urgency, payback period, accounting rate of return
- 5 **Construction contract**  
Bidding process, General contract conditions (CPWD and FIDIC), sub-contracting.

## 6 **Bidding**

Estimation of costs and bidding strategies, bid preparation, bidding models

## 7 **Planning and organizing construction site and resources**

Site: site layout, developing site organization, record keeping at site, Manpower: planning, organizing, staffing, motivation, Materials: concepts of planning, procurement and inventory control, Equipment: basic concepts of planning and organizing,

## 8 **Project financing**

Accounting process, revenue recognition, working capital needs, financing for working capital, Funds: cash flow, sources of funds.

## 9 **Claims management**

Claims identification, claim quantification, claim prevention, claim resolution, contract dispute sand project closure, and settlement method.

## 10 **Risk in construction entrepreneurship**

Risk management process, insurance in construction

## 11 **Heath, Safety, Security and Environmental (HSSE) management on project sites**

Accidents; their causes and effects, costs of accidents, occupational health problems in construction, organizing for safety and health

### **Text Books :**

- 1 Jha K N, Construction Project Management, Pearson, 2011
- 2 Chitkara K K, Construction Project Management, Tata McGraw Hill

### **Reference Books :**

- 1 Project Management for Construction - Fundamental Concepts for Owners, Engineers, Architects and Builders, Chris Hendrickson, World Wide Web Publication, 2000
- 2 Barrie D.S. & Paulson B C, Professional Construction Management, McGraw Hill

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VIII</b>
<b>Course Code</b>	<b>CE4006T</b>	
<b>Course Title</b>	<b>Construction Management</b>	
<b>Prerequisites</b>		

### **Course Outcomes:**

After completion of course students will be able to

1. Explain need for management and management functions.
2. Develop and analyze plans and resolve resource conflicts.
3. Relate monitoring and control issues with reference to time, cost and quality.

### **Course Contents:**

#### **1 Management**

Definition, functions of management, advances and societal influences in construction management

#### **2 Construction projects:**

Relationships with Project, Program and Portfolio Management, Project lifecycle, Phases of a project, agencies involved, Indian standards on construction and project management

#### **3 Construction project planning:**

Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail.

Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, estimating durations, sequence of activities, activity utility data

#### **4 Techniques of planning:**

Bar charts, Networks: basic terminology, types of precedence relationships: finish to start, start to start, finish to finish, start to finish, preparation of CPM networks: activity on link and activity on node representation, analysis of single relationship (finish to start) networks, computation of float values, critical and semi-critical paths, calendaring networks

**5 Resource Scheduling:**

Bar chart, line of balance technique, resource constraints and conflicts, resource aggregation, allocation, smoothing and leveling

**6 PERT:**

Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion

**7 Construction costs:**

Classification of costs, time cost trade-off in construction projects, compression and decompression

**8 Monitoring & control:**

Project communications, record keeping, periodic progress reports, periodical progress meetings, earned value management, scope creep and change management, updating of plans: purpose, frequency and methods of updating common causes of time and cost overruns and corrective measures.

Quality control: concept of quality, quality of constructed structure, supervision, use of manuals and checklists for quality control, role of inspection, basics of statistical quality control

**9 Project Closure:** Closeout documentation, Project punch list, Lessons Learned, as build drawing, operation and maintenance manual.

**Text Books :**

- 1 Chitkara K K, Construction Project Management, Tata McGraw Hill
- 2 Jha K N, Construction Project Management, Pearson, 2011

**Reference Books :**

- 1 Antill J M & Woodhead R W, Critical Path Methods in Construction Practice, Wiley
- 2 Barrie D.S. & Paulson B C, Professional Construction Management, McGraw Hill
- 3 Indian and other relevant Standards



<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VIII</b>
<b>Course Code</b>	<b>CE4006P</b>	
<b>Course Title</b>	<b>Construction Management Laboratory</b>	
<b>Prerequisites</b>		

### **Course Outcomes:**

After completion of course students will be able to

1. Develop plan for construction of civil engineering facility
2. Use project management software for generation of plans, schedules and reports.

### **Course Contents:**

- 1 Preparation of a project plan for one of the following projects using working drawings
  - Residential bungalow
  - Single storied building for commercial purpose
  - single span bridge.
- 2 Use of project management software, capability, input requirements, possible outputs.

### **Text Books :**

- 1 Chitkara K K, Construction Project Management, Tata McGraw Hill
- 2 Jha K N, Construction Project Management, Pearson, 2011

### **Reference Books :**

- 1 Antill J M & Woodhead R W, Critical Path Methods in Construction Practice, Wiley
- 2 P K Joy, Handbook of construction management

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VIII</b>
<b>Course Code</b>	<b>CE4108S</b>	
<b>Course Title</b>	<b>Solid and Hazardous waste Management (Elective III)</b>	
<b>Prerequisites</b>	<b>Environmental Engineering</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Use the principles of solid & hazardous waste management.
2. Design & optimize techniques in solid & hazardous waste management.
3. Acquire knowledge on specialized solid & hazardous waste treatment.
4. Analyze policies regarding solid and hazardous wastes including legal implications.

