INDUS UNIVERSITY

INDUS INSTITUTE OF TECHNOLOGY

CIVIL ENGINEERING DEPARTMENT

B.TECH. CIVIL ENGINEERING (BOS 2021)

SEMESTER 1 — **SEMESTER 1**

Sr. No.	Sub Code	Subject Name	Category	Hours	L	T	P	C
1	MA0112	MULTIVARIABLE CALCULUS	BS	4	2	2	0	4
2	PH0011	ENGINEERING PHYSICS	BS	5	3	0	2	4
3	EN0111	TECHNICAL ENGLISH-I	HS	2	2	0	0	2
4	ME0112	WORKSHOP	ES	4	0	0	4	2
5	CV0151	ENGINEERING MECHANICS	ES	4	3	1	0	4
6		OPEN ELECTIVE-I	OE	3	3	0	0	3
7		INDIAN KNOWLEDGE SYSTEM	PC	3	3	0	0	3
		Total		**25**	**16**	**3**	**6**	**22**

SEMESTER 2 — **SEMESTER 2**

Sr. No.	Sub Code	Subject Name	Category	Hours	L	T	P	C
1	MA0211	DIFFERENTIAL EQUATIONS AND LINEAR ALGEBRA	BS	4	2	2	0	4
2	CH0011	ENGINEERING CHEMISTRY	BS	5	3	0	2	4
3	EN0211	TECHNICAL ENGLISH-II	HS	2	2	0	0	2
4	CV0052	ENVIRONMENTAL SCIENCE	ES	2	2	0	0	2
5	ME0211	ENGINEERING GRAPHICS	ES	5	1	0	4	3
6		OPEN ELECTIVE-II	OE	3	3	0	0	3
7		OPEN ELECTIVE-III	OE	3	3	0	0	3
8	IST0001	INDIAN SCIENCE AND TECHNOLOGY	PC	1	1	0	0	1
		Total		**25**	**17**	**2**	**6**	**22**

SEMESTER 3 — **SEMESTER 3**

Sr. No.	Sub Code	Subject Name	Category	Hours	L	T	P	C
1	MA0312	BASICS OF PROBABILITY, STATISTICS & NUMERICAL METHODS	BS	5	3	0	2	4
2	CV0351	FLUID MECHANICS - I	PCC	4	2	0	2	3
3	CV0352	BUILDING CONSTRUCTION AND MATERIALS	ES	4	3	1	0	4
4	CV0353	STRUCTURAL ANALYSIS - I	PCC	4	3	1	0	4
5	CV0354	SURVEYING	PCC	5	3	0	2	4
6	CV0355	COMPUTER AIDED BUILDING PLANNING AND DESIGN	ES	4	2	0	2	3
7		HUMAN VALUES AND PROFESSIONAL ETHICS	HS	2	2	0	0	2
8	CV0356	INTERNSHIP-I	INTERN	0	0	0	0	2
		Total		**28**	**18**	**2**	**8**	**26**

SEMESTER 4 — **SEMESTER 4**

Sr. No.	Sub Code	Subject Name	Category	Hours	L	T	P	C
1	CV0451	ENVIRONMENTAL ENGINEERING	PCC	4	2	0	2	3
2	CV0452	STRUCTURAL ANALYSIS - II	PCC	4	3	1	0	4
3	CV0453	HIGHWAY ENGINEERING	PCC	5	3	0	2	4
4	CV0454	GEOTECHNIQUES & APPLIED GEOLOGY	PCC	5	3	0	2	4
5	CV0455	CONCRETE TECHNOLOGY	PCC	4	2	0	2	3
6		OPEN ELECTIVE-IV	OE	3	3	0	0	3
7		OPEN ELECTIVE-V	OE	3	3	0	0	3
8		MANAGEMENT FOR ENGINEERS	HS	2	2	0	0	2
		Total		**30**	**21**	**1**	**8**	**26**

SEMESTER 5 — **SEMESTER 5**

Sr. No.	Sub Code	Subject Name	Category	Hours	L	T	P	C
1	CV0551	ADVANCED CONSTRUCTION TECHNOLOGY AND EQUIPMENTS	PCC	4	3	1	0	4
2	CV0552	SOIL MECHANICS & FOUNDATION ENGINEERING	PCC	5	3	0	2	4
3	CV0553	FLUID MECHANICS - II	PCC	3	2	1	0	3
4	CV0554	CONSTRUCTION PROJECT MANAGEMENT	PCC	4	3	1	0	4
5		DEPARTMENT ELECTIVE - I	PE	3	2	1	0	3
6		OPEN ELECTIVE-VI	OE	3	3	0	0	3
7		ENTREPRENEURSHIP DEVELOPMENT	ES	2	2	0	0	2
8	CV0555	INTERNSHIP-II	INTERN	0	0	0	0	2
		Total		**24**	**18**	**4**	**2**	**25**

SEMESTER 6 — **SEMESTER 6**

Sr. No.	Sub Code	Subject Name	Category	Hours	L	T	P	C
1	CV0651	DESIGN OF STRUCTURES (RCC)	PCC	4	3	1	0	4
2	CV0652	GREEN AND SUISTAINABLE DEVELOPMENT	ES	3	3	0	0	3
3		DEPARTMENT ELECTIVE - II	PE	3	2	1	0	3
4		DEPARTMENT ELECTIVE - III	PE	3	2	1	0	3
5		DEPARTMENT ELECTIVE - IV	PE	3	2	1	0	3
6		ORGANIZATIONAL BEHAVIOUR	HS	2	2	0	0	2
7		OPEN ELECTIVE-VII	OE	3	3	0	0	3
		Total		**21**	**17**	**4**	**0**	**21**
							TOTAL CREDIT	

SEMESTER 7 — **SEMESTER 7**

Sr. No.	Sub Code	Subject Name	Category	Hours	L	T	P	C
1	CV0751	ESTIMATING AND COSTING	PCC	4	3	1	0	4
2		DEPARTMENT ELECTIVE - V	PE	3	2	1	0	3
3		DEPARTMENT ELECTIVE - VI	PE	3	2	1	0	3
4		DEPARTMENT ELECTIVE - VII	PE	4	0	0	4	2
5		OPEN ELECTIVE-VIII	OE	3	3	0	0	3
6		OPEN ELECTIVE-IX	OE	3	3	0	0	3
7	CV0752	BASICS OF RESEARCH AND PAPER WRITING	HS	2	1	1	0	2
8	CV0753	INTERNSHIP-III	INTERN	0	0	0	0	2
		Total		**22**	**14**	**4**	**4**	**22**

Subject: **Environmental Science**								
Program: **B. Tech. in Civil Engineering**				Subject Code: **CV0251**			Semester: **I/II**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
02	-	-	02	24/60	-	16/40	-	100

Course Objectives:

- To get the real sense of environmental conservation aspects and making aware about the current trends towards environmental stability.

Course Outcomes:

On successful completion of course student will be able to,

1. Understand and realize the multi-disciplinary nature of the environment, its components, and inter-relationship between man and environment.
2. Understand the relevance and importance of the natural resources in the sustenance of life on earth and living standard.
3. Comprehend the importance of ecosystem, biodiversity and natural bio geo chemical cycle.
4. To correlate the human population growth and its trend to the environmental degradation and develop the awareness about his/her role towards environmental protection and prevention.
5. Identify different types of environmental pollution and control measures.
6. To correlate the exploitation and utilization of conventional and non-conventional resources.

Course Content

UNIT I [07 Hours]

Concepts of Environmental Sciences: Levels of organizations in environment, Structure and functions in an ecosystem;

Biosphere: Its Origin and distribution on land, in water and in air, Ecosystem and functioning of Ecosystem.

Natural Resources: Renewable and Non-renewable Resources, Forests, water, minerals, Food and land (with example of one case study); Energy, Growing energy needs, energy sources (conventional and alternatives), State of Indian Environment.

Biodiversity and its conservation: Biodiversity at global, national and local levels; India as a mega-diversity nation; Threats to biodiversity (biotic, abiotic stresses), and strategies for conservation

UNIT-II [07 Hours]

Environmental Pollution: Types of pollution- Air, water (including urban, rural, marine), soil, noise, thermal, nuclear, Solid Waste (Organic and Inorganic), Concept of clean Environment; Case Studies on pollution, disasters and taragedies.

UNIT-III [08 Hours]

Pollution prevention: Management of pollution- Rural/Urban/Industrial waste management [with case study of any one type, e.g., power (thermal/nuclear), fertilizer, tannin, leather, chemical, sugar], Solid/Liquid waste management, disaster management.

Environmental Monitoring: Monitoring- Identification of environmental problem, tools for monitoring (remote sensing, GIS); Sampling strategies- Air, water, soil sampling techniques

Technologies for Pollution Control: Bio-remediation, phytoremediation, bio-pesticides, bio-fertilizers;

Legal issues: Environmental legislation (Acts and issues involved), Environmental Protection **Acts :** (Swacch Bharat Abhiyan, state Action Plans)

UNIT-IV [08 Hours]

Social Issues and the Environment: Concept of sustainability and Sustainable Development, environmental Sustainability Index, Environmental Ethics, Public awareness and people's participation, Green Business (Profitability in managing Environment)

Self-study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Basics of Environmental Studies by Prof Dr N S Varandani ,2013 Publisher: LAP - Lambert Academic Publishing, Germany
2. Environmental Studies by Anindita Basak ,2009 Publisher: Drling Kindersley(India)Pvt. Ltd., Pearson
3. Textbook of Environmental Studies by Deeksha Dave & S S Kateva , Cengage Publishers.
4. Environmental Sciences by Daniel B Botkin & Edward, A Keller Publisher: John Wiley & Sons.
5. Environmental Studies by R. Rajagopalan, Oxford University Press

6. Environmental Studies by Benny Joseph, TMH publishers
7. Environmental Studies by Dr. Suresh K Dhameja, 2007 Published by: S K Kataria & Sons, New Delhi.
8. Basics of Environmental Studies by U K Khare, 2011 Published by Tata McGraw Hill

Text Books:

1. Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha Second edition,2013 Publisher: Universities Press (India) Private Ltd, Hyderabad

B. Tech. Civil Engineering

Semester IV

Subject: **Environmental Engineering**								
Program: **B. Tech. Civil Engineering**				Subject Code: **CV0451**			Semester: **IV**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
02	-	02	04	24/60	24/60	16/40	16/40	200

Course Objectives:

This subject provides the knowledge of water sources, water treatment, characteristics, treatment and safe disposal methods of waste water. It also inculcates the basics of Solid waste management, Air and Noise pollution.

Course Outcomes:

On successful completion of course student will be able to,

1. Analyse characteristics of water with reference to standards.
2. Predict water requirement and select treatment chain for water supply.
3. Evaluate characteristics of wastewater and conveyance system
4. Prepare basic process design of waste water.
5. Understand basic concept and management of different Solid wastes
6. Understand sources, effects and control measures of Air and noise pollution

COURSE CONTENTS

UNIT-I: [07 Hours]

Components of environment, Types of microbes, their growth and role in the environment, Water-borne diseases. Sources of water, quality and quantity of water, drinking water standards, water requirements, pumping for water supply, basic unit operations and unit processes for water treatment, distribution of water.

UNIT-II: [08 Hours]

Characteristics of domestic wastewater (physical, chemical and biological characteristics). Study of characteristics of various industrial wastewater. Quantity of waste water, collection and conveyance of domestic waste water. Primary, secondary and tertiary treatment of wastewater, sludge disposal, effluent discharge standards.

`

UNIT-III: [08 Hours]

Municipal Solid Wastes: Characteristics, generation, collection and transportation of solid wastes. Treatment and disposal of solid waste, engineered systems for solid waste management. Hazardous waste, Bio-medical waste, construction and demolition waste. Resource utilization of recycled solid waste.

UNIT-IV: [07 Hours]

Air Pollution: Types of pollutants, their sources and effects of air pollution on human, plant and material. Air quality standards, air pollution control methods. Indian legislation for air pollution control.

Noise pollution: Physics of sound, Sources of noise pollution, Effect of noise pollution on human health, measurement and monitoring of noise. Mitigation measures to reduce noise pollution.

Self-study

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. SK Garg , Environmental Engineering:I and II, Khanna Publishers
2. HS Peavy, DR Rowe, G Tchobanoglous , Environmental Engineering, McGraw Hill
3. B.C.Punmia, Ashok Jain and Arun Jain, "Environment engineering-I and II, Water Supply Engineering", Laxmi Publications (P) Ltd. New Delhi
4. CS Rao,Wiley , Environmental Pollution and Control Engineering Publications
5. Birdie, G.S. and Birdie, Water Supply and Sanitary Engineering, Dhanpat Rai & Sons.
6. Duggal, K.N. Elements of Environmental Engineering, S.Chand & Co.

List of Practical:

1.Introduction to the Laboratory components and Study of Sampling and Preservation methods

2.Determination of pH

3.Determination of Turbidity

4.Determination of Electrical Conductivity

5.Determination of Alkalinity

6.To determine the concentration of residual chlorine in the given water sample.

7.Determination of Acidity of Water

8.Determination of Hardness of Water sample.

