

**Honours Courses**  
**R20 Regulations**

S. No	Course Code	Subject	Year	Semester	L-T-P	Credit
1	CIV H221	Sustainability Engineering	II	II	3-1-0	2
2	CIV H311	Construction Technology	III	I	3-1-0	4
3	CIV H321	Infrastructure Engineering	III	II	3-1-0	4
4	CIV H322	E TABS Lab	III	II	1-1-3	4
5	CIV H411	Earthquake Engineering	IV	I	3-1-0	2
6	CIV H412	PRIMAVERA Lab	IV	I	1-1-3	4
		Total				20

# SUSTAINABILITY ENGINEERING

**CIV H221**

Instruction : 3 Lectures & 1 Tutorial / week

End Exam : 3 Hours

**Credits : 2**

Sessional Marks : 40

End Exam Marks : 60

## Prerequisites:

Building Technology, Environmental Engineering

## Course objectives:

The objective of this course is to

1. Outline the concepts related to conventional and non-conventional energy
2. Demonstrate the broad perspective of sustainable practices by utilizing engineering
3. Explain the different types of environmental pollution problems and their sustainable Solutions

## Course outcomes:

At the end of this course the student will be able to

1. Illustrate the relevance and the concept of sustainability and the global initiatives in this direction
2. Assess the impact on Environmental components and prepare the impact statements
3. Explain the different types of environmental pollution problems and their sustainable
4. Outline the concepts related to green buildings
5. Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles solutions

## Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3					3		1					3		
	2	3					3		1					3		
	3	3					3		1					3		
	4	3					3		1					3		
	5	3					3		1					3		

## SYLLABUS

### UNIT I

Sustainability: Introduction, concept, evolution of the concept; Social, environmental and economic sustainability concepts; Sustainable development, Nexus between Technology and Sustainable development; Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs), Clean Development Mechanism (CDM).

## **UNIT II**

Solid waste management:

Solid waste types- characteristics – generation – collection –segregation and transportation-engineered systems for solid waste management (reuse/recycle recovery, treatment and disposal).

## **UNIT III**

Environmental Sustainability:

Local and global environmental challenges; climate change; tools used to ensure sustainability in engineering activities (environmental management systems and environmental impact assessment).

## **UNIT IV**

Green buildings: Concept of Green building. Principles of green building - Selection of site and Orientation of the building - usage of low energy materials - effective cooling and heating systems - effective electrical systems - effective water conservation systems - Certification systems - GRIHA and LEED.

## **UNIT V**

Sustainability practices: Basic concept of sustainable habitat, Methods for increasing energy efficiency in buildings, Green Engineering, Sustainable Urbanisation, Sustainable cities, Sustainable transport.

## **TEXT BOOKS**

1. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
2. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning
3. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998
4. Ni bin Chang, Systems Analysis for Sustainable Engineering: Theory and Applications, McGraw-Hill
5. Twidell, J. W. and Weir, A. D., Renewable Energy Resources, English Language Book Society (ELBS).
6. Purohit, S. S., Green Technology - An approach for sustainable environment, Agrobios Publication

## **REFERENCES**

1. Environment Impact Assessment Guidelines, Notification of Government of India, 2006
2. ECBC Code 2007, Bureau of Energy Efficiency, New Delhi Bureau of Energy Efficiency Publications-Rating System, TERI Publications - GRIHA Rating System

# CONSTRUCTION TECHNOLOGY

## CIV H311

Instruction : 3 Lectures & 1 Tutorial / week

End Exam : 3 Hours

**Credits : 4**

Sessional Marks : 40

End Exam Marks : 60

### Prerequisites:

Building Technology, Building Materials

### Course objectives:

The objective of this course is to

1. Familiarize students with different types of construction methods and equipment
2. Understand the principles of construction planning techniques

### Course outcomes:

At the end of this course the student will be able to

1. Identify different phases of a construction project.
2. Classify and planning of construction projects based on management principles.
3. Suggest the suitable method for execution of construction projects.
4. Identify the suitable equipment for execution of construction projects..
5. Apply the suitable construction management principle to a project.

### Mapping of course outcomes with program outcomes:

		PO												PSO			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO	1	2					2						1		2		
	2	2					2						1		2		
	3	2					2						1		2		
	4	2					2						1		2		
	5	2					2						1		2		

## SYLLABUS

### UNIT I

Basics of Construction- Unique features of construction, construction projects, types and features, phases of a project, agencies involved and their methods of execution.

### UNIT II

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, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning.

### **UNIT III**

Construction Methods basics: Types of foundations and construction methods; Basics of Formwork and Staging; Common building construction methods (conventional walls and slabs; conventional framed structure with block work walls; Modular construction methods for repetitive works; Precast concrete construction methods; Basics of Slip forming for tall structures; Basic construction methods for steel structures; Basics of construction methods for Bridges.