### **Course Contents:**

- 1 Solid Wastes - sources, types, composition, physical, chemical, and biological properties of solid wastes / sources and types of hazardous and infectious wastes in municipal solid wastes.
- 2 Solid waste generation and collection, Handling, Storage, Processing, Transportation
- 3 Disposal of Solid waste - materials separation and processing, thermal conversion, biological and chemical conversion, recycling of material in municipal solid wastes, Land filling, Composting, gas generation, closure of landfills.
- 4 Industrial solid wastes-composition, bio-degradable, non biodegradable hazardous, toxic solid wastes, methods of detoxification, disposal on land.
- 5 Legal aspects of municipal solid waste collection, conveyance, treatment and disposal.
- 6 Hazardous wastes - origin, quantity and quality parameters.
- 7 Treatment and disposal methods of Hazardous waste - Physico-chemical and biological. Stabilization and solidification, thermal methods, land disposal, site remediation.

### **Text Books:**

- 1 Integrated solid waste management, Tchobanoglous, Theisen and Vigil, McGraw Hill International
- 2 Hazardous waste management, Lagrega, Buckingham & Evans, McGraw Hill International
- 3 Solid waste management in developing countries A.D. Bhide, Nagpur Publications
- 4 Management of Municipal Solid Waste by T V Ramachandra; ISBN:9788179931875

### **Reference Books:**

- 1 Integrated solid waste management. Tchobanoglous, Theissen and Vigil-McGraw Hill Book Co.
- 2 Hazardous waste management LaGrega, Buckingham & Evans. McGraw Hill Book Co.
- 3 Solid wastes - Engineering principles and management issues. Tchobanoglous, Theissen and Eliassen. McGraw Hill Book Co.
- 4 Solid waste management - Hagerty, Pavoni, Heer-Van Nostrand Reinhold Co., New York
- 5 Handbook of solid wastes disposal-Materials and Energy
- 6 Recovery-Paveni, Heer, Hagerty. Van Nostrand Reinhold Co. N. Y.
- 7 Infectious & Medical Waste Management by Peter A Reinhardt Judith G Gordo

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VIII</b>
<b>Course Code</b>	<b>CE4109S</b>	
<b>Course Title</b>	<b>Watershed Management (Elective-III)</b>	
<b>Prerequisites</b>	<b>Engineering Hydrology, Water Resource Engineering.</b>	

### Course Outcomes:

After completion of course students will be able to

1. Use integrated watershed management approach.
2. Analyze socio-economic aspects of watershed.
3. Apply techniques to analyze and solve watershed problems.

### Course Contents:

- 1 **Introduction and Basic Concepts:** Concept of watershed, introduction to watershed management, different stakeholders and their relative importance , watershed management policies and decision making.
- 2 **Sustainable Watershed Approach & Watershed Management Practices:** Sustainable integrated watershed management, natural resources management, agricultural practices, integrated farming, Soil erosion and conservation. Watershed Management Practices in Arid and Semi-arid Regions, Case studies, short term and long term strategic planning.
- 3 **Integrated Watershed Management:** Introduction to integrated approach, Integrated water resources management, conjunctive use of water resources, rainwater harvesting; roof catchment system.
- 4 **Social Aspects of Watershed Management:** Community participation, Private sector participation, Institutional issues, Socio-economy, Integrated development, Water legislation and implementations, Case studies.
- 5 **Use of modern techniques in watershed management:** Applications of Geographical Information System and Remote Sensing in Watershed Management, Role of Decision Support System in Watershed Management.
- 6 **Management of Water Quality:** Water quality and pollution, types and Sources of pollution, water quality modelling, environmental guidelines for water quality.

**7 Storm Water and Flood Management:**

Storm water management, design of drainage system, flood routing through channels and reservoir, flood control and reservoir operation, case studies on flood damage.

**8 Drought Management:** Drought assessment and classification, drought analysis techniques, drought mitigation planning.

**9 Water Conservation and Recycling:**

Rain water harvesting, Perspective on recycle and reuse, Waste water reclamation.

**Text Books:**

- 1 Murty, J.V.S. “Watershed Management”, New Age Intl., New Delhi 1998.
- 2 Murthy, J.V.S., Watershed Management in India, Wiley Eastern, New Delhi, 1994 .
- 3 Purandare, A.P., Jaiswal A.K., Waterhed Development in India, NIRD, Hyderabad, 1995.
- 4 V. Singh, Raj , Watershed Planning and Management, Yash Publishing House, Bikaner, 2000.

**Reference Books:**

- 1 Allam, Gamal Ibrahim Y., Decision Support System for Integrated Watershed M anagement,Colorado State University, 1994.
- 2 American Socy. of Civil Engr., Watershed Management, American Soc. of Civil Engineers, New York, 1975.
- 3 Black Peter E., Watershed Hydrology, Prentice Hall, London, 1991.
- 4 Michael A.M., Irrigation Engineering, Vikas Publishing House, 1992.

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VIII</b>
<b>Course Code</b>	<b>CE4110S</b>	
<b>Course Title</b>	<b>Pavement Management System (Elective III)</b>	
<b>Prerequisites</b>	<b>Pavement Engineering</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Gain the knowledge of pavement management systems at network level and project level.
2. Perform the functional and structural evaluation of pavement.
3. Design strategies of pavement and economic evaluation.