9. Determination color in given sample.

`

10. Determination of dissolved oxygen of given sample

11.Determination of Total solids, Total Suspended Solids & Total Dissolved Solids

12. Measurement of noise at different sources using sound meter.

`

Subject: **Structural Analysis - II**								
Program: **B. Tech. Civil Engineering**				Subject Code: **CV0452**			Semester: **IV**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
03	01	-	04	24/60	-	16/40	-	100

Course Objectives:

To introduce the students to the concept of global structural stability, theory of structural analysis, and methods in structural analysis.

Course Outcomes

On completion of the course student will be able to:

1. Distinguish between stable and unstable and statically determinate and indeterminate structures.
2. Apply theorems to structures and compute the internal forces.
3. Derive the shear and bending moment equations.
4. Derive the mathematical expression for displacements.
5. Evaluate and draw the influence lines for reactions, shears, and bending moments in beams and girders due to moving load.
6. To understand analysis of indeterminate structures and adopt an appropriate structural analysis technique.

COURSE CONTENTS

UNIT-I: [09 Hours]

Direct and Bending Stress

Columns subjected to direct and eccentric loads, Core and kernel of section.

Column and Strut

Introduction, short and long columns, Euler's theory on columns (Assumptions and standard cases), effective length and slenderness ratio, Rankine's formula.

UNIT-II: [10Hours]

Fixed and Continuous Beams

Calculate fixed end action for various types of loads, beams of varying moment of inertia and analysis of propped cantilever beams.

Slope Deflection Method

`

Continuous beams and rigid frames (with and without sway), symmetry and antisymmetry, simplification for hinged end support displacement.

UNIT-III: [13Hours]

Moment Distribution Method

Distribution and carryover of moments, stiffness and carry over factors, analysis of continuous beams, plane rigid frame with and without sway – Naylor's simplification.

UNIT-IV: [13Hours]

Energy Methods

Castigliano's theorem, calculation of slope and deflection for statically determinate beams, trusses and frames, analysis of indeterminate beams.

Self-study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Mechanics of Structures - S B Junnarkar & H J Shah Charotar Pub House
2. R.C. Hibbeler, Structural Analysis, Prentice Hall Publishing Company, Current Edition
3. Theory of Structures – R.S.KhurmS.Chand
4. Structural Analysis 1-S S Bhavikatti Vikas Publishing House Pvt Limited
5. Theory of Structures – RamamruthamDhanpatRai Publishing House
6. Theory of Structures – B.C.Punamia, Ashokkumar Jain, Arunkumar Jain Laxmi Publication
7. Vazirani.V.N And Ratwani, M.M, Analysis of Structures, Vol.II, Khanna Publishers, 2015.

`

Subject: **Highway Engineering**								
Program**. B. Tech. in Civil Engineering**				Subject Code: **CV0453**			Semester: **IV**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
03	--	02	04	24/60	24/60	16/40	16/40	200

Course Objectives:

Understand the principles and practices of transportation engineering which focuses on highway engineering

Course Outcomes:

On successful completion of course student will be able,

1. Apply basic science principles in estimating stopping and passing sight distance requirements.
2. Characterize material with respect to MoRTH limits
3. Understand the necessity surface treatment layers
4. Design horizontal& vertical alignment of the highway
5. List out the design steps of flexible and rigid pavement.
6. Understand importance of highway drainage & arboriculture

COURSE CONTENTS

UNIT-I: [12 Hours]

Highway Planning and Development: Highway planning in India, Development, Rural and urban roads, Road departments in India, Road classification, Road authorities i.e. IRC, CRRI, NHAI, etc.
Highway Geometric Design: Cross section elements, sight distances, design of horizontal & vertical alignment.

UNIT-II: [11 Hours]

Road Material: Sub grade soil and its classification, CBR and Plate load test, Aggregates and their types, physical and engineering properties, Bitumen, Emulsions and cutbacks, Basic tests on all materials.
Bituminous Surface Treatments: Prime Coats, Tack Coats, Surface Dressing, Seal Coats & Built up Spray Grout.

`

UNIT-III: [12 Hours]

Highway Pavements: Functions and Desirable Characteristics of Pavement, Pavement Courses, Pavement Types, Comparison of Rigid and Flexible Pavements, Factors Affecting Pavement Design, Overview on Design steps of Flexible pavement& rigid pavement.

UNIT-IV: [10 Hours]

Highway Drainage: Surface and Subsurface Drainage arrangements and design.

Roadside Developments: Arboriculture, street lighting.

Reference Books:

1. L.R.Kadiyali, "Highway Engineering", Khanna Publishers, NewDelhi.
2. Dr.S.K.Khanna and Dr.C.E.G. Justo, "Highway Engineering",NemChand & Bros. Roorkee.
3. S.K.Sharma, "Principles Practice and Design of Highway Engineering", S.Chand & Co. NewDelhi.

List of Practical:

1. Introduction to Highway Engineering Laboratory
2. Determination of Aggregate Impact Value
3. Determination Of Aggregate Crushing Value
4. Shape Test For Aggregate
5. LosAngeles Abrasion Value Test
6. Determination Of Specific Gravity And Water Absorption Of Aggregate
7. California Bearing Ratio Test
8. Penetration Test
9. Softening point test for Bitumen.
10. Ductility test for Bitumen
11. Flash and Fire Point test for Bitumen.
12. Demonstration of Marshall Stability Test on Bituminous Mixes.

`

Subject: **Geotechniques and Applied Geology**								
Program**. B. Tech. in Civil Engineering**				Subject Code: **CV0454**			Semester: **IV**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
03	-	02	04	24/60	24/60	16/40	16/40	200

Course Objectives:

- To understand the basics of applications part of Geology and Geotechniques in the field of Civil Engineering.
- To understand different soil classification system.

Course outcome:

On successful completion of course student will be able,

1. Able to identify and classify soil based on standard geotechnical engineering practice.
2. Determine principles of phase diagram for soil properties and perform basic weight volume calculations.
3. Able to identify and classify rock using basic geologic classification systems.
4. Explain the concept of weathering and erosion process.
5. Describe the consistency limits of soil.
6. Able to describe early warning systems for earthquakes and tsunamis.

COURSE CONTENTS

UNIT-I: [12 Hours]

Introduction to Geology: Introduction, Basics of the earth, parts of the earth, Branch of geology, Scope of Engineering geology.

Geological work of Natural agencies: Introduction, Erosion, Weathering, Types of weathering, Factors affecting weathering, Products of weathering. Geological work of Wind and water and its engineering considerations.

Structural Features of Rocks: Introduction, types of Rocks and rock classification and its formation cycle. Faults: Terminology, Classification, Effects of Faulting. Folds: Parts of Folds and terminology, Classification and position of axial plane.

`

UNIT-II: [12 Hours]

Engineering properties of rocks and laboratory measurement: Rocks as Materials for construction: Building stones, Road materials. Rocks as sites for construction, Laboratory test, in-situ test. Site Improvement in Rocks: Grouting, Backfilling and Soil Stabilization.

Geotechniques: Introduction to types of soils and its formation, Geotechnical Engineering, its scope and limitations.

Origin and Nature of Soil: Geological cycle, Physical and chemical agencies for soil, Formation - residual, transported, alluvial, marine and lacustrine, glacial drift, loess and colluvial soils. General characteristics of different types of soils. Overview of different types of soils in Gujarat / India.

UNIT-III: [12 Hours]

Basics of Soil Properties and simple Tests: Introduction to 2-Phase & 3-Phase diagrams, Volumetric Relationships, Volume-Mass Relationships, Volume-Weight Relationships and their correlations. Water Content, Specific Gravity, Mass Density, Relative Density and determination of each. Illustrative Examples and Problems.

Particle Size Analysis and Plasticity Characteristics of Soils: Introduction, Sieve Analysis, Stoke's Law, Theory of Sedimentation Analysis, Hydrometer method, Limitation of Sedimentary analysis, Particle size distribution and its uses, Consistency limits and its determination, Plasticity liquidity and consistency indices, Flow index, sensitivity, thixotropy, activity of soils. Numerical.

UNIT-IV: [09 Hours]

Soil Water: Free water and held water, Structural water and absorbed water, Capillary

Soil Structure: Shape of the particles, Texture and structure of the soil. Types of the structure, properties.

Soil Classification: Objectives, Basis, Textural, Unified soil classification, IS classification method, group index. Field identification and General characteristics of the soil, Numerical.

List of Practical:

1. Introduction to Geotchniques and geology laboratory.
2. Identification and description of physical properties of rocks and minerals.
3. Study of Seismic zoning and tectonic features of India.
4. Study of Sections across Asia and epicenters of India & surrounding areas.
5. Study of convective current Mechanism for engineering continental drift.

`

6. To determine the water content of foil sample by oven drying method.
7. To determine the specific gravity of solids by the density bottle method.
8. To determine the dry density of the soil by core cutter method.
9. To determine in-situ dry density by the sand replacement method.
10. To determine the particle size distribution of soil sample by sieving.
11. To determine the particle size distribution by the hydrometer method.
12. To determine the Liquid limit of a soil specimen.
13. To determine the Plastic limit of a soil specimen.
14. To determine the Shrinkage limit of a specimen.

Self-study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Parbin Singh, "Engineering and general Geology", Katson Publication
2. D.S.Arora, "Engineering Geology", Abhishek Publication
3. Punmia B. C., Soil Mechanics & Foundations, Laxmi Publications
4. B.P.Verma "Engineering Geology and Rock Mechanics for Engineering", Khanna Publication
5. Murthy V. N. S., "Soil Mechanics & Foundation Engineering", Dhanpat Rai, Engineering
6. Alamsingh, "Soil Mechanics & Foundation Engineering", CBS Publishers & Distributors, Delhi
7. Gopal Ranjan & Rao A. S. R., "Basic & Applied Soil Mechanics", New Age International Publishers
8. Das Braja M, "Principles of Geotechnical Engineering", Thomson Asia Pvt. Ltd.

`

Subject: **Concrete Technology**								
Program**. B. Tech. in Civil Engineering**				Subject Code: **CV0455**			Semester: **IV**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
02	-	02	03	24/60	24/60	16/40	16/40	200

Course Objectives:

- To understand the properties of ingredients of concrete
- To study the behavior of concrete at its fresh and hardened state
- To study about the concrete design mix

Course Outcomes:

On successful completion of course student will be able to,

1. Determine the mechanical and physical properties of concrete ingredients as per IS code specifications
2. Design the concrete mix using ACI and IS code methods
3. Determine the properties of fresh and hardened concrete
4. Design special concretes and their specific applications
5. Understand various types of admixtures and its application to enhance the properties of special types of concrete
6. Ensure quality control while testing/ sampling and acceptance criteria

COURSE CONTENTS

UNIT-I: [08 Hours]

Concrete Ingredients: Cement, Chemical composition, hydration of cement, types of cement, manufacture of OPC testing of cement, Fine aggregate, Coarse aggregate, Grading of aggregates, Test of aggregates

UNIT-II: [07 Hours]

Fresh Concrete: Workability, Test of workability, Segregation, Bleeding, Process of manufactures of concrete, Various Chemical and Mineral admixtures.

UNIT-III: [07 Hours]

Hardened Concrete: Factors affecting strength of Concrete, w/c ratio, gel/space ratio, Effect of aggregate properties, Bond strength, Modulus of rupture. Modulus of elasticity, Shrinkage, Creep

Testing of hardened concrete: Compressive strength, split tensile strength, Flexural strength, factors influencing strength test results.

`

UNIT-IV: [08 Hours]

Concrete Mix Design: Concept of Mix design, variables in proportioning, exposure conditions, Procedure of mix design as per IS 10262-2019, Numerical examples of Mix Design.

Special Concrete: High strength concrete, High performance concrete, Fibre reinforced concrete, Mass concrete, Light weight and heavy weight concrete.

Self-study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

References Books:

1. M.S.Shetty "Concrete Technology - Theory and Practice", S.Chand and Company, New Delhi, 2009.
2. A. M. Neville, J.J. Brooks, "Concrete Technology", Pearson, 2002.
3. Neville, A.M. "Properties of Concrete", ELBS, London
4. M.L. Gambhir, "Concrete Technology: Theory and Practice", Tata McGraw-Hill Education, 2009.
5. N. KrishnaRaju "Concrete Mix Design", Sehgal – publishers
6. F.M. Lue, Edward Arnold "Chemistry of Cement and Concrete".
7. D.F. Orchardi, "Concrete Technology", Wiley, 1962.
8. Indian Standards: IS-456, IS-10262

List of Practical:

1. Introduction to Concrete Technology laboratory
2. Sieve Analysis for Coarse and Fine Aggregate
3. Determination of Aggregate Crushing Value
4. Determination of Aggregate Impact Value
5. Shape Test for Aggregate
6. Los Angeles Abrasion Test
7. Determination of Specific Gravity and Water Absorption of Aggregate
8. Determination of Consistency of Standard Cement Paste

`

9. Determination of Initial and Final Setting Time of Ordinary Portland Cement And Effect Of Certain Admixture
10. Determination of Compressive Strength of Cement
11. Concrete Mix Design.
12. Compaction Factor Test for Concrete
13. Slump Test for Concrete
14. Compression Test for Concrete Cubes
15. Split Cylinder Test for Concrete

`

Subject: **Design of Structures (RCC)**								
Program: **B. Tech. in Civil Engineering**				Subject Code: **CV0641**			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
03	01	-	04	24/60	-	16/40	-	100

Course Objectives:

1. To learn the fundamentals of reinforced concrete structural properties and behaviors.
2. To become informed about the optimum design criteria and procedures.