### **UNIT IV**

Construction Equipment basics: Conventional construction methods Vs Mechanized methods and advantages of latter; Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials, Equipment productivities.

### **UNIT V**

Planning and organizing construction site and resources- Site: site layout including enabling structures, developing site organization, Documentation at site; Manpower: planning, organizing, staffing, motivation; Materials: concepts of planning, procurement and inventory control; Equipment: basic concepts of planning and organizing; Funds: cash flow, sources of funds, Common Good Practices in Construction

### **TEXT BOOKS**

1. Varghese, P.C., "Building Construction", Prentice Hall India, 2007.
2. National Building Code, Bureau of Indian Standards, New Delhi, 2017.

### **REFERENCES**

1. Chudley, R., Construction Technology, ELBS Publishers, 2007.
2. Peurifoy, R.L. Construction Planning, Methods and Equipment, McGraw Hill, 2011
3. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
4. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015.
5. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi Publications, 2016.

# INFRASTRUCTURE ENGINEERING

**CIV H321**

Instruction : 3 Lectures & 1 Tutorial / week

End Exam : 3 Hours

**Credits : 4**

Sessional Marks : 40

End Exam Marks : 60

## Prerequisites:

Building Technology, Building Materials

## Course objectives:

The objective of this course is to

1. To understand various concepts of infrastructure planning and management
2. To identify suitable techniques and follow the trends in infrastructure engineering.

## Course outcomes:

At the end of this course the student will be able to

1. Identify various types of infrastructures based on adequacy and quality
2. Design integrated framework for infrastructure planning and management.
3. Analyse the strategies for Infrastructure Project implementation.
4. Apply the suitable techniques of Infrastructure management.
5. Identify and follow the trends in Infrastructure engineering

## Mapping of course outcomes with program outcomes:

		PO												PSO			
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
CO	1	2					2						1		2		
	2	2					2						1		2		
	3	2					2						1		2		
	4	2					2						1		2		
	5	2					2						1		2		

## SYLLABUS

### UNIT I

Introduction: Definition of basic terminologies, role of infrastructure in economic development, types of infrastructure, measurement of infrastructure capacity, bases for quantification of demand and supply of various types of infrastructure, Indian scenario in respect of adequacy and quality.

### UNIT II

Infrastructure Planning: Goals and objectives of infrastructure planning; Identification and quantification of the casual factors influencing the demand for infrastructure; review and application of techniques to estimate supply and demand for infrastructure; use of econometric, social and land use indicators and models to forecast the demand and level of service of infrastructure and its impact on land use

### **UNIT III**

Infrastructure Planning: critical review of the relevant forecasting techniques; infrastructure planning to identify and prioritize preferred areas for development; Integration of strategic planning for infrastructure at urban, regional and national levels; case studies in infrastructure planning.

### **UNIT IV**

Infrastructure Management: Concepts, Common aspects of urban and rural infrastructure management systems; pavement and bridge management systems, Integrated infrastructure management, Case studies;

### **UNIT V**

Emerging trends in infrastructure: Overview of Public-Private Sector Participation in infrastructure projects, Understanding stakeholders' concerns, regulatory framework, risk management in infrastructure projects, public policy for infrastructure Sector.

### **TEXT BOOKS**

1. Grigg, Neil, Infrastructure engineering and management, Wiley, (1988).
2. Haas, Hudson, Zaniewski, Modern Pavement Management, Krieger, Malabar, (1994).

### **REFERENCE**

1. Hudson, Haas, Uddin, Infrastructure management: integrating design, construction, maintenance, rehabilitation, and renovation, McGraw Hill, (1997).
2. Munnell, Alicia, Editor, Is There a Shortfall in Public Capital Investment? Proceedings of a Conference Held in June (1990).
3. World Development Report 1994: Infrastructure for Development (1994).
4. Zimmerman, K. and F. Botelho, "Pavement Management Trends in the United States," 1<sup>st</sup> European Pavement Management Systems Conference, Budapest, September (2000).