### **Course Contents:**

#### **1 Pavement Management System (PMS)**

Components of PMS and their Activities, Major Steps in Implementing PMS, Inputs, Design, Construction and Maintenance, Rehabilitation and Feedback Systems.

Pavement Structural Design and Economic Analysis.

Emerging Technology in Pavement Management Systems

#### **2 Pavement distresses**

Distresses in flexible/rigid pavements : causes & remedies. Visual Surface distress survey procedures and techniques. Serviceability indicators for roads.

Measurement of Serviceability Indicators using various equipments like Bump Indicator, Skid tester, Distress surveys & Benkelman Beam.

Functional evaluation of pavements: Serviceability Concepts, Visual Rating, Pavement Serviceability Index, Roughness Measurements, Skid Resistance, Roughness, and Safety Aspects. Inventory System

#### **3 Maintenance operations/alternatives**

Classification of maintenance operations, Routine, Periodic, Special.

Common types of maintenance: Potholes, Cracked surface, Ruts & undulations,

Resurfacing, Interface treatments, White topping.

Bituminous Thin Surface Courses: Seal Coat, Surface Dressing, Premixed carpet, Mixed seal surfacing, Micro asphalt concrete (MAC).

Bituminous Surface Courses: Semi-Dense Bituminous Concrete, Bituminous Concrete, and Bitumen Mastic.

Road maintenance in high rainfall areas. Choice of materials. Modified bitumen & geofabrics. Maintenance alternatives including recycling

### **Text Books :**

- 1 Principles and Practice of Highway Engineering, L.R.Kadiyali, Khanna Publications
- 2 Highway engineering, Khanna S.K. & Justo C.E.G. Nem Chand

### **Reference Books :**

- 1 IRC 58-2012, Guidelines for the design of rigid pavements for highways
- 2 Specifications for rural road, Indian Road Congress
- 3 Rural roads manual, Indian Road Congress
- 4 Guidelines for the design of flexible pavements, Indian Road Congress
- 5 IRC 81-1997, Guidelines for strengthening of flexible road pavements using Benkalman deflection technique.
- 6 The Design and Performance of Road Pavements, Croney, David et al, McGraw Hill
- 7 Principles of Pavement Design, Roder and Witciak, Wiley International

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VIII</b>
<b>Course Code</b>	<b>CE4111S</b>	
<b>Course Title</b>	<b>Pavement Design and Construction (Elective III)</b>	
<b>Prerequisites</b>	<b>Pavement Engineering</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Modeling to analyze flexible and rigid pavements.
2. Apply the pavement management concepts to better manage road pavement and its construction.
3. Apply the various types of highway appurtenance to enhance the safety of users.

### **Course Contents:**

- 1 Pavement structure and functional attributes, factors affecting pavement design, types of wheel loads for highways and airports, development of design method for highway and airport pavements.
- 2 Stresses in flexible pavements 1-layer, 2-layers, 3-layer theories, EWF, ESWL load coverage
- 3 Stresses in rigid pavement: load and temperature stresses, combined stresses.
- 4 Evaluation of sub-grade and pavement materials: group index, FAA classification, CBR, Triaxial compression, Dynamic/ Resilient modulus, embankment design and construction Grading requirements for aggregates, selection of bases and sub-base materials (including stabilized materials), selection of different grades of bitumen, types of bituminous surfaces, skid qualities, bituminous mix design, design aspects of paving concrete
- 5 Flexible Pavement Design:  
 Airport pavement: Corps of Engineers (CBR) method, FAA Method, CDOT method, Asphalt Institute method.  
 Highway pavement: Empirical methods using no soil strength criteria, Empirical method based on soil strength-CBR, Design procedure in Road Note 29(U.K.), IRC(1984) guidelines, AASHO method, Asphalt Institute method.



- 6 Rigid pavement Design:  
Airport pavement: PCA methods, corps of engineers method, FAA method  
Joints and reinforcement requirement  
Highway pavement: current British procedure, IRC method
- 7 Drainage: importance, principles of good drainage, surface drainage, sub-surface drainage, role of shoulders, Use of geotextiles.  
  
Culverts, Causeways; Importance, types, site selection
- 8 Evaluation and strengthening:  
Flexible and rigid pavement distresses, condition and evaluation surveys, present serviceability index, Roughness measurement, Benkalman Beam deflections, design of overlays, skid-resistance and its measurement
- 9 Economics of pavement types, basis for comparison, period of analysis, cost of initial construction, cost of maintenance, cost of vehicle operation, equivalencies in thickness.
- 10 Economic evaluation of highway scheme basic principles of economic evaluation, Net present value method, Benefit/cost ratio method, internal rate of return method
- 11 Concrete Road construction:  
Mix design, concrete strength, size of aggregates, and gradation, workability, preparation of base, form work, placing of reinforcement, compacting, finishing, curing, joints
- 12 Quality control in highway engineering: importance - process control and end product control, statistical methods in quality control, control charts, frequency of testing