Course Outcomes:

On successful completion of course student will be able,

1. Learn the fundamentals of reinforced concrete structural properties and behaviors.
2. Identify the typical failure modes of RC building
3. Develop the ability to analyze and design simple reinforced concrete building frames.
4. Apply the principles, procedures and current Indian code requirements to the analysis and design
5. Assess loads, prepare layout, analyze, design and detail of various structural elements for RC framed structure
6. Understand Limit State of Compression and design of foundation.

COURSE CONTENTS

UNIT-I: [09Hours]

Introduction to Reinforced Cement Concrete (RCC): Properties of Concrete and Reinforcing Steel, Introduction to Limit state methods. Design Philosophies for Reinforced Cement Concrete (RCC): Limit State of Flexure, Design of Singly & Doubly Reinforced Beams, Concept of Flanged Beam or T-Beam.

UNIT-II:[09Hours]

Limit State of Shear: Nominal Shear Stress, Design Shear Strength of Concrete, Design of Shear Reinforcement, Design of Beams for Shear.

Limit State of Torsion: Reinforcement in members subjected to Torsion, Bond, Development Length, Limit State of Serviceability: Deflections and Crack Width.

UNIT-III:[13Hours]

Solid Slabs: One-way Slab, Simply Supported One-way Slab, Design & Detailing of One Way Slab & Two Way Slabs**.**

UNIT-IV: [07 Hours]

Limit State of Compression: Minimum eccentricity, Design of Short axially loaded columns, Members subjected to combined Axial load, Uni-axial bending & Bi-axial bending.

Design of Foundations: Classification of Foundations, Types of Footings, Design of Eccentrically Loaded Footings.

Reference Books:

1. P. C. VARGHESE, 'Limit State Design of Reinforced Concrete', Prentice Hall India (PHI), Second Edition.
2. S. U. Pillai and D. Menon, Reinforced Concrete Design, Tata Mcgraw-Hill 3rd Edition, 2009.
3. M.L. Gambhir, Fundamentals of Reinforced Concrete Design, Prentice Hall India, 2006
4. Subramanian,N.,"Design of Reinforced Concrete Structures",Oxford University Press, New Delhi, 2013.
5. Krishnaraju.N " Design of Reinforced Concrete Structurres ", CBS Publishers & Distributors Pvt. Ltd., New Delhi.
6. Ramachandra, "Limit state Design of Concrete Structures" Standard Book House, New Delhi
7. Dr. B. C. Punmia, Ashok Kr. Jain, Arun Kr. Jain, 'Reinforced Concrete Structures – Volume-I', Laxmi Publication.
8. Dr. H. J. SHAH, 'Reinforced Concrete (Elementary Reinforced Concrete) Volume-I', Charotar Publishing House Pvt. Ltd., 10th Edition.

Subject: **Green Building and Sustainable Development**								
Program: **B. Tech. Civil Engineering**				Subject Code: **CV0642**			Semester: V**I**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
03	-	-	03	24/60	-	16/40	-	100

Course Objectives:

3. To learn basics of green design and sustainable development practice to enhance built environment using green materials and energy efficiency.
4. To learn institutional guidelines for development and certification of green designs.

Course Outcomes:

On successful completion of course student will be able to,

1. Understand green building and sustainable construction practices.
2. Explain fundamentals of energy into building designs.
3. Identify strategies for services designs in buildings.
4. Analyze various green construction materials and energy management techniques.
5. Understand green building rating systems.
6. Design green building by implementing rating system and green design criteria.

COURSE CONTENTS

UNIT-I: [12 Hours]

Green Building & Sustainable Development Concept: Issues and strategies of Green building and sustainable development; Objectives; Principals and Benefits of Green building design; Introduction to High performance building, Energy and resource conservation; Design of green buildings; Evaluation tools for building energy; Embodied and operating energy; Peak demand - Comfort and Indoor Air quality; Visual and acoustical quality - Land, water and materials; Airborne emissions and waste management.

Fundamentals of energy: Energy Production Systems - Heating, Ventilating and Air-conditioning; Solar Energy and Conservation-Energy Economic Analysis Energy conservation and audits; Domestic energy consumption-savings-challenges-primary energy use in buildings; Residential-Commercial-Institutional and public buildings - Legal requirements for conservation of fuel and power in buildings.

UNIT-II: [11 Hours]

Services: Energy in building design; Energy efficient and environment friendly building; Thermal phenomena; thermal comfort; Indoor Air quality; Climate, sun and Solar radiation,; Psychometrics; passive heating and cooling systems; Energy Analysis; Active HVAC systems; Preliminary Investigation; Goals and policies; Energy audit; Types of Energy audit; Analysis of results; Energy flow diagram; Energy consumption / Unit Production; Identification of wastage; Priority of conservative measures; Maintenance of energy management programme.

UNIT-III: [11 Hours]

Green Building Materials and Indoor Environment Quality: Introduction; Low emitting materials; Building and material reuse; Construction waste management; Regional materials; Life cycle cost assessment of building materials and products; Factors affecting indoor environment quality; Ventilation and filtration; Building materials and finishes: Emittance level.

Water and Energy efficiency designs: Introduction; Wastewater strategy and water reuse/recycling; Water fixtures and water use reduction strategies; Impact of energy and atmosphere – Introduction; A Building Envelop; Intelligent energy management system; Mechanical system: Air conditioning; Heating and Ventilation; Electric power and lighting system; Solar energy system.

UNIT-IV: [11 Hours]

Green Building Guidelines: Introduction; IGBC green new building Rating system – Overview and process – project checklist; Sustainable architecture and design; Site selection and planning; Water conservation & energy efficiency; Building materials and resources; Indoor Environment quality; Innovation and development.

Self-study

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Submission

At the end of the syllabus students alone or in group must submit a conceptual design proposal for any building project in form of sketches and power point presentation.

Reference Books:

1. Kubba Sam “Green Construction Project Management and Cost Oversight”, Elsevier Architecture press.
2. IGBC Green New building rating system.
3. Moore F., Environmental Control system Tata McGraw - Hill, Inc. 1994.
4. Green building: principals and practice in residential construction by Abe Kruger and Carl

Seville, Cengage Learning.
5. Brown, GZ, Sun, Wind, and light: Architectural design strategies, John Wiley & Sons, 1985.
6. Cook, J, Award - Winning passive Solar Design, Tata McGraw - Hill, 1984.
7. J.R. Waters, Energy conservation in Buildings: A Guide to part L of the Building Regulations, Blackwell Publishing, 2003.
8. GRIHA User Manual for Green buildings.

Subject: Groundwater Hydrology								
Program: **B. Tech. in Civil Engineering**				Subject Code: **CV0653**			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
2	1	0	3	**24/60**	-	16/40	-	100

Course Objectives:

- The knowledge of hydrology is prerequisite for the Irrigation Engineering and for design of hydraulic structure. So one of the objective of this course is to impart the knowledge of hydrology that deals with the occurrence, distribution, movement and properties of water on the earth
- To impart the knowledge of various irrigation techniques, requirements of the crops
- To learn about distribution systems for canal irrigation, design of unlined and lined irrigation canals design sediment problems associated with canal

Course Outcomes

1. Various components of hydrologic cycle that affect the movement of water in the earth
2. Various Stream flow measurements technique
3. Students will learn the concepts of movement of ground water beneath the earth
4. They will able to understand the basic requirements of irrigation and various irrigation techniques, requirements of the crops
5. Distribution systems for canal irrigation and the basics of design of unlined and lined irrigation canals design

COURSE CONTENTS

UNIT-I [6 Hours]

Introduction:

Scope, Historical Background, Trends in water withdrawals and uses, Utilization of Groundwater, Groundwater in Hydrological Cycle, Origin and Age of Groundwater, Rock Properties Affecting Groundwater, Vertical Distribution of Groundwater, Zone of Aeration, Zone of Saturation, Geologic Formation as Aquifers, Types of Aquifers, Storage Coefficient, Springs.

UNIT-II [10 Hours]

Groundwater Movement:

Darcy's Law, Permeability, Determination of Hydraulic Conductivity, Anisotropic Aquifers, Groundwater Flow Rates, Groundwater Flow Directions, Dispersion, Steady Unidirectional Flow, Steady Radial Flow to a Well, Well in a Uniform Flow, Unsteady Radial Flow in a Confined Aquifer, Unsteady Radial Flow in an Unconfined Aquifer, Unsteady Radial Flow in a Leaky Aquifer.

Water Well:

Test Holes and Well Logs, Method of Constructing Shallow Wells, Methods of Drilling Deep Wells, Well Completion, Well Development, Testing Wells for Yield, Pumping Equipment, Protection of Wells, Characteristics of Well Loss, Specific Capacity and Well Efficiency.

UNIT-III [7 Hours]

Quality of Groundwater:

Natural Groundwater Quality, Sources of Salinity, Measures of Water Quality, Chemical Analysis, Graphical Representation, Physical Analysis, Biological Analysis, Water Quality Criteria, Changes in Chemical Composition, Dissolved Gasses, Temperature, Saline Groundwater, Pollution in relation to Water Use, Municipal Sources and Causes, Industrial Sources and Causes, Municipal Sources and Causes, Agricultural Sources and Causes, Miscellaneous Sources and Causes, Remediation of Contaminated Groundwater.

UNIT-IV [7 Hours]

Groundwater Management:

Groundwater problems related to foundation work, mining, canals and tunnels; Over-exploitation of groundwater and groundwater mining; Groundwater problems in urban areas; Ground water management in arid and semi-arid areas; Climate change impact on ground water resources; Concept of sustainable development of groundwater resources; Groundwater management-supply side and demand side management; Rainwater harvesting and managed aquifer recharge; Conjunctive use of surface and groundwater; Groundwater legislation.

Self-Study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Raghunath H M, "Groundwater" by New Age International Publishers (Third Edition).
2. M. Karamouz, A. Ahmadi, M. Akhbari, "Groundwater Hydrology: Engineering, Planning, and Management" 1st Edition.

3. N. Kresic, Z. Stevanovic, “Groundwater Hydrology of Springs: Engineering, Theory, Management and Sustainability” 1st Edition, Kindle Edition.
4. David Keith Todd., Groundwater Hydrology, John Wiley and Sons, Inc. (3rd Edition**).**

Subject: **Advanced Structural Analysis**								
Program: **B. Tech. Civil Engineering**				Subject Code: **CV0654**			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)-Theory**	**Continuous Internal Evaluation (CIE)-Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
2	1	-	3	24/60	-	16/40	-	100

Course Objectives:

- To learn the theoretical background behind modern structural analysis software.
- To learn matrix method and stiffness method of analysis

Course Outcomes:

On successful completion of this course, students will be able to,

1. Analyze determinate and indeterminate trusses, beams, and frames by using Matrix method of analysis.
2. Develop computer programs for analysis of framed structure.
3. Familiar with contemporary issues in structural engineering and effectively use of commercial software for analysis and design of structures.
4. Understand how to analyze the different framed structure in matrix form.
5. Analyze skeleton structures using stiffness method
6. Analyze skeleton structures having secondary effects using stiffness method.

Course Content:

UNIT-I: [9 Hours]

Introduction: Introduction to Classical, Matrix and Finite-Element Method of Structural, Analysis, Introduction to Flexibility (Force or Compatibility) Method and Stiffness (Displacement or Equilibrium) Method, Analytical Model, Merits and Demerits of Flexibility and Stiffness Method, Matrix Algebra: Definition of Matrix, Types of Matrix, Matrix Operations, Gauss-Jordan Elimination Method.

Beams: Analytical Model, Member Stiffness Relationship in Local Coordinate System, Member Fixed End Forces Due to Load, Structure Stiffness Relations, Structure Fix Joint Forces and Equivalent Joint Loads, Procedure for Analysis, Work Example.

UNIT-II: [8 Hours]

Plane Frame: Analytical Model, Member Stiffness Relationship in Local Coordinate System, Coordinate Transformation, Member Stiffness Relationship in Global Coordinate System, Structure Stiffness Relations, Procedure for Analysis, Work Example.

UNIT-III: [9 Hours]

Plane Trusses: Global and Local Coordinate Systems, Degree of Freedom, Member Stiffness Relationship in Local Coordinate System, Coordinate Transformation, Member Stiffness Relationship in Global Coordinate System, Structure Stiffness Relation, Procedure for Analysis, Work Example.

Space Trusses: Development of Element Stiffness Matrix, Coordinate Transformation, Procedure for Analysis, Work Example.

UNIT-IV: [8 Hours]

Analysis of Grids: Development of Grid Element Stiffness Matrix, Coordinate Transformation, Procedure for Analysis, Work Example.

Introduction to Analysis of elastic instability and second-order effects: Stiffness matrix for prismatic beam-column element; estimation of critical elastic buckling loads; second-order analysis.

Self-study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Asslam Kassimali,"Matrix Analysis of Structures", Brooks/Cole Publishing Co., USA, 1999.
2. Madhujit Mukhopadhyay, “Matrix and Finite Element Analysis of Structures”, Ane Books Pvt. Ltd.
3. G.Ramamurty, “Applied Finite Element Analysis”, I.K.International Publishing House.
4. Weaver, W. & Gere, J. M. (1990). Matrix Analysis Framed Structures. Springer Science & Business Media.
5. Ghali, A., Neville, A.M., "Structural Analysis - A Unified Classical and Matrix Approach", Second Edition, Chapman and Hall, London, 1978.