## E TABS LAB

**CIV H322**

**Credits: 4**

Instruction: 3 Practicals / week & 1 Theory

Sessional Marks: 40

End Exam: 3 Hours

End Exam Marks: 60

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**Prerequisite:**

Structural Analysis, Reinforced Concrete Structures, Steel Structures

**Course Objective:**

1. To develop skill to use software to create 2D and 3D models
2. To acquire hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice

**Course Outcomes:**

At the end of the course the student will be able to

1. Analyse and design the structures by using E Tabs.
2. Analyse and design the 2D Trusses and Gable frames by using E Tabs

**Mapping of course outcomes with program outcomes:**

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3	3		3	3			3	3			3		
	2	3	3	3		3	3			3	3			3		

### SYLLABUS

1. Concrete Frame Design and Detailing
2. Response Spectrum Analysis
3. Response History Analysis
4. Seismic Analysis of Hi rise structures
5. Steel frame Design and Detailing
6. Analysis of Composite Beam
7. Dynamic Analysis
8. Push-over analysis



## **REFERENCES**

1. Gaurav Varma “E TABS”, Cadcamcae works Publications, 1st Edition, 2016.
2. Relevant NPTEL/MOOCs Courses.
3. Data base of Computers & Structures Inc

# EARTHQUAKE ENGINEERING

**CIV H411**

**Credits: 2**

Instruction: 3 Lectures / week

Sessional Marks: 40

End Exam: 3 Hours

End Exam Marks: 60

**Prerequisite:**

**Course Objective:**

1. To create a strong understanding on application of single degree and multi-degree of freedom systems.
2. To impart the knowledge on causes and effects of earthquakes.
3. To familiarize with seismic codal and detailing provisions.

**Course Outcomes:**

At the end of the course the student will be able to

1. Explain the basic concepts related to earthquake engineering.
2. Analyse problem on structures subjected to vibrations.
3. Apply various concepts related to plan configurations to a framed structure having plan irregularities.
4. Illustrate the structural detailing of structures affected by seismic forces.
5. Explain various methods adopted in strengthening and retrofitting of structures.

**Mapping of course outcomes with program outcomes:**

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	2												3		
	2	2												3		
	3	2									1			3		
	4	2				1					1			3		
	5	2				1					1			3		

## **SYLLABUS**

### **UNIT – I**

Introduction: Earthquakes, Epicenter, Hypocenter and earthquake waves, Measurement of ground motion, Seismic Regions, Intensity and Iso-seismals of an earthquake, Magnitude and energy of an earthquake, Consequences of earthquakes, Seismic zones.

### **UNIT – II**

Theory of vibrations – Lumped mass and continuous mass systems – Single Degree of Freedom (SDOF) Systems – Formulation of equations of motion – Undamped and damped free vibration, Multiple Degree of Freedom (MDOF) Systems Formulation of equations of motion – Free vibration – Determination of natural frequencies of vibration and mode shapes

### **UNIT – III**

Plan Configurations – Torsion Irregularities – Re-entrant corners – Non-parallel systems – Diaphragm Discontinuity – Vertical Discontinuities in load path – Irregularity in strength and stiffness – Mass Irregularities – Vertical Geometric Irregularity – Proximity of adjacent buildings.

### **UNIT – IV**

Ductile Detailing: Ductility of R.C structures- Confinement- detailing as per IS-13920-1993- moment redistribution – principles of design of beams, columns – beam column joints – soft story concept.

### **UNIT – V**

Cyclic loading behaviour of RC and steel elements, Base isolation, Retrofitting and restoration of buildings subjected to damage due to earthquakes, effects of earthquakes, factors related to building damages due to earthquake, methods of seismic retrofitting, restoration of buildings.

### **TEXT BOOKS**

1. Pankaj Agarwal and Manish Shri Khande, Earthquake Resistant Design of Structures, Prentice Hall of India, 2007, New Delhi.

### **REFERENCES**

1. Chopra A.K., “Dynamics of Structures”, 5th Edition, Pearson Education, Indian Branch, Delhi, 2007
2. Duggal, S.K. “Earth Quake Resistant Design of Structures”, Oxford university Press, 1st Edition, 2012
3. IS Codes: IS: 1893, IS: 4326 and IS:13920, Bureau of Indian Standards, New Delhi.
4. Relevant NPTEL Courses.

## PRIMAVERA LAB

**CIV H412**

**Credits: 4**

Instruction: 3 Practicals / week & 1 Theory

Sessional Marks: 40

End Exam: 3 Hours

End Exam Marks: 60

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**Prerequisite:**

Project Planning & Management

**Course Objective:**

1. To develop skill to organize and execute project plans
2. To acquire hands on experience in preparing and scheduling an engineering project

**Course Outcomes:**

At the end of the course the student will be able to

1. Organize and schedule the activities of a project.
2. Optimize the project plans as per schedule

**Mapping of course outcomes with program outcomes:**

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3	3		3	3			3	3	3		3		
	2	3	3	3		3	3			3	3	3		3		

### SYLLABUS

1. Describing Enterprise and Project-Specific data
2. Opening an Existing Project & Customizing layouts
3. Create a project & navigating in the Projects Window
4. Formatting Schedule Data
5. Assigning Roles and Rates on Roles
6. Assigning & analyzing Resources
7. Optimizing the Project Plan
8. Base lining the Project Plan

**REFERENCES**

1. Relevant NPTEL/MOOCs Courses.