### **Text Books:**

- 1 Principles and Practice of Highway Engineering, L.R.Kadiyali, Khanna Publications
- 2 Highway engineering, Khanna S.K. & Justo C.E.G. Nem Chand

### **Reference Books:**

- 1 The Design and Performance of Road Pavements, Croney, David et al, McGraw Hill
- 2 Principles of Pavement Design, Roder and Witciak, Wiley International

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VIII</b>
<b>Course Code</b>	<b>SE4103S</b>	
<b>Course Title</b>	<b>Design of Prestressed Concrete Structures (Elective III)</b>	
<b>Prerequisites</b>		

### **Course Outcomes:**

After completion of course students will be able to

1. Implement the principles of pre-stressed concrete for analysis of pre-stressed concrete sections.
2. Evaluate losses in pre-stressed concrete sections.
3. Design pre-stressed concrete sections.
4. Analyze determinate pre-stressed structural members.
5. Design determinate pre-stressed structural members.

### **Course Contents:**

#### **1 Introduction to prestressed concretes**

Basic concept and general principles, materials used and their properties, methods and techniques of prestressing, prestressing systems, loss of prestress, segmental box girder.

#### **2 Analysis of prestressed concrete sections**

Loading stages and computation of section properties, critical sections under working load for pretensioned and post tensioned members, load balancing method of analysis of prestressed concrete beams.

#### **3 Design of prestressed concrete sections for flexure**

General philosophy of design, design approaches in working stress method and limit stress method, critical conditions for design, limit state of collapse in flexure, permissible stresses in concrete and steel, kern points, choice and efficiency of sections, cable profiles and layouts, cable zone, deflections of prestressed concrete members.

#### **4 Design for shear**

Calculation of principle tension under working load, permissible principle tension, shear strength calculation under limit state of collapse for both sections cracked and uncracked in flexure

## **5 End zone stresses in prestressed concrete members**

Transfer of prestress in pretension member: pretension transfer bond, transmission length, end zone reinforcement

Anchor zone stresses in post tensioned members: stress distribution in end block, anchor zone reinforcement

## **6 Design of prestressed concrete beams**

Design of simply supported pretension and post tensioned slabs and beams, introduction to application of prestressing to continuous beams, linear transformation and concordancy of cables.

### **Text Books :**

- 1 N. Krishna Raju, Prestressed Concrete, Tata McGraw Hill Publishing Co., 2000

### **Reference Books :**

- 1 T.Y. Lin, Design of Prestressed Concrete Structures, John Wiley and Sons Inc., 1981.
- 2 R.H. Evans and E.W. Bennett, Prestressed Concrete, Chapman and Hall, London, 1958.
- 3 James Libby, Modern Prestressed Concrete, Springer Science & Business Media, 2012
- 4 Antoine E. Naaman, Prestressed Concrete Analysis and Design, Mcgraw-Hill College, 1982.
- 5 Y. Guyon, Prestressed Concrete, Contractors Record, 1955

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VIII</b>
<b>Course Code</b>	<b>SE4104S</b>	
<b>Course Title</b>	<b>Geosynthetic Engineering (Elective III)</b>	
<b>Prerequisites</b>	<b>Soil mechanics, Geotechnical engineering.</b>	

## Course Outcomes:

After completion of course students will be able to

1. Select geosynthetics for intended purpose.
2. Evaluate properties of geosynthetics.
3. Design geosynthetics for intended purpose.
4. Design geocomposite systems to solve contemporary geotechnical and landfill problems.

## Course Contents

### 1 Introduction

Historical Development: Types of Geosynthetics, Geotextiles, geogrids, geonets, geomembranes, geocomposites, functions, reinforcement, separation, filtration, drainage, barrier Functions.

### 2 Physical Mechanical, Hydraulic & Durability Properties

Physical properties: Mass per unit area, thickness, specific gravity, hydraulic properties: Apparent open size, permittivity transmissivity.

Mechanical Properties: Uniaxial Tensile Strength, Burst and Puncture Strength, Soil Geosynthetic friction tests; Durability: Abrasion resistance, Ultraviolet resistance.

### 3 Testing methods for Geosynthetics

Techniques for testing of different index properties, strength properties, Apparent Opening Size, In-plane and cross-plane permeability tests, assessment of construction induced damage, extrapolation of long term strength properties from short term tests

### 4 Drainage And Filtration Applications of Geosynthetics

Different filtration requirements, filtration in different types of soils and criteria for selection of geotextiles, estimation of flow of water in retaining walls, pavements, etc. and selection of geosynthetics.

## **5 Reinforced Soil Slope**

Basal reinforcement for construction on soft clay soils, construction of steep slopes with reinforcement layers on competent soils, Different slope stability analysis methods like planar wedge method, bi-linear wedge method, and circular slip methods. Erosion control on slopes using geosynthetics

## **6 Pavement Application**

Geosynthetics for separation and reinforcement in flexible pavements, design by Giroud-Noiray approach, reflection cracking and control using geosynthetics.