Subject: **Contract Management**								
Program: **B. Tech. Civil Engineering**				Subject Code: **CV0655**			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
2	1	0	3	24/60	0	16/40	0	100

Course Objectives:

- To study in detail contract and various terms associated with it.
- To brief about various contracts prevailing in Construction Industry.

Course Outcomes:

On successful completion of this course, students will be able to:

1. Understanding of Contract and other terms associated with it.
2. Knowledge about various contracts prevailing in Construction Industry.
3. Basic know how of Specifications.
4. General idea of tendering process.
5. To understand specifications thoroughly.
6. To give idea about tendering process.

COURSE CONTENTS

UNIT-I: [9 Hours]

Introduction to Contract: General Introduction to Contract; Definitions of - Contract Management, Employer, Engineer and Contractor.

Contract Law: What is a Contract?; Contract Elements; Essentials of a Valid Contract; Performance of Contract; Damages.

UNIT-II: [7 Hours]

Contract between Owner and Contractor: Relationship between Employer and Contractor; Forms of Contract; Sub-contract; Essential features of concession Agreement; Parts of concession Agreement.

Conditions of Contract: Definition of terms used; Security Deposit; Earnest Money Deposit; General Obligations, Suspension of work; Time limit for completion; Incentives and Compensation; Measurement and payment to contractor; Additions and deviations; Execution of work; Subletting;

Breach of contract; Final Payment; Claims; Arbitration.

UNIT-III: [6 Hours]

Contract Documents: Tender notice; Conditions of Contract; Bill of Quantities; Specifications; Drawings.

Contract for Engineering and Architectural Services: Owner's choice; Nature of contract between Owner and Engineer; Liabilities of Engineer and Architect; Specimen Agreement Form.

UNIT-IV: [8 Hours]

Tender: Definition; Types of Tender; Classification of Tender; NIT; Advertisement of Tender; Tender Form; Pre-Qualification of Bidders; Submission of Tender; Opening of Tender; Consideration and Scrutiny of Tender; Acceptance of Tender; Revocation of Tender.

Reference Books:

1. Civil Engineering Contracts and Estimates by Dr. B. S. Patil
2. Estimation, Costing and Valuation by Rangwala
3. Construction Project Management by K. N. Jha
4. Harris, F., and McCaffer, R., 2005, Modern Construction Management, 5th Edition, Blackwell Publishing.
5. Indian Contract Act (1872)

Subject: **Environmental Chemistry and Microbiology**								
Program: **B. Tech. Civil Engineering**				Subject Code: **CV0656**			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
02	01	-	03	24/60	-	16/40	-	100

Course Objectives:

To familiarize the students with the chemical and biological principles as applied to Environmental Engineering and apply these concepts to Water and Wastewater Treatment and Pollution Control.

Course Outcomes:

On successful completion of course student will be able to,

1. Understand basics of environmental chemistry and its applications in environmental engineering field
2. Gain knowledge of different methods for chemical analysis.
3. Learn application of environmental chemistry for testing various pollution parameters.
4. Understand type of microorganisms in the environment and the role of microorganisms in the cycling of nutrients in an ecosystem.
5. Determine the role microbial metabolism in a wastewater treatment plant.
6. Identify the role of microorganisms in contaminated water and the diseases caused.

COURSE CONTENTS

UNIT-I: [07 Hours]

Significance of Environmental Chemistry in Environmental Engineering, Units of Measurement. Biogeochemical cycles, Concepts of acids, bases and salts, buffers, acid-base indicators. Solutions, activity and activity coefficients, chemical equilibrium.

UNIT-II: [08 Hours]

Methods of Chemical Analysis, Analysis applicable to water, wastewater principles of analysis of Gravimetric, Volumetric, Colorimetric, photoelectric, Polarographic and Gas Chromatographic methods, Optical Methods such as Absorption, Spectrophotometry, Flame photometry, Fluorimetry. Applications of above analysis methods for testing of pollution parameters.

UNIT-III: [07 Hours]

Scope and Areas of Environmental Microbiology, Cell and its Structure, Introduction to Enzyme and

Metabolic Reactions, Fungi, Bacteria, molds and yeast, algae, protozoa, viruses. Control of microorganisms. Aerobic and anaerobic respiration, Classification, identification, Taxonomy, Reproduction and growth, cultures & characteristics, Pathogens and diseases

UNIT-IV: [08 Hours]

Microscopy and Micrometry, Measurements and isolation of Microorganism, Different cultures, media and techniques of staining and enumeration of microorganism. Applied microbiology of soil, air, water and biological processes of wastewater treatments.

Self-study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. C.N Sawyer, P.L McCarty and G.F Parkin, Chemistry for Environmental Engineering and Science, 5th ed., Tata McGraw-Hill, 2003
2. Standard Methods of Testing of Water and Wastewater Use by APHA, AWWA, AND WPCF (USA) – Latest Edition
3. Physico Chemical Examination of Water Sewage and Industrial Effluents, Pragati Prakashan, Meerut, India
4. Manahan, S.E., Environmental Chemistry , Eighth Edition, CRC press, 2005
5. Ronbald A. Hites , Elements of Environmental Chemistry , Wiley, 2007
6. Stanley E. Mahajan , Fundamental of environmental Chemistry, Lewis Publishers
7. Plezar, Chan, Krieg , Microbiology, McGraw Hill
8. E. Gaudy and Gaudy , Environmental Microbiology, McGraw Hill
9. Maier, R.M., I.L. Pepper and C.P. Gerba , Environmental Microbiology , Academic Press, New York, 1999

Subject: Strength and Deformation Behavior of Soil								
Program: **B. Tech. in Civil Engineering**				Subject Code: **CV0657**			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
3	-	-	3	24/60	-	16/40	-	100

Course Objectives:

- To understand the strength and deformation characteristics of soil.
- To understand the stress-strain laws for soils.

Course Outcomes:

On successful completion of course student will be able to,

1. To relate the difference between shear characteristics of cohesive and cohesionless soil.
2. To understand the concept of yield and failure in soil.
3. To analyze the factors affecting shear strength of soil.
4. To evaluate various stress strain laws for soil.
5. To compute plastic strain in soil.
6. To understand deformation characteristics of soil.

COURSE CONTENTS

UNIT-I: [14 Hours]

Shear strength of granular soils - Direct shear - Triaxial Testing- Drained and undrained Stress-strain behavior - Dilation, contraction and critical states - Liquefaction on saturated sands. Factors influencing stress-strain shear strength.

UNIT-II: [12 Hours]

Shear strength of clays - Stress-strain behaviour - Triaxial testing and stress path plotting - pore pressure parameter of Skempton, Total stress and effective stress approach - shear strength of partially saturated clay in terms of stress state variables. Factors influencing shear strength.

UNIT-III:[10Hours]

Concepts of yield and failure in soils- yield criteria of von Mises, Tresca and their extended form, their applicability to soils - Detailed discussion of Mohr. - Coulomb failure criterion.

UNIT-IV: [09Hours]

Stress-strain laws for soils - hyperbolic law - Linear visco-elastic and Elasto -plastic laws - yield functions, hardening law, flow rules and plastic strain computation

Self-study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Hotlz, R.D and Kovacs, W.D., Introduction Geotechnical Engineering, Prentice-Hall, 1981
2. Braja, M, Das., Advanced soil mechanics, McGraw Hill, 1997.
3. Lambe, T.W. and Whitman R.V. Soil Mechanics in S.I. Units John Wiley, 1979.
4. Atkinson J.H. and BrandsbyP.L. Introduction to critical state soil mechanics McGraw Hill, 1978.
5. Wood, D.M., Soil behaviour and Critical State Soil Mechanics, Cambridge University Press, New York, 1990.
6. Bazant, Z.P., Mechanics of Geo-materials, Rocks, Concrete and Soil, John Willey and Sons, Chilchester, 1985.
7. Graham Barnes, Soil Mechanics Principles and Practices, Macmillan Press Ltd., London, ISBN 0-333-77776x - 2002.
8. Shear Strength of Liquefied Soils, Final Proceedings of the workshop, National Science Foundation, Urbane, Illinois, July 1998.
9. Braja, M. Das, Fundamentals of Geotechnical Engineering, Brooks/Cole, Thomson Learning Academic Resource, Center, ISBN-O-534-37114-0.
10. Keedwell, M.J., Rheology and Soil Mechanics, Elsevier applied science Publishers Ltd., 1984. ISBN 0-85334-285-7

Subject: **Railway Bridge & Tunnel Engineering**								
Program: **B. Tech. in Civil Engineering**				Subject Code: CV0658			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
2	1	0	3	24/60	-	16/40	-	100

Course Objectives:

This course will enable students to:

- The students will gain experience in the implementation of Railway, Bridge and Tunnel Engineering on engineering concepts which are applied in the field of Transportation Engineering.
- The students will get a diverse knowledge of Railway, Bridge and Tunnel engineering practices applied to real life problems.
- The students will learn to understand the theoretical and practical aspects of Railway, Bridge and Tunnel engineering along with the design and applications.

Course Outcomes:

After learning the course the students should be able to:

1. Know about railway track components, their materials, size, and function.
2. Carry out geometric design of railway track
3. Know about various components of railway turnout, stations, yards, signaling, interlocking
4. Understand about different types of bridges, their components
5. Explain construction steps of different types of bridges.
6. Understand about importance, types, methods of construction, mucking, ventilation, lining and lighting in Tunnels.

COURSE CONTENTS

UNIT-I: [4 Hours]

Railway Track & its components: Permanent way and its basic requirements, types of gauges, selection of gauges, concept of coning of wheels. Rails, Sleepers, Ballast and its fixtures.

UNIT-II: [10 Hours]

Geometric Design of Track:

Necessity of geometric design, details of geometric design, design of tracks.

Points and Crossings: Important terms, track layouts and sketches of turnouts, diamond crossing,

gauntlet track, gathering line.

UNIT-III: Bridge Engineering [9 Hours]

General:

Site investigation, waterway calculation, scours depth, afflux and economic span.

Classification:

Classification of superstructures with respect to structural behavior and materials used types of substructures, bridge bearings, movable bridges, temporary bridges.

Maintenance:

Testing and strengthening of bridges.

UNIT-IV: Tunnel Engineering [7 Hours]

Necessity/ advantages of tunnels, classification of tunnels, size and shape of tunnels, shafts, methods of tunnelling in hard and soft ground, Lighting and ventilation in tunnels, Dust control, safety measures, economics of tunnelling.

Self-study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Satish Chandra and M.M. Agrawal, Railway Engineering, Oxford University Press, New Delhi
2. S.P. Bindra, Principles and Practice of Bridge Engineering, Dhanpat Rai & Sons, New Delhi
3. S.C. Saxena, Tunnel Engineering, Dhanpat Rai & Sons, New Delhi
4. D.J. Victor, Essential of Bridge Engineering, Oxford & IBH Pub. Co. Ltd. Mumbai

SUBJECT: Water Resources and Watershed Management								
Program: **B.Tech. Civil Engineering**				Subject Code: **CV0659**		Semester: **VI**		
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
2	1	0	3	24/60	0	16/40	0	100

COURSE OBJECTIVES:

- The basic aim of this course is to understand the surface water resources and its management including environmental impact assessment, project economics, water quality management planning, and design of water resources systems etc.

COURSE OUTCOMES:

1. Discuss basic concepts of "Water Resources Management".
2. Estimate the surface runoff from given precipitation data.
3. Describe various types of survey investigations for reservoir planning
4. Design the appropriate rain water harvesting scheme and required structures for given conditions.

COURSE CONTENTS

UNIT-I [8 Hours]

Introduction to Watershed Management: Types of watershed and their characteristics. Purpose of planning of watershed projects, Guidelines for project formulation, Management strategies, system concept, systems components and constraints.

UNIT-II [7 Hours]

Social Aspects of Watershed Management: Hydrologic cycle and its effect on man's activity, erosion process and sediment yield, conservation practices, water resources and environmental problems, water quality management planning, Design of water resources systems. Community participation, Private sector participation, Institutional issues, Socio-economy, Integrated development, Water legislation and implementations.

UNIT-III [8 Hours]

Environmental Impact: Environmental impact assessment, adverse effects of dams and reservoir on environment, watershed management with multiple use concepts. Water quality and pollution, types and Sources of pollution**,** water quality modeling, environmental guidelines for water quality.

UNIT-IV [7 Hours]

Project economics: pattern of financing and credit, cost benefit analysis, Economic evaluation, project implementation and management, problems of execution and management.

Reference Books:

1. Michael A.M., Irrigation Engineering, Vikas Publishing House, 1992.
2. Murty, J.V.S. "Watershed Management", New Age Intl., New Delhi 1998.
3. Murthy, J.V.S., Watershed Management in India, Wiley Eastern, New Delhi, 1994
4. K.C. Patra, "Hydrology and water Resources Engineering"
5. S. K. Garg, " Irrigation Engineering"

Subject: **Elements of Earthquake Engineering**								
Program: **B.Tech. Civil Engineering**				Subject Code: **CV0660**			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
02	-	02	03	16/40	16/40	24/60	24/60	200

Course Objectives:

1. To give an experience in the implementation of engineering concepts which are applied in field of structural engineering.
2. To involve the application of scientific and technological principles of planning, analysis and design of buildings according to earthquake design philosophy.