Use of geosynthetics for construction of heavy container yards and railway lines

## **7 Construction of Landfills using Geosynthetics**

Different components of modern landfills, collection techniques for leachate, application of different geosynthetics like geonets, geotextiles for drainage in landfills, use of geomembranes and Geosynthetic Clay Liner (GCL) as barriers

### **Text Books :**

- 1 G.VenkatappaRao and G.V.SuryanarayanaRaju, Engineering with Geo-synthetics, Tata McGraw Hill, New Delhi, 1990.
- 2 Robert M. Koerner, Designing with Geosynthetics , Prentice Hall, New Jersey UAS, 1989
- 3 Shukla, S.K. Handbook of Geosynthetic Engineering: Geosynthetics and their applications

### **Reference Books :**

- 1 Robert M. Koerner, Construction and Geotechnical Methods in Foundation Engineering, McGraw Hill, New York, 1985.
- 2 Jewell, R.A., Soil Reinforcement with Geotextile, CIRIA, London, 1996
- 3 John, N.W.M., Geotextiles, John Blackie and Sons Ltd., London, 1987
- 4 Proc. Conference on polymer and Reinforcement, Thomas Telford Co., London, 1984.

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VII</b>
<b>Course Code</b>	<b>CE4112S</b>	
<b>Course Title</b>	<b>Unit Operations &amp; Processes in Environmental Engineering (Elective IV)</b>	
<b>Prerequisites</b>	<b>Environmental Engineering</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Describe various types of process units used for preliminary, primary, secondary and tertiary treatment.
2. Explain and distinguish pollutant removal mechanisms of physicochemical and biological treatment units.
3. Design the treatment processes of water and wastewater in the context of environmental, economic and social factors.
4. Identify the operational characteristics, and evaluate emerging technologies for advanced wastewater treatment and water recycling

### **Course Contents**

#### **1 Introduction:**

Need of treatment: Preliminary, Primary, Secondary, Tertiary, Advanced treatment.  
Unit Operations and Processes: Definition. Examples.

#### **2 Unit Operations**

Screening-Classification, Coarse Screen, Fine Screen, Microscreens. Design Consideration. Screenings characteristics and quantities.

Flow Equalization: Description, Application and Design consideration.

Mixing and Flocculation: Rapid Mixing & Flocculation, Different types, Design Consideration.

Gravity Separation: Discrete & Flocculant particle settling.

Flotation: Description, Applications, Design consideration.

Aeration: Oxygen Transfer, Types of Aeration systems.

Filtration: Slow sand filter and Rapid sand filter.

### **3 Chemical Unit Processes**

Role of chemical unit processes in treatment,  
Chemical Coagulation for removal of turbidity, color; Chemical precipitation for removal of heavy metals, phosphorous removal; Chemical oxidation for removal of BOD/COD, Chemical neutralization.

### **4 Biological Unit Processes**

Oxidation of Organic matter. Synthesis, Auto oxidation, Aerobic and Anaerobic processes.  
Biological removal of nitrogen and phosphorous. Biological removal of Toxic organic compounds.

### **Text Books:**

1. Tom D. Reynolds and Paul D. Richards, Unit Operations and Processes in Environmental Engineering, 2<sup>nd</sup> Edition, PWS publishing Company, 1996
2. Robert Noyes, Unit Operations in Environmental Engineering, 2<sup>nd</sup> Edition, William Andrew Publishing, 1994
3. Rao M. N, Wastewater Treatment: Rational Methods of Design and Industrial Practices, 3<sup>rd</sup> Edition, Oxford and IBH Publishing, 2007.

### **Reference Books:**

1. Soli J. Arceivala and Shyam R Asolekar, Wastewater Treatment for pollution control & reuse, 3<sup>rd</sup> Edition, Tata McGraw Hill Pvt Ltd, New Delhi, 2008.
2. Syed R. Qasim, Wastewater Treatment Plants: Planning, Design and Operation, 2<sup>nd</sup> Edition, Taylor and Francis Publishing, 1998.

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VIII</b>
<b>Course Code</b>	<b>CE4113S</b>	
<b>Course Title</b>	<b>Transportation &amp; Planning &amp; Traffic Engineering (Elective IV)</b>	
<b>Prerequisites</b>	<b>Pavement Engineering</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Apply techniques for collecting and analyzing traffic data and its evaluation.
2. Develop appropriate model of traffic flow.
3. Use methods for demand forecasting and economic evaluation of transport projects

### **Course Contents:**

#### **1 Traffic Engineering and control**

Review of various traffic surveys and traffic studies.

Statistical methods for traffic engineering and their applications : Distributions, sampling theory and Significance testing, Regression and Correlation.

Intersection design: Principles, various available alternatives, rotary design, mini roundabout, traffic signals: types of traffic signals, advantages, determination of optimal cycle time and signal setting for an intersection with fixed time signals, co-ordination of signals, types, area traffic control, delay at signalized intersection.

Accident and road safety: accident causes, recording system, analysis and preventive measures, accident cost, alternative methodologies for calculation.

Traffic management: various measures and their scope, relative merits and demerits.

Highway capacity: Passenger's car units, level of service, factor affecting capacity and level of service, influence of mixed traffic.

#### **2 Transportation Planning and management**

Introduction to the process of urban transport planning.

Travel demand forecasting:

Trip generation analysis, trip classification, multiple regression analysis, category analysis

Modal split analysis: introduction, earlier modal split models, modal split models with



behavioral basis.

Trip distribution analysis: introduction, methods of trip distribution, uniform and average factor method, Fratar method, Furness method, The Gravity model, Intervening and competing, Linear programming approach to trip distribution.

Traffic Assignment: purpose of traffic assignment, traffic flow characteristics, Assignment techniques: All or nothing assignment, Multiple route assignment, Capacity restraint assignment, Diversion curves. Rout building algorithms.

Land-use transport models: Introduction, selection of Land-use transport models, The Lowry model, Grain – Lowry model, Applications of Lowry model.

### **3 Theory of traffic flow**

Scope, definitions and basic relationship, review of flow density speed studies, hydrodynamic analogies, Application of hydrodynamic analogy, Car-following theory and its application to traffic engineering, probabilistic description of traffic flow, an introduction to queuing theory as applied to traffic flow problems for study state conditions, simulation studies.

### **4 Transport Economics**

Economic evaluation of highway schemes, need for economic evaluation, cost and benefits of transportation projects, basic principles of economic evaluation, Net present value method, benefit/cost ratio method, internal rate of return method. Vehicle operating costs, Value of travel time saving, Accident costs

### **5 Public Transportation**

Mass transit systems: Bus and rail transit, characteristic capacities etc.

### **6 Introduction to intelligent transportation systems, Introduction to advanced computational techniques for transportation planning**

## **Text Books :**

- 1 Traffic engineering and transport planning by L.R. Kadiyali, Khanna publishers Delhi
- 2 Partha Chakraborty and Animesh das, Principles of Transportation Engineering, Prentice Hall (India)
3. Transportation Engineering and Planning, C.S. Papacostas and P.D. Prevedouros, 3<sup>rd</sup> edition, Prentice Hall, New Jersey, 2001.

## **Reference Books :**

- 1 Wohl and Martin, Traffic System Analysis for Engineering and Planners, McGraw Hill, 1983.
- 2 Manual of Economic Evaluation of Highway PProjects in India (SP30), Indian Road Congress

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VIII</b>
<b>Course Code</b>	<b>CE4114S</b>	
<b>Course Title</b>	<b>Project Appraisal (Elective IV)</b>	
<b>Prerequisites</b>		

### **Course Outcomes:**

After completion of course students will be able to

1. Explain concepts of project formulation.
2. Illustrate application of tools of data analysis for appraisal.
3. Articulate arguments to justify projects in view of various aspects.
4. Analyze and explain risks involved in undertaking a project.

### **Course Contents**

#### **1 Project development**

Projects, Capital expenditure: Importance and difficulties, Phase of capital budgeting, project development cycle, aspects of appraisal.

#### **2 Project preparation**

Project Conception, scouting for ideas and alternatives, Preliminary screening

#### **3 Technical appraisal**

Materials and other resources, choice of technology, selection of site, plans and works schedules

#### **4 Market analysis**

Demand, past, present and future, govt. policies, demand forecasting techniques

#### **5 Financial estimates and projections**

Project estimates, sources of financing, cost and financing, financial projections – balance sheet, sources and uses of funds, cash flow statement

## 6 **Financial appraisal**

Urgency, payback period, accounting rate of return, net present value, internal rate of return

## 7 **Risk analysis**

measures of risk, mathematical analysis of cash flows, sensitivity and scenario analysis, decision tree analysis, Social cost benefit analysis ; - rationale, different approaches.

### **Text Books :**

- 1 Prasanna Chandra, Project Preparation, appraisal, budgeting and implementation, Tata McGraw Hill
- 2 Policy guidelines: Guidelines for the Preparation of Feasibility reports of Industrial Projects, Controller of Publications, New Delhi.

### **Reference Books:**

- 1 OECD : Manual of Industrial Projects analysis in developing countries – methodology and case studies, OECD Paris
- 2 UNIDO ; Guide Practical Project Appraisal, UN
- 3 UNIDO ; Guidelines for Project evaluation , UN

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VIII</b>
<b>Course Code</b>	<b>CE4115S</b>	
<b>Course Title</b>	<b>Environmental Impact Assessment (Elective IV)</b>	
<b>Prerequisites</b>	<b>Environmental Engineering</b>	

### **Course Outcomes:**

After completion of course students will be able to

- CO1.** Describe EIA process and relate various government notifications..
- CO2.** Formulate the methodology for prediction and assessment of various impacts on environment
- CO3.** Analyze the issues and mitigation measures through case study

### **Course Contents**

#### 1. Fundamental Approach To EIA:

History of EIA: Evolution Environmental Laws in World & India, Development of EIA in India, Environmental Clearance Procedure in India.

Basic Concept of EIA: Introduction, EIA Procedure, Objective of EIA, Significances

Systematic Approach for Using EIA: Introduction, Identification of Study Area, Classification of Environmental Parameters, Terms of References, Preparation of EIA Report, Scoping in EIA,

Baseline Studies in EIA, Environmental Monitoring & Management Planning, Draft and Final EIA, Impact Analysis, Final EIA Report.