Course Outcomes:

On successful completion of course student will be able to,

1. Determine the response of undamped SDOF systems subjected to vibrations.
2. Illustrate the phenomenon, causes and effects of earthquake.
3. Apply the concept of earthquake resistant design.
4. Construct the detailing drawings of the structural elements such as beam and column to exhibit ductile behaviour under the action of lateral loads.
5. Demonstrate the mode shapes of MDOF system.
6. Appraise the effect of pounding and re-entrant corner.

COURSE CONTENTS

UNIT-I [08 Hours]

Fundamentals of Structural Dynamics: Static load v/s Dynamic load, Simplified Single Degree of Freedom (SDOF) System, Mathematical Modelling of SDOF System, Response of SDOF System to different types of Vibrations like Free and Forced Vibration of Undamped SDOF Systems.

UNIT-II [07 Hours]

Earth Interior, Plate Tectonics, Faults, Seismic Waves, Consequences of Earthquake, Earthquake Parameters, Magnitude & Intensity, Scales, Seismic Zones of India. Earthquake Design Philosophy, Four Virtues of Earthquake Resistant Structure

UNIT-III [08 Hours]

Introduction to IS: 1893, Seismic Methods of Analysis, Seismic Coefficient Method, Base Shear and Lateral Load Distribution along Height. Work Example.

UNIT-IV [07 Hours]

Rigid Diaphragm Effect, Centre of Mass and Centre of Stiffness.

Ductile Detailing of Beam and column as per IS: 13920.

Self-study

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Pankaj Agarwal and Manish Shrikhande, 'Earthquake Resistant Design of Structures', Prentice Hall of India.
2. S.K. Duggal, 'Earthquake Resistant Design of Structures', Oxford University Press.
3. Mario Paz, 'Structural Dynamics – Theory and Computation', Van Nostard Reinhold Company, New York.
4. A.K. Chopra, 'Dynamics of Structures', Pearson Publication.
5. Clough, R. W. & Penzin J., 'Dynamics of Structures', McGraw-Hill Publishing House, New Delhi.
6. John M. Biggs, 'Introduction to Structural Dynamics', McGraw-Hill Publishing House, New Delhi.
7. IITK-BMTPC, Earthquake Tips, 'Learning Earthquake Design and Construction" by C.V.R. Murthy, Building Material and Technology Promotion Council.

Indian Standards:

IS: 1893 PART I – 2016 and IS:13920 – 2016

List of Experiments:

1. Introduction to Structural Dynamics laboratory
2. Spring Mass Model
3. Free vibration of single degree of freedom system
4. Forced vibration of single degree of freedom system
5. To determine mode shapes of a three storied building
6. To understand the response of structure without Shear Wall
7. To understand the response of structure with Shear Wall

8. To understand the response of structure without Bracing Systems
9. To understand the response of structure with Bracing Systems
10. Pounding and Re-entrant corner effect

Subject: **Construction Quality Management**								
Program: **Civil Engineering**				Subject Code: CV0661			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
3	-	-	3	24/60	-	16/40	-	100

Course Objectives:

- Will be aware of quality management importance in construction. Also be in form to apply various quality management tools and process in construction project to improvise the quality of structure.
- Get idea of various standards at national and international level in construction industry.

Course Outcomes:

On successful completion of course student will be able to,

1. To learn Quality management concept and its philosophies.
2. To study quality management through TQM tools
3. To study quality management through Six Sigma tools
4. To study quality control and quality assurance plan
5. To study cost of quality
6. To understand the Quality Management System and its implementation in Construction industry.

COURSE CONTENTS:

UNIT-I: [7 Hours]

Quality Management: Concept; Importance; Quality; Quality History; Quality Inspection; Quality Engineering; Quality Management; Quality Assurance; Quality Control; Quality Control Tools

Quality Management Philosophies: Quality Management Gurus & their Philosophies: Philip B. Crosby; W. Edward Deming – PDCA Cycle, Statistical Process Control, 14 Principles of Transformation, The Seven Point Action Plan; Joseph M. Juran

UNIT-II: [8 Hours]

Evolution of quality: quality inspection, quality control and quality assurance in projects, inspection, quality control (QC) vs quality assurance (QA)

Total Quality Management (TQM): Definition & Concept; changing views of Quality; Principles of

TQM – Basic Components

Six Sigma: Introduction, Analytic Tool Sets, DMAIC Process, DMADV Process

UNIT-III: [7 Hours]

Quality Management System (QMS): Introduction; Standards Organizations; International Organization for Standardization (ISO); ISO 9000 Quality Management System;

Quality Cost in Construction: Introduction, Categories of Costs, Reasons for Poor Quality, Quality Cost in Construction, Prevention Costs, Appraisal Costs, Internal Failure Costs, External Failure Costs, Quality Performance Management System, Integrated Quality Management

UNIT-IV: [8 Hours]

A Practical Approach: Quality Assurance Processes/Techniques for Construction Projects: Quality Management Plan; QA/QC Observation & Surveillance; Issuance of Non- Conformance reports; Corrective & Preventive actions; Quality Reports; QA/QC Audit & Reporting; Management Review Committee Meeting

References Books:

1. Rumane, Abdul R. "*Quality Management in Construction Projects",* CRC Press
2. Juran, J.M., and Godfrey, A.B. (1999). *Juran's Quality Handbook*, Fifth edition, New York: McGraw-Hill.
3. PMBOK Guidelines
4. Thorpe, B., Sumner, P., and Duncan, J. (1996). Quality Assurance in Construction. Surrey, U.K.: Gower Publishing Ltd.
5. Narayan B. ISO 9000 & Quality Movements. A.P.H. Publishing Corporation, New Delhi 110 002
6. Total Quality Management & ISO 9000 Certification in Construction. NICMAR, First Edition, July 1994.
7. Dewar, J.D. & Anderson, R. Manual of Ready Mixed Concrete Blackie & Son Ltd., 1988 Glasgow & London.

Subject: **Sustainable Sanitation and Water Management**								
Program: **B. Tech. Civil Engineering**				Subject Code: **CV0662**			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
02	01	-	03	24/60	-	16/40	-	100

Course Objectives:

- Enhance the understanding and ability in sustainable, low cost and hygienic sanitation system and water management.

Course Outcomes:

On successful completion of course student will be able to,

1. Understand and importance of sustainability
2. Comprehend the current scenario of sanitation and water management and linking them with sustainable solution
3. Design centralized and decentralized systems for sanitation and water management
4. Implement various low cost sanitation systems for optimum solution.
5. Emphasis the water conservation techniques
6. Decide ground water recharge and treated wastewater use for sustainability.

COURSE CONTENTS

UNIT-I: [07 Hours]

Introduction: Concept of sustainability in sanitation and water management, integrated water resource management, sustainable Sanitation, global picture of water, sanitation, hygiene and health. Linking up sustainable sanitation and water management.

UNIT-II: [08 Hours]

Water footprint and accounting; integrated water resources management. Natural wastewater treatment systems: Natural and constructed wetlands, different types, Mechanisms, performance, design, Land treatment systems, Centralized and Decentralized Systems for Water and Sanitation.

UNIT-III: [07 Hours]

Low-cost sanitation: Dry sanitation methods, Pit latrines, VIP latrines, Aqua privy, septic tank,

Ecological Sanitation, Socio-Economic Aspects of sanitation

UNIT-IV: [08 Hours]

Water Conservation, Rainwater Harvesting: Roof water harvesting, technology, quality, health issues. Groundwater recharge, techniques, case studies Wastewater reuse and reclamation.

Self-study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Cites R W, Middlebrooks E J, Reed S C, Natural wastewater Treatment Systems, CRC Taylor and Francis, 2006.
2. Cairncross S, Feachem R. Environmental Health Engineering in the Tropics; 2nd edition, John Wiley & Sons 1993.
3. The World Bank – Appropriate technology for water supply and sanitation. (Series)
4. Compendium of Sanitation Systems and Technologies, 2nd revised edition, IWA.

Subject: Ground Improvement Techniques								
Program: **B. Tech. in Civil Engineering**				Subject Code: CV0663			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
3	-	-	3	24/60	-	16/40	-	100

Course Objectives:

- To understand the role of Ground Improvement Techniques and their application for various types of soil.
- To understand different grouting techniques.

Course Outcomes:

On successful completion of course student will be able to,

1. To understand the necessity of Ground Improvement Techniques.
2. To discuss various ground improvement techniques based on type of soil.
3. To identify suitable technique and justify the same.
4. Identify the problems encountered on site related to soils.
5. Educate students with numerous ground improvement principles.
6. Design the technique for ground improvement.

COURSE CONTENTS

UNIT-I: [10 Hours]

Introduction - Scope and necessity of ground improvement in Geotechnical engineering- basic concepts and philosophy. Drainage - Ground Water lowering by well points deep wells, vacuum and electro-osmotic methods. Stabilization by thermal and freezing techniques

UNIT-II: [12 Hours]

In-situ compaction of granular and cohesive soils, Shallow and Deep compaction ,sand piles – concept, design, factors influencing compaction Blasting and dynamic consolidation – Preloading with sand drains, fabric drains, wick drains etc. – theories of sand drain – design and relative merits. Dewatering: Drainage - Ground Water lowering by well points deep wells, vacuum and electro-osmotic methods. Stabilization by thermal and freezing techniques. Preloading with sand drains, fabric drains, wick drains etc. – theories of sand drain – design and relative merits.

UNIT-III: [12 Hours]

Stone column, lime piles – Functions – Methods of installation – design, estimation of load carrying capacity and settlement-slope stability-stability of trenches-lime-sand columns, soil nailing –

Applications.

Soil densification: Insitu compaction of granular and cohesive soils, Shallow and Deep compaction, sand piles concept design, factors influencing compaction Blasting and dynamic consolidation, Stone column: Functions, Methods of installation & design, lime piles: Functions, Methods of installation & design, estimation of load carrying capacity and settlement.

UNIT-IV: [11 Hours]

Grouting techniques – Types of grout – Suspension and solution grouts – Ideal characteristics of grout. Grouting equipment – principle of injection methods – properties of treated ground-application of jet grouting, grout monitoring, Electro – chemical stabilization – Stabilization with cement, lime etc. – Stabilization of expansive clays.

Self-study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Rowe, R.K., Geotechnical and Geoenvironmental Engineering Handbook, Kluwer Academic Publishers, 2001.
2. Moseley, M.D., Ground Treatment, Blackie Academic and Professional, 1998.
3. Davies, M.C. and Schlosser, F., Ground Improvement Gas Systems, American Society of Civil Engineers, 1997.
4. Das, B.M., Principles of Foundation Engineering, (Fourth Edition). PWS Publishing, 1999
5. Hehn, R.W., Practical Guide to Grouting of Underground Structures, ASCE, 1996.
6. Shroff, A.V., Grouting Technology in Tunneling and Dam, Oxford & IBH Publishing Co. Pvt.Ltd, New Delhi, 1999.

Subject: **Traffic Engineering**								
Program: **B. Tech. in Civil Engineering**				Subject Code: **CV0664**			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
2	1	-	3	24/60	-	16/40	-	100

Course Objectives:

This course will enable students to:

- Synchronize the traffic signal design by using the new technology.
- Apply the traffic control aids and norms.
- Explain causes of road accidents, prevention and traffic management.

Course Outcomes:

After learning the course the students should be able to:

1. Understand Road user characteristics & vehicular characteristics.
2. Conduct different types of Traffic Surveys
3. Find out delays across the urban sections from the data given.
4. Explain the reasons of accidents and their preventive measures
5. Design of traffic signals at intersections and rotary intersections.
6. Aware of various traffic regulation and control devices.

COURSE CONTENTS

UNIT-I: [5 Hours]

Traffic Engineering Administration and Function: Definition, traffic Engineering, Function, Importance of traffic engineering. Road user characteristics & Vehicle characteristics

UNIT-II: [9 Hours]

Traffic Volume Study and Characteristics: The traffic volume study, purpose of traffic volume study, Methods of traffic volume study, Analysis and presentation of volume data, Pedestrian studies.

Origin- Destination & Parking Surveys: Need & Methods of O-D survey, Need of parking Surveys, Definition, and Types of parking Surveys.

UNIT-III: [7 Hours]

Spot Speed studies and Characteristics: Speed and Journey time, Definitions, Factors Affecting spot speed, Purpose & Methods of spot speed study, Spot speed characteristics.

Highway Capacity: General, Importance of "Capacity" in Highway Transportation, Passenger Car units (PCUs), Capacity of uninterrupted Flow conditions, Level of Service, Factors Affecting Level of Service, Capacity of Signalized Intersection.

UNIT-IV: [9 Hours]

Traffic Signals: Introduction of Traffic Signals, Fixed Time and Vehicle Actuated Signals, optimum cycle length, Coordinated control of Signals, Delay at signalised Intersections, Various methods for signal time design.

Traffic Signs and Road Markings: Importance of traffic signs, General Principles & Types of Traffic Signing, Location, Height and Maintenance of Traffic Signs**.** Function, Types of Road Marking, General Principles of pavement marking, Material and colour, Pedestrian and Cyclist Crossings, Word message and Object markings.

Self-study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Khisty, C J., Transportation Engineering – An Introduction, Prentice-Hall, NJ
2. S.C. Saxena, Traffic Planning and Design, Dhanpat Rai Pub., New Delhi.
3. L.J.Pingnataro, Traffic Engineering; Theory and Practice. Prentice Hall, Englewood Clitts, 1973.
4. M.Wohl and B.V.Martin, Traffic System Analysis for Engineering and Planners, McGraw-Hill. New York,1983.
5. D.R.Drew, Traffic Flow Theory and Control, McGraw Hill. New York 1968.
6. W.R.McShane, R.P.Roess and E.S.Prassas, Traffic Engineering, Prentice Hall, New Jersey, 1990
7. L.R.Kadiyali,"TrafficEngineeringandTransportPlanning,"KhannaPublishers,NewDelhi.
8. S.C. Saxena, "Traffic Planning And Design".

Subject: Irrigation Engineering								
Program: **B. Tech. in Civil Engineering**				Subject Code: **CV0665**			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
2	1	0	3	24/60	0	16/40	0	100

Course Objectives:

- To take up the basic concepts of irrigation and construction of various hydraulic structures.
- To introduce students to basic concepts of water, plants, their interactions, as well as irrigation and drainage systems design, planning and management.
- The structures involved the elementary hydraulic design of different structures and the concepts of maintenance shall also form part.
- To develop analytical skills relevant to the areas mentioned above, particularly the design of irrigation and drainage projects.

Course Outcomes:

After learning the course, the students should be able to:

1. Understand the irrigation methods and duty-delta relation for crops
2. Calculate Net Irrigation Requirement (NIR), Field Irrigation Requirement (FIR) and Gross Irrigation Requirement (GIR)
3. Plot seepage line of earthen dam with corrections at entry and exit
4. Understand function of spillway and energy dissipation
5. Design lined and unlined canal using silt theories
6. Understand functions of regulating and cross drainage works and drainage principles

COURSE CONTENTS

UNIT-I [8 Hours]

Introduction-

Definition, Necessity, Scope, Benefits and ill effects of irrigation, Types of irrigation schemes, Social and environmental considerations, Irrigation development in India. Water Requirement of Crops- Soil-water-plant relation- field capacity, wilting point, available water, consumptive use, Irrigation requirements – Net irrigation requirement, Field irrigation requirement, Gross Irrigation requirement,

Soil moisture extraction pattern, Frequency of irrigation, Principal Indian crops, Gross command area, Culturable command area, Intensity of irrigation, Duty and delta relation, Introduction to various methods of application of irrigation water, Irrigation efficiency, assessment of irrigation water

UNIT-II [8 Hours]

Diversion Works:

Different stages of a river and their flow characteristics, Weir and barrages, Various parts of a weir and their functions, Exit gradient.

Storage and Outlet works:

Types of earthen dams, Seepage in earth dams, Gravity dams, Forces acting on a gravity dam, Rock-fill dams, Spillways, Types of spillways, Spillways gates and energy dissipation works.

UNIT-III [8 Hours]

Distribution works:

Modes of conveying irrigation water- Types of irrigation canals contour canal, ridge canal, side sloping canals, Canal sections-filling, cutting, partial cutting and partial filling, Balanced depth, Canal FSL, Capacity factor and Time factor, L-section, Losses of canal water, Silting and scouring of canals, Method of design of unlined section of irrigation canal, Silt theories, Lined canals, Design of lined canal, Link canals.

UNIT-IV [6 Hours]

Regulating and Cross Drainage Works:

Canal falls, Cross drainage works, Types of cross drainage works, Canal escapes, Head regulator and Cross regulator, Silt ejector, Irrigation outlets and types of outlets.

Self-Study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. J. Nemec, “Engineering Hydrology”, Mc Graw-Hill, N.Y
2. Irrigation Engineering and Hydraulic Structures - S.K.Garg, Khanna Publishers, Delhi 5. Irrigation Engineering, S.K. Mazumder, Galgotia Publications Pvt Ltd., New Delhi
3. Irrigation & Water Power Engineering - Dr. B.C.Punmia & B.B.Pande, Laxmi Publications, (P) Ltd, New Delhi

4. Irrigation, Water Resources & Water Power Engineering - Dr. P.N.Modi, Standard Book House, Delhi
5. Irrigation, Water Power & Water Resources Engineering - Dr. K.R.Arora Standard Publishers Distributors, Delhi

Subject: **Pre-stressed Concrete**								
Program: **B.Tech. Civil Engineering**				Subject Code: **CV0666**			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
02	01	-	03	16/40	-	24/60	-	100

Course Objectives:

- To learn the concept of prestressing and fundamentals of prestressed concrete structures for analysis and design of various types of structures and structural elements.
- To understand the application of various Indian Standard codes for design of members subjected to compression, bending, shear, torsion, axial loads and/or flexure.

Course Outcomes:

On successful completion of course student will be able to,

1. Explain the concept of prestressing and various devices use for prestressing of RCC members.
2. Analyze bending moments and stresses; decide cable profile for prestressed members subjected to various types of loading.
3. Estimate short-term and long-term losses in prestress.
4. Determine short-term and long-term deflections of uncracked and cracked prestressed concrete members.
5. Estimate the flexural caapcity of prestressed concrete sections as per Indian Standard Provisions.
6. Design the prestressed RC members for Axial, Shear, Torsion, Compression and bending as per Indian Standard Provisions.

COURSE CONTENTS

UNIT-I [09 Hours]

Basic Concept of Prestressing: Need for High Strength Steel and Concrete, Advantages of Prestressed Concrete, Applications of Prestressed Concrete. Materials for Prestressed Concrete: High-Strength Concrete, High-Tensile Steel.

Introduction to Prestressing Systems: Tensioning Devices, Pretensioning Systems, Post-Tensioning Systems, Thermo-Electric Prestressing, Chemical Prestressing.

Analysis of Prestress and Bending Stresses: Basic Assumptions, Analysis of Prestress, Resultant

Stresses at a Section, Pressure Line or Thrust Line and Internal Resisting Couple, Concept of Load Balancing, Stresses in Tendons, Cracking Moment.

UNIT-II [05 Hours]

Losses of Prestress: Loss Due to Elastic Deformation of Concrete, Loss Due to Shrinkage of Concrete, Loss Due to Creep of Concrete, Loss Due to Relaxation of Stress in Steel, Loss Due to Anchorage Sleep, Loss of Stress Due to Friction, Total Losses Allowed for Design.

UNIT-III [07 Hours]

Deflection of Prestress Concrete Members: Factors Influencing Deflections, Short Term Deflections of Uncracked Members, Effect of Tendon Profile on Deflections, Deflections Due to Self-Weight and Imposed Loads, Prediction of Long Time Deflections, Deflection of Cracked Members, Requirements of various codes of practice.

Flexural Strength of Prestressed Concrete Sections: Simplified Code Procedures (IS: 1343), Shear and Principal Stresses, Ultimate Shear Resistance of Prestress Concrete Members, Design of Shear Reinforcement as per IS: 1343.

UNIT-IV [09 Hours]

Philosophy of Limit-State Design: Limit State Design Criteria for Prestressed Concrete Members, Design Loads and Strengths, Partial Factors for Loads.

Design of Prestressed Concrete Sections: Design of Section for Flexure, Design of Section for Axial Tension, Design of Section for Compression and Bending, Design of Section for Shear and Torsion.

Self-study

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. N. Krishna Raju, 'Prestressed Concrete', Tata Mc Graw Hill Publishing Co. Ltd, New Dehi.
2. S K Mallick, A P Gupta, 'Prestressed Concrete', Oxford and IBI Series.
3. R. H. Evans, Bennet E W, 'Prestressed Concrete Theory and Design', Chapman and Hall, London.
4. T. Y. Lin, 'Design of Prestressed Concrete Structures', Asia Publishing House.
5. Praveen Nagarajan, 'Prestressed Concrete Design', Pearson Publication.
6. Rajgopalan, N., 'Prestressed Concrete', Narosa Publishing House.

7. Nilson, A. H., ‘Design of Prestressed Concrete’, John Wiley and Sons.

Indian Standards:

IS: 1343

Subject: **Project Planning and Quality Control**								
Program: **B. Tech. Civil Engineering**				Subject Code: **CV0667**			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
2	1	0	3	24/60	0	16/40	0	100

Course Objectives:

- To know practicality of Project Management at construction site.
- To understand analysis and feasibility study of Construction Project.

Course Outcomes:

1. Knowledge about practicality of Project Management at construction site.
2. Understanding analysis and feasibility study of Construction Project.
3. Introduction to Quality Management.
4. Learning about assessment of Quality
5. To introduce students to Quality Management.
6. To learn how to assess Quality.

COURSE CONTENTS:

UNIT-I [9 Hours]

A Practical Approach to Project Management at Construction Site: Introduction; Construction Project Management; Project Management knowledge areas; The role of a contractor in construction management; Construction Project management basics – how to obtain a construction management project, business models for construction projects, project management principles and process; Construction Project Management stages; Organizing and scheduling a Construction Project; Problems, Issues and legal in a Construction Project.

UNIT-II [8 Hours]

Construction Project Concept Analysis and Feasibility Study: Introduction; Project Need Analysis; Feasibility Study; Project investment Analysis and Appraisal; Project Implementation Strategy; Analyzing Factors affecting Project Feasibility – Market Analysis, Technical Analysis and Financial Analysis; Feasibility Report – Case Studies.

UNIT-III [7 Hours]

Overview of Quality: Quality History; Quality Definition; Quality Inspection; Quality Control; Quality Assurance; Quality Engineering; Quality Management.

Integrated Quality Management: Introduction; Quality Standards; Standards Organizations; International Organization for Standardization (ISO); ISO 9000 Quality Management System; ISO Certification.

UNIT-IV [6 Hours]

Total Quality Management (TQM): Definition & Concept: Principles of TQM – Basic Components, Six Sigma Methodology; Six Sigma Analytic Tool Sets; A Practical Approach: Quality Assurance Processes/Techniques for Construction Projects; An Overview and Guidelines for Quality Control Plan in Construction Projects; A Practical Approach: Quality Management Checklist & Documentation.

Reference Books:

1. Rumane, Abdul R. "Quality Management in Construction Projects", CRC Press
2. Chitkara K K, (2011), "Construction Project Management- Planning, Scheduling and Controlling"-– Tata McGraw Hill Education Private Limited.
3. Rangwala S C, (2012), "Construction of structures and management of works" –Charotar Publishing House Private Limited.

Subject: **Air Pollution and Control**								
Program: **B. Tech. Civil Engineering**				Subject Code: **CV0668**			Semester: VI	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
02	01	-	03	24/60	-	16/40	-	100

Course Objectives:

To understand the effects of air pollution and noise on the environment and its control measures.

Course Outcomes:

On successful completion of course student will be able to,

- Identify sources, causes and effects of air pollution.
- Take basic actions to minimize air pollution, prevention and control.
- Gain knowledge of site selection and zoning for control of air pollution.
- Follow the laws and regulations of air pollution prevention and control at the local, state and country level.
- Gain knowledge of various sources of noise pollutants and its effects on human health.
- Manage of noise pollution and mitigation methods.

COURSE CONTENTS

UNIT-I: [08 Hours]

Introduction of atmosphere, **Air Pollution**: Sources & Classification of air pollutants - Effects of air pollution, air quality and emission standards, Sampling of pollutants in ambient air. **Meteorology And Air Pollution**: Factors influencing air pollution, Wind rose, Mixing depths, Lapse rates and dispersion - Atmospheric stability, Plume rise and dispersion, Prediction of air quality

UNIT-II: [07 Hours]

Legislation: The Environment (Protection) Act,The Air(Prevention and Control of Pollution)Act ,Motor vehicle Act

Control Of particulate pollutants: Properties of particulate pollution - Particle size distribution - Control mechanism - Dust removal equipment - Design and operation of control equipment.

UNIT-III: [07 Hours]

Control Of Gaseous Pollutants: Process and equipment for the removal by chemical methods - Design and operation of absorption and adsorption equipment - Combustion and condensation equipment. Zoning and site selection, other management control.

UNIT-IV: [08 Hours]

Fundamentals of Acoustic, quantification of sound, Sources of noise and measurements , noise standards and limit values; noise instrumentation and monitoring procedure. Noise evaluation indices. Effects of noise on health, noise management. Noise control approaches, mitigation measures.

Self-study

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Kenneth Work and C Warner, "Air pollution: Its origin and control", Harper and Row Publication, 1981.
2. Mackenzie L. Davis, David A. Cornwell, "Introduction to Environmental Engineering", McGraw Hill (India) Private Limited
2. Henry Crawford Perkins, "Air Pollution", McGraw hill Publication
3. Martin Crawford, "Air Pollution control Theory", McGraw hill Publication.
4. CS Rao, Environmental Pollution Control Engineering- Wiley Eastern Ltd., New Delhi.
5. PE Cunniff, Environmental Noise Pollution, McGraw Hill, New York.
6. 7.Handbook of Noise Measurement –APG Peterson & EE Gross PH, Englewood cliffs New Jersey.

Subject: Dynamics of Soil and Foundation								
Program: **B. Tech. in Civil Engineering**				Subject Code: **CV0669**			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
2	1	-	3	24/60	-	16/40	-	100

Course Objectives:

- To understand the impact of dynamic loading on soil and various control measures to reduce the transmissions caused by it.
- To understand the concepts of machine foundations.