- 2. EIA Methodologies: Introduction, Criteria for The Selection of EIA Methodology, EIA Methods: Adhoc Methods, Checklists Methods, Matrices Methods, Networks Methods, and Overlays Methods,
- 3. Environmental Impact Statement (EIS): Introduction, Basic Concepts behind EIS, Various Stages in EIS Production, Typical EIS Outline.
- 4. Rapid EIA: Introduction, Procedure, Advantages and Limitation.
- 5. Prediction and assessment of impacts on soil and ground water environment: introduction, soils and ground water, methodology for the prediction and assessment of impacts on soil and groundwater.
- 6. Prediction and Assessment of Impacts on Surface Water Environment: Introduction, Project Which Create Impact Concerns for the Surface-Water Environment, Systematic Methods For Evaluation of Impacts of Various, Developmental Activities on Surface

Water Environment.

7. Prediction and Assessment of Impacts on Biological Environment: Introduction, General Methodology for the Assessment of Impacts on Biological Environment, Systematic Approach for Evaluating Biological Impacts.
8. Prediction and assessment of impacts on the air environment: Introduction, a generalized approach for assessment of air pollution impact.
9. Prediction and assessment of impacts of noise on The environment: Introduction, Basic Information of Noise, Noise Measurement, Effects of Noise on People, Systematic Methodology for Assessing Environmental Impacts of Noise.
10. Prediction and Assessment of Impacts on the Socio-Economic Environment: Introduction, Social Assessment, Conceptual Frame Work for Socio Economic Assessment.
11. Case studies on Environmental Impact assessment

**Recommended books:**

1. Environmental Impact Assessment, second edition, Larry W. Canter, McGraw-Hill International editions.
2. Environmental Impact Assessment, Lauren David P., Willy Interscience, New Jersey.
3. Environmental Impacts of Industrial & Mining activities, Lalit N. Patraik, Ashish Public house.
4. Impact of Mining on Environment, Trivedi R. K., Sinha M. P., Ashish Publication House.
5. Radioactive releases in the environment: Impact and Assessment, cooper, John R., Randle, Keith and other, 2003, John Wiley sons.
6. Environment, construction and sustainable development vol. 1, The Environmental Impact of Carpenter T. G., 2001, John Wiley & sons

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VIII</b>
<b>Course Code</b>	<b>SE4105S</b>	
<b>Course Title</b>	<b>Finite Element Method (Elective IV)</b>	
<b>Prerequisites</b>	<b>Structural Analysis I and II, Numerical Methods</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Acquire the basics of fundamental theory of the Finite Element Analysis method.
2. Generate the governing FE equations for systems governed by partial differential equations.
3. Use of the 1D finite elements for structural mechanics, heat transfer and seepage analysis.
4. Use of the 2D finite elements for structural mechanics, heat transfer and seepage analysis.
5. Use FEA software package for analysis of 1D and 2D problems.

### **Course Contents**

- 1 Fundamentals of mechanics and essential mathematics.
- 2 Approximate solution of boundary value problems-Methods of weighted residuals, variational method, Modified Galerkin method. Boundary conditions and general comment. One Dimensional and Two dimensional example.
- 3 Review of direct stiffness approach for analysis of discrete structural systems.
- 4 Introduction to Finite Element Analysis: Basic finite element concepts-Basic ideas in a finite element solution, General finite element solution procedure, Finite element equations using Principle of Minimum Potential Energy and modified Galerkin method, Application: Axial deformation of bars, Axial spring element.
- 5 Formulation and application of 1-D finite elements to problems in structural mechanics for 1D elements (Axial bar, Torsional shaft, Spar, Truss, Beam and Frame element).
- 6 Formulation and application of 1-D finite elements to problems in heat transfer, fluid flow and seepage analysis.

- 7 Formulation and application of 2-D finite elements to problems in structural mechanics (plane stress problems, plane strain problems and axisymmetric) and seepage analysis.
- 8 Dynamic Analysis: Formulation of finite element model, element matrices, evaluation of Eigen values and Eigen vectors for an axial bar and a beam.
- 9 Computer implementation of FEA.

### **Text Books :**

- 1 Cook R. D., Malkan D. S. and Plesta M. E., Concepts and Application of Finite Element Analysis – Fourth Edition, John Wiley and Sons Asia Pte. Ltd., 2004
- 2 Desai Y. M., Eldho T. I. and Shah A. H., Finite Element Method with Applications in Engineering, Dorling Kindersely Pvt. Ltd., Licensees of Pearson Education in South Asia. 2011

### **Reference Books :**

- 1 Shames I. H. and Dym C. J., Energy and Finite Element Methods in Structural Mechanics, SI Units Edition, New Age International, New Delhi, 1995.
- 2 Desai C. and Abel J., Introduction to the Finite Element Method, East West Press Pvt. Ltd., 1972.
- 3 Rajasekaran. S., Finite Element Analysis in Engineering Design, Wheeler Publishing, 1993
- 4 Logan D. L., A First Course in the Finite Element Method, Thomson- Engineering, 3rd edition, 2001
- 5 Bathe K. J., Finite Element Procedures in Engineering Analysis, Prentice Hall, 1996.
- 6 Reddy J. N., Introduction to Finite Element, McGraw Hill Book Co., 2006.
- 7 Zienkiewicz O. C., The Finite Element Method in Engineering Science, McGraw Hill Book Co., 2006.
- 8 Krishnamoorthy C. S., Finite Element Analysis: Theory and Programming, McGraw Hill Book Co., 2007.