Course Outcomes:

On successful completion of course student will be able,

1. To understand the nature of dynamic loads on soil.
2. To discuss different laboratory and field test to determine dynamic soil constants.
3. To classify various machine foundations and their design considerations.
4. To suggest various control measures to reduce the effect of transmission of vibrations to soil.
5. To study different design criteria for foundation
6. To study dynamic properties of soil.

COURSE CONTENTS

UNIT-I: [08Hours]

Introduction - Nature of dynamic loads - free vibrations of spring - mass systems - forced vibrations - viscous damping - principles of vibrations measuring equipments.

Dynamic soil properties - Laboratory and field testing techniques, Selection of design values. Liquefaction of soils: An introduction and evaluation using simple methods.

UNIT-II: [07Hours]

Dynamic stress - Deformation and strength of soils - Dynamics bearing capacity and earth pressure - Effect of transient and pulsating loads - Field-test- Typical values of soil constants.

UNIT-III: [08Hours]

Necessity, M/C foundation and its types, Basic Terminology connected with vibrating system and Foundation ,General Criteria for design of Foundation, Use of Mass spring Analogy to Machine Foundation ,Determination of natural frequency of Foundation soil system, Design criteria for Reciprocating and Impact Machine as per I.S code. Vibration Isolation and control, Numerical.

UNIT-IV: [07 Hours]

Vibration Isolation - Passive and active isolation - use of springs and damping materials construction aspects of machine foundations.

Dynamic stiffness and damping constants of single pile and pile group-Analysis for vertical, lateral, rocking modes of vibration. Vibration absorption and isolation techniques

Self-study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. KameswaraRao, N.S.V., Dynamics soil tests and applications, Wheeler Publishing - New Delhi, 2000.
2. Prakash, S and Puri, V.K., Foundations for machines, McGraw Hill, 1987.
3. Moore, P.J., Analysis and Design of Foundations for Vibrations, Oxford and IBH, 1985.
4. Major, A., Vibration Analysis and Design of Foundations for Machines and Turbines, Vol. I, II and III Budapest, 1964.
5. Swami Saran, Soil Dynamics and Machine Foundation, Galgotia publications Pvt. Ltd., New Delhi 1999.
6. Das B.M., Principles of Soils Dynamics, McGraw Hill, 1992.
7. Kameswara Rao, "Vibration Analysis and Foundation Dynamics", wheeler Publishing, New Delhi, 1998.

Subject: **Dock Harbour & Airport Engineering**								
Program: **B. Tech. in Civil Engineering**				Subject Code: **CV0670**			Semester: VI	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
2	1	0	3	24/60	-	16/40	-	100

Course Objectives:

This course will enable students to:

- To have an overall knowledge of the design and construction of airport, docks, harbours and ports as a whole.
- To understand the function of different components of airports, docks and harbours.

Course Outcomes:

After learning the course the students should be able to:

1. Understand the various elements of Harbour and Airport
2. Understand the fundamentals of planning and design of various marine structures
3. Explain the importance of dredging & different methods of dredging.
4. Draw wind rose diagram
5. Understand the fundamentals of planning and design of Airport structures
6. List out the functions of various components of the airport.

COURSE CONTENTS

UNIT-I: (HARBOUR) [8 Hours]

General: History, development and policy, classification of harbours, Harbour economics

Harbour Planning: Harbour components, ship characteristics, characteristics of good harbour and principles of harbour planning, size of harbour, site selection criteria and layout of harbour,

Marine Structures: General Design aspects, Breakwaters- Function, Types, General design Principles, wharves, quays, jetties, piers, pier heads, dolphin, fenders, mooring accessories function, types, suitability, design and construction features

UNIT-II: (DOCKS) [7 Hours]

Port Amenities: Ferry, transfer bridges, Floating landing stages, transit sheds, ware houses, cold storage, aprons, cargo handling equipments, purpose and general description.

Navigation Aids: Channel and entrance demarcation, bouys, beacons, LightHouse electronic communication Devices, costal protection purpose and devices, dredging-capital and maintenance dredging, purpose, methods, dredgers-types, suitability, disposal of dredged material.

UNIT-III: (AIRPORT): [7 Hours]

General: History, development, policy of air transport, aircrafts, aerodromes, air transport authorities, air transport activities, air crafts and its characteristics, air port classifications

AirPort Planning: Regional planning-concepts and advantages, location and planning of airport elements-airfield, terminal area, obstructions, approach zone, zoning laws, airport capacity, airport size and site selection, development of new airport, requirements of an ideal airport layout.

UNIT-IV: [8 Hours]

Runway Design: Wind rose and orientation of runway, factors affecting runway length, basic runway length, and corrections to runway length, runway geometrics and runway patterns (configurations). **Terminal Area Design:** Terminal area elements and requirements, terminal building functions, space requirements, location planning concepts, vehicular parking area and circulation network.

Self-study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Dr. S. K. Khanna, M.G.Arora and S.S. Jain, Airport Planning & Design, Nem Chand & Bros.,Roorkee
2. G.V. Rao Airport Engineering, Tata McGraw Hill Pub. Co., New Delhi
3. R. Srinivasan and S. C. Rangwala, Harbour, Dock and Tunnel Engineering, 1995, Charotar Pub.House, Anand
4. Airport Engineering, Charotar Publishing House Pvt. Ltd, Anand
5. S. P. Bindra, A Course in Docks and Harbour Engineering, 1992, DhanpatRai& Sons, New Delhi

Subject: **Contract Management**								
Program: **B. Tech. Civil Engineering**				Subject Code: CV0655			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
2	1	0	3	24/60	0	16/40	0	100

Course Objectives:

- To study in detail contract and various terms associated with it.
- To brief about various contracts prevailing in Construction Industry.

Course Outcomes:

1. Understanding of Contract and other terms associated with it.
2. Knowledge about various contracts prevailing in Construction Industry.
3. Basic know how of Specifications.
4. General idea of tendering process.
5. To understand specifications thoroughly.
6. To give idea about tendering process.

COURSE CONTENTS:

UNIT-I **[9]**

Introduction to Contract: General Introduction to Contract; Definitions of - Contract Management, Employer, Engineer and Contractor.

Contract Law: What is a Contract?; Contract Elements; Essentials of a Valid Contract; Performance of Contract; Damages.

UNIT-II **[7]**

Contract between Owner and Contractor: Relationship between Employer and Contractor; Forms of Contract; Sub-contract; Essential features of concession Agreement; Parts of concession Agreement.

Conditions of Contract: Definition of terms used; Security Deposit; Earnest Money Deposit; General Obligations, Suspension of work; Time limit for completion; Incentives and Compensation; Measurement and payment to contractor; Additions and deviations; Execution of work; Subletting; Breach of contract; Final Payment; Claims; Arbitration.

UNIT-III **[6]**

Contract Documents: Tender notice; Conditions of Contract; Bill of Quantities; Specifications; Drawings.

Contract for Engineering and Architectural Services: Owner's choice; Nature of contract between Owner and Engineer; Liabilities of Engineer and Architect; Specimen Agreement Form.

UNIT-IV **[8]**

Tender: Definition; Types of Tender; Classification of Tender; NIT; Advertisement of Tender; Tender Form; Pre-Qualification of Bidders; Submission of Tender; Opening of Tender; Consideration and Scrutiny of Tender; Acceptance of Tender; Revocation of Tender.

Self-study

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Submission

At the end of the syllabus, students alone or in group must submit power point presentation on the assigned topics.

Reference Books:

1. Civil Engineering Contracts and Estimates by Dr. B. S. Patil
2. Estimation, Costing and Valuation by Rangwala

IH Soni

3. Construction Project Management by K. N. Jha
4. Harris, F., and McCaffer, R., 2005, Modern Construction Management, 5th Edition, Blackwell Publishing.
5. Indian Contract Act (1872)

Subject: **Railway Bridge & Tunnel Engineering**								
Program: **B. Tech. in Civil Engineering**				Subject Code: CV0658			Semester: VI	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
2	1	0	3	24/60	-	16/40	-	100

Course Objectives:

This course will enable students to:

1. The students will gain experience in the implementation of Railway, Bridge and Tunnel Engineering on engineering concepts which are applied in the field of Transportation Engineering.
2. The students will get a diverse knowledge of Railway, Bridge and Tunnel engineering practices applied to real life problems.
3. The students will learn to understand the theoretical and practical aspects of Railway, Bridge and Tunnel engineering along with the design and applications.

Course Outcomes:

After learning the course the students should be able to:

1. Know about railway track components, their materials, size, and function.
2. Carry out geometric design of railway track
3. Know about various components of railway turnout, stations, yards, signaling, interlocking
4. Understand about different types of bridges, their components
5. Explain construction steps of different types of bridges.
6. Understand about importance, types, methods of construction, mucking, ventilation, lining and lighting in Tunnels.

COURSE CONTENTS

UNIT-I: [4 Hours]

Railway Track & its components: Permanent way and its basic requirements, types of gauges, selection of gauges, concept of coning of wheels. Rails, Sleepers, Ballast and its fixtures.

UNIT-II: [10 Hours]

Geometric Design of Track:

Necessity of geometric design, details of geometric design, design of tracks.

Points and Crossings:
Important terms, track layouts and sketches of turnouts, diamond crossing, gauntlet track, gathering line.

UNIT-III: Bridge Engineering [9 Hours]

General:
Site investigation, waterway calculation, scours depth, afflux and economic span.

Classification:
Classification of superstructures with respect to structural behavior and materials used types of substructures, bridge bearings, movable bridges, temporary bridges.

Maintenance:
Testing and strengthening of bridges.

UNIT-IV: Tunnel Engineering [7 Hours]

Necessity/ advantages of tunnels, classification of tunnels, size and shape of tunnels, shafts, methods of tunnelling in hard and soft ground, Lighting and ventilation in tunnels, Dust control, safety measures, economics of tunnelling.

Self-study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Satish Chandra and M.M. Agrawal, Railway Engineering, Oxford University Press, New Delhi
2. S.P. Bindra, Principles and Practice of Bridge Engineering, Dhanpat Rai & Sons, New Delhi
3. S.C. Saxena, Tunnel Engineering, Dhanpat Rai & Sons, New Delhi
4. D.J. Victor, Essential of Bridge Engineering, Oxford & IBH Pub. Co. Ltd. Mumbai

Subject: **Elements of Earthquake Engineering**								
Program: **B.Tech. Civil Engineering**				Subject Code: CV0660			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
02	-	02	03	16/40	16/40	24/60	24/60	200

Course Objectives:

1. To give an experience in the implementation of engineering concepts which are applied in field of structural engineering.
2. To involve the application of scientific and technological principles of planning, analysis and design of buildings according to earthquake design philosophy.

Course Outcomes:

On successful completion of course student will be able to,

1. Determine the response of undamped SDOF systems subjected to vibrations.
2. Illustrate the phenomenon, causes and effects of earthquake.
3. Apply the concept of earthquake resistant design.
4. Construct the detailing drawings of the structural elements such as beam and column to exhibit ductile behaviour under the action of lateral loads.
5. Demonstrate the mode shapes of MDOF system.
6. Appraise the effect of pounding and re-entrant corner.

COURSE CONTENTS

UNIT-I [08 Hours]

Fundamentals of Structural Dynamics: Static load v/s Dynamic load, Simplified Single Degree of Freedom (SDOF) System, Mathematical Modelling of SDOF System, Response of SDOF System to different types of Vibrations like Free and Forced Vibration of Undamped SDOF Systems.

UNIT-II [07 Hours]

Earth Interior, Plate Tectonics, Faults, Seismic Waves, Consequences of Earthquake, Earthquake Parameters, Magnitude & Intensity, Scales, Seismic Zones of India. Earthquake Design Philosophy, Four Virtues of Earthquake Resistant Structure

UNIT-III [08 Hours]

Introduction to IS: 1893, Seismic Methods of Analysis, Seismic Coefficient Method, Base Shear and Lateral Load Distribution along Height. Work Example.

UNIT-IV [07 Hours]

Rigid Diaphragm Effect, Centre of Mass and Centre of Stiffness.

Ductile Detailing of Beam and column as per IS: 13920.

Self-study

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Pankaj Agarwal and Manish Shrikhande, 'Earthquake Resistant Design of Structures', Prentice Hall of India.
2. S.K. Duggal, 'Earthquake Resistant Design of Structures', Oxford University Press.
3. Mario Paz, 'Structural Dynamics – Theory and Computation', Van Nostard Reinhold Company, New York.
4. A.K. Chopra, 'Dynamics of Structures', Pearson Publication.
5. Clough, R. W. & Penzin J., 'Dynamics of Structures', McGraw-Hill Publishing House, New Delhi.
6. John M. Biggs, 'Introduction to Structural Dynamics', McGraw-Hill Publishing House, New Delhi.
7. IITK-BMTPC, Earthquake Tips, 'Learning Earthquake Design and Construction" by C.V.R. Murthy, Building Material and Technology Promotion Council.

Indian Standards:

IS: 1893 PART I – 2016 and IS:13920 – 2016

List of Experiments:

1. Introduction to Structural Dynamics laboratory
2. Spring Mass Model
3. Free vibration of single degree of freedom system
4. Forced vibration of single degree of freedom system
5. To determine mode shapes of a three storied building
6. To understand the response of structure without Shear Wall

7. To understand the response of structure with Shear Wall
8. To understand the response of structure without Bracing Systems
9. To understand the response of structure with Bracing Systems
10. Pounding and Re-entrant corner effect

Subject: **Construction Quality Management**								
Program: **M. Tech. In Civil Engg. (Construction Project Management)**				Subject Code: CV0661			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**University Theory Examination**	**University Practical Examination**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**Total**
3	1	-	4	20/40	-	30/60	-	50/100

Course Outcomes:

1. Will be aware of quality management importance in construction. Also be in form to apply various quality management tools and process in construction project to improvise the quality of structure.
2. Get idea of various standards at national and international level in construction industry.