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VIII</b>
<b>Course Code</b>	<b>SE4106S</b>	
<b>Course Title</b>	<b>Advanced Design of Steel Structures (Elective-IV)</b>	
<b>Prerequisites</b>	<b>Design of Steel Structures, Structural Analysis I and II</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Describe design philosophy and behavior of moment resisting beam end connections.
2. Analyse and design of welded plate girder and gantry girder.
3. Design steel structural system by using round tubular steel members.
4. Analyse and design circular and rectangular elevated steel tanks.
5. Analyse and design chimney and lattice tower steel structures.

### **Course Contents:**

#### **1 Moment Resisting Connections**

Design of moment resistant bolted and welded beam end connections

#### **2 Welded Plate Girder and Gantry Girder**

Proportioning, loading calculation and design of plate girder section and connections, curtailment of flange plates, design of web splices, design of stiffeners.

Loading calculation, fatigue effect and design on gantry girder.

#### **3 Design of Round Tubular Structural Members**

Properties of steel tubes, design of tension and compression members, design of welded connections, design of flexural members. Analysis and design of tubular trusses including purlins and supports

#### **4 Elevated Steel Tanks and Stacks**

Loads acting on tanks including wind and earthquake. Design of circular tanks with conical bottom, supporting ring beam, staging for circular tanks, design of rectangular steel tanks and design of foundation for columns.



## **5 Steel Chimney**

Forces acting on chimney, design of self-supporting welded chimney including design of foundation.

## **6 Lattice Tower**

Loads acting on lattice towers, analysis and design of lattice tower including welded or riveted connections for members

### **Text Books :**

- 1 S.K. Duggal, Limit State Design of Steel Structures, Tata McGraw Hill Education Private Limited, 2014.
- 2 V.L. Shah and V. Gore, Limit State Design of Steel Structures IS:800-2007, Structures Publication, 2010

### **Reference Books :**

- 1 S.S. Bhavikatti, Design of Steel Structures, I.K. International Publishing House Limited, 2010.
- 2 N. Subramanian, Design of Steel Structures, Oxford University Press, 2010.
- 3 IS 800 (2007), General Construction in Steel- Code of Practice, Ced 7: Structural Engineering and Structural Section, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.
- 4 IS 875- Part 1 (1987): Dead Loads, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.
- 5 IS 875- Part 2 (1987): Imposed Loads, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.
- 6 IS 875- Part 3 (1987): Wind Loads, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.
- 7 IS 875- Part 4 (1987): Snow Loads, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.
- 8 IS 875- Part 5 (1987): Special Loads and Combinations, Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures, Published by Bureau of Indian Standard Manak Bhavan, New Delhi.

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VIII</b>
<b>Course Code</b>	<b>CE4902D</b>	
<b>Course Title</b>	<b>Project II</b>	
<b>Prerequisites</b>	<b>Project I</b>	

### **Course Outcomes:**

After completion of course students will be able to

1. Review available knowledge with reference to specific problem
2. Formulate problem and define systematic approach to arrive at solution.
3. Collect data, analyze and arrive at solution to a defined problem

### **Course Contents:**

At the time of evaluation, substantial data collection and analysis work shall be completed. In the final stage student has to submit a report in standard format indicating work done and conclusions drawn for final evaluation.

<b>Programme Name</b>	<b>Bachelor of Technology in Civil Engineering</b>	<b>Semester – VIII</b>
<b>Course Code</b>	<b>CE4007A</b>	
<b>Course Title</b>	<b>Laws for Civil Engineers</b>	
<b>Prerequisites</b>		

### **Course Outcomes:**

After completion of course students will be able to

1. Acquire knowledge regarding Indian legal system and its relevance for civil engineering works.
2. Identify risk and opportunities arising out of such legal knowledge.

### **Course Contents:**

#### **1 Introduction to Indian Legal System:**

Constitution of India, Sources of law, judicial system, Companies Act, Partnership Act, LLP Act, Income Tax Act, Civil law, Criminal law, Tort, RTI, Direct and indirect taxes,

#### **2 Indian Contract Act:**

Offer, Acceptance, consideration, parties eligible to contract, invalid contract, void, voidable contract, indemnity, guarantee, Model agreement for PPP projects.

#### **3 Environment & heritage Laws:**

Heritage laws, Environment laws, CRZ regulations,

#### **4 Dispute Resolution Mechanism:**

Arbitration, Conciliation, Commercial courts, Real Estate Regulation act (RERA)

#### **5 Employment Laws:**

Labour laws, Laws relating to industrial dispute, health and safety of construction workers, compensation

### **Text Books :**

- 1 Law of Contract – Dr. Avtar Singh
- 2 FIDIC model document
- 3 Relevant Bare Acts