Course Objectives:

3. To learn Quality management concept and its philosophies.
4. To study quality management through TQM tools
5. To study quality management through Six Sigma tools
6. To study quality control and quality assurance plan
7. To study cost of quality
8. To understand the Quality Management System and its implementation in Construction industry.

COURSE CONTENTS:

UNIT-I **[7]**

Quality Management: Concept; Importance; Quality; Quality History; Quality Inspection; Quality Engineering; Quality Management; Quality Assurance; Quality Control; Quality Control Tools

Quality Management Philosophies: Quality Management Gurus & their Philosophies: Philip B. Crosby; W. Edward Deming – PDCA Cycle, Statistical Process Control, 14 Principles of Transformation, The Seven Point Action Plan; Joseph M. Juran

UNIT-II **[8]**

Evolution of quality: quality inspection, quality control and quality assurance in projects, inspection, quality control (QC) vs quality assurance (QA)

Total Quality Management (TQM): Definition & Concept; changing views of Quality; Principles of TQM – Basic Components

Six Sigma: Introduction, Analytic Tool Sets, DMAIC Process, DMADV Process

UNIT-III **[7]**

Quality Management System (QMS): Introduction; Standards Organizations; International Organization for Standardization (ISO); ISO 9000 Quality Management System;

Quality Cost in Construction: Introduction, Categories of Costs, Reasons for Poor Quality, Quality Cost in Construction, Prevention Costs, Appraisal Costs, Internal Failure Costs, External Failure Costs, Quality Performance Management System, Integrated Quality Management

UNIT-IV **[8]**

A Practical Approach: Quality Assurance Processes/Techniques for Construction Projects: Quality Management Plan; QA/QC Observation & Surveillance; Issuance of Non- Conformance reports; Corrective & Preventive actions; Quality Reports; QA/QC Audit & Reporting; Management Review Committee Meeting

Self-study

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Submission

At the end of the syllabus, students alone or in group must submit power point presentation on the assigned topics.

References Books:

1. Rumane, Abdul R. "*Quality Management in Construction Projects",* CRC Press

2. Juran, J.M., and Godfrey, A.B. (1999). *Juran's Quality Handbook*, Fifth edition, New York: McGraw-Hill.

3. PMBOK Guidelines

4. Thorpe, B., Sumner, P., and Duncan, J. (1996). Quality Assurance in Construction. Surrey, U.K.: Gower Publishing Ltd.

5. Narayan B. ISO 9000 & Quality Movements. A.P.H. Publishing Corporation, New Delhi 110 002

6. Total Quality Management & ISO 9000 Certification in Construction. NICMAR, First Edition, July 1994.

7. Dewar, J.D. & Anderson, R. Manual of Ready Mixed Concrete Blackie & Son Ltd., 1988 Glasgow & London.

Subject: **Prestressed Concrete**								
Program: **B.Tech. Civil Engineering**				Subject Code: CV0666			Semester: **VI**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
02	01	-	03	16/40	-	24/60	-	100

Course Objectives:

1. To learn the concept of prestressing and fundamentals of prestressed concrete structures for analysis and design of various types of structures and structural elements.
2. To understand the application of various Indian Standard codes for design of members subjected to compression, bending, shear, torsion, axial loads and/or flexure.

Course Outcomes:

On successful completion of course student will be able to,

1. Explain the concept of prestressing and various devices use for prestressing of RCC members.
2. Analyze bending moments and stresses; decide cable profile for prestressed members subjected to various types of loading.
3. Estimate short-term and long-term losses in prestress.
4. Determine short-term and long-term deflections of uncracked and cracked prestressed concrete members.
5. Estimate the flexural caapcity of prestressed concrete sections as per Indian Standard Provisions.
6. Design the prestressed RC members for Axial, Shear, Torsion, Compression and bending as per Indian Standard Provisions.

COURSE CONTENTS

UNIT-I [09 Hours]

Basic Concept of Prestressing: Need for High Strength Steel and Concrete, Advantages of Prestressed Concrete, Applications of Prestressed Concrete. Materials for Prestressed Concrete: High-Strength Concrete, High-Tensile Steel.

Introduction to Prestressing Systems: Tensioning Devices, Pretensioning Systems, Post-Tensioning Systems, Thermo-Electric Prestressing, Chemical Prestressing.

Analysis of Prestress and Bending Stresses: Basic Assumptions, Analysis of Prestress, Resultant Stresses at a Section, Pressure Line or Thrust Line and Internal Resisting Couple, Concept of Load Balancing, Stresses in Tendons, Cracking Moment.

UNIT-II [05 Hours]

Losses of Prestress: Loss Due to Elastic Deformation of Concrete, Loss Due to Shrinkage of Concrete, Loss Due to Creep of Concrete, Loss Due to Relaxation of Stress in Steel, Loss Due to Anchorage Sleep, Loss of Stress Due to Friction, Total Losses Allowed for Design.

UNIT-III [07 Hours]

Deflection of Prestress Concrete Members: Factors Influencing Deflections, Short Term Deflections of Uncracked Members, Effect of Tendon Profile on Deflections, Deflections Due to Self-Weight and Imposed Loads, Prediction of Long Time Deflections, Deflection of Cracked Members, Requirements of various codes of practice.

Flexural Strength of Prestressed Concrete Sections: Simplified Code Procedures (IS: 1343), Shear and Principal Stresses, Ultimate Shear Resistance of Prestress Concrete Members, Design of Shear Reinforcement as per IS: 1343.

UNIT-IV [09 Hours]

Philosophy of Limit-State Design: Limit State Design Criteria for Prestressed Concrete Members, Design Loads and Strengths, Partial Factors for Loads.

Design of Prestressed Concrete Sections: Design of Section for Flexure, Design of Section for Axial Tension, Design of Section for Compression and Bending, Design of Section for Shear and Torsion.

Self-study

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. N. Krishna Raju, 'Prestressed Concrete', Tata Mc Graw Hill Publishing Co. Ltd, New Dehi.
2. S K Mallick, A P Gupta, 'Prestressed Concrete', Oxford and IBI Series.
3. R. H. Evans, Bennet E W, 'Prestressed Concrete Theory and Design', Chapman and Hall, London.
4. T. Y. Lin, 'Design of Prestressed Concrete Structures', Asia Publishing House.
5. Praveen Nagarajan, 'Prestressed Concrete Design', Pearson Publication.

6. Rajgopalan, N., ‘Prestressed Concrete’, Narosa Publishing House.
7. Nilson, A. H., ‘Design of Prestressed Concrete’, John Wiley and Sons.

Indian Standards:

IS: 1343

Subject: Dynamics of Soil and Foundation								
Program: **B. Tech. in Civil Engineering**				Subject Code: CV0669			Semester: **VII**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
2	1	-	3	24/60	-	16/40	-	100

Course Objectives:

1. To understand the impact of dynamic loading on soil and various control measures to reduce the transmissions caused by it.
2. To understand the concepts of machine foundations.

Course Outcomes:

On successful completion of course student will be able,

1. To understand the nature of dynamic loads on soil.
2. To discuss different laboratory and field test to determine dynamic soil constants.
3. To classify various machine foundations and their design considerations.
4. To suggest various control measures to reduce the effect of transmission of vibrations to soil.
5. To study different design criteria for foundation
6. To study dynamic properties of soil.

COURSE CONTENTS

UNIT-I:[08Hours]

Introduction - Nature of dynamic loads - free vibrations of spring - mass systems - forced vibrations - viscous damping - principles of vibrations measuring equipments.

Dynamic soil properties - Laboratory and field testing techniques, Selection of design values. Liquefaction of soils: An introduction and evaluation using simple methods.

UNIT-II:[07Hours]

Dynamic stress - Deformation and strength of soils - Dynamics bearing capacity and earth pressure - Effect of transient and pulsating loads - Field-test- Typical values of soil constants.

UNIT-III:[08Hours]

Necessity, M/C foundation and its types, Basic Terminology connected with vibrating system and Foundation ,General Criteria for design of Foundation, Use of Mass spring Analogy to Machine Foundation ,Determination of natural frequency of Foundation soil system, Design criteria for Reciprocating and Impact Machine as per I.S code. Vibration Isolation and control, Numerical.

UNIT-IV:[07 Hours]

Vibration Isolation - Passive and active isolation - use of springs and damping materials construction aspects of machine foundations.

Dynamic stiffness and damping constants of single pile and pile group-Analysis for vertical, lateral, rocking modes of vibration. Vibration absorption and isolation techniques

Self-study:
The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. KameswaraRao, N.S.V., Dynamics soil tests and applications, Wheeler Publishing - New Delhi, 2000.
2. Prakash, S and Puri, V.K., Foundations for machines, McGraw Hill, 1987.
3. Moore, P.J., Analysis and Design of Foundations for Vibrations, Oxford and IBH, 1985.
4. Major, A., Vibration Analysis and Design of Foundations for Machines and Turbines, Vol. I, II and III Budapest, 1964.
5. Swami Saran, Soil Dynamics and Machine Foundation, Galgotia publications Pvt. Ltd., New Delhi 1999.
6. Das B.M., Principles of Soils Dynamics, McGraw Hill, 1992.
7. Kameswara Rao, "Vibration Analysis and Foundation Dynamics", wheeler Publishing, New Delhi, 1998.

Subject: **Basics of Civil Engineering**								
Program: **B.Tech. offered by Civil Dept.**				Subject Code: CV0152			Semester: **I**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
02	01	-	03	24/60	-	16/40	-	100

Course Objectives:

- To learn the basics of the civil engineering branch universally applicable to all.
- To understand building planning and construction.

Course Outcomes:

On successful completion of course student will be able to,

1. Understand various disciplines of Civil Engineering.
2. Understand properties and applications of various building materials.
3. Apply basic principles of building and town planning.
4. Understand various symbols being used in building services and their use.
5. Explain fundamental principles of surveying.
6. Appraise the possible advances and entrepreneurial opportunities in civil engineering.

COURSE CONTENTS

UNIT-I: [07 Hours]

Introduction to Civil Engineering: Branches of civil engineering, Scope of civil Engineering, Role of Civil engineer in society, Basic introduction to engineering structures (Bridges, Dams, railways, pavement etc.) Impact of infrastructural development on the economy of a country. Units of measurement, Unit conversion (Length, Area, Volume), Different Building Materials (Types, Characteristics and uses).

UNIT-II: [08 Hours]

Introduction to Building and Town Planning: Definition and concept of plan of a simple residential building, Principles of planning, Elementary principles and basic requirements for building planning. Principles of town planning, Necessity of town planning, Origin of town, Growth of town, Land use, Principles and objects of zoning, Advantages of zoning, Low-cost housing, Prevention of slum, FSI.

UNIT-III: [08 Hours]

Building Construction and Services: Types of building, Components of building & its functions, types of loads acting on building, Types of brick bonds, Typical building layout, Symbols used in electrical layout, Symbols used for water supply, plumbing and sanitation. Nominal dimensions for door, window and furniture. Building Services: Types of building services like plumbing & sanitation, water supply & drainage system, electricity, building finishes, HVAC.

UNIT-IV: [07 Hours]

Introduction to Surveying: Introduction, Fundamental principles, Classification. Linear and Angular measurement, Instruments used in Surveying.

Advancements in Civil Engineering: Smart city and its features, Solid waste management systems, Mass Transportation systems-BRTS, Metro, Rainwater harvesting systems, Watershed Management, Green building, Energy efficient building, Development of River fronts, Heritage structures & its conservations, Features of Earthquake resistant structures.

Self-study

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Jain, R. K., and Lodha, "Elements of Civil Engineering", McGraw Hill Publishing.
2. M. N. Shesha Prakash and Ganesh B. Mogaveer, "Elements of Civil Engineering and Engineering Mechanics", PHI Learning Pvt. Ltd.
3. Rangwala, S. C., "Building Construction", Charotar Publishing House.
4. Birdie, G. S. and Ahuja, T. D., "Building Construction and Construction Material", Dhanpat Rai Publication.
5. Shah, M. G., Kale C. M. and Patki, S. Y., "Building drawing", Tata McGraw Hill Publishing.
6. Basak, N. N., "Surveying and Levelling", Tata McGraw Hill Publishing.
7. Subramanian, R., "Surveying and Levelling", Oxford University Press.

Subject: **Engineering Materials for Sustainability**								
Program: **B.Tech. offered by Civil Dept.**				Subject Code: CV0252			Semester: **I**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
3	0	0	3	24/60	-	16/40	-	100

Course objectives:

- To learn the basics of carbon cycle, ecological footprints and alternative cementitious materials.
- To learn the Sustainability issues for concrete, recycled aggregate, operational energy in building role of materials and thermal conductivity.
- To study the basics of radiation budget, urban heat island.

Course Outcomes:

On successful completion of course student will be able,

1. Explains the ecological footprint, bio-capacity and calculation of planet equivalent.
2. Describes the carbon cycle and balance of carbon in the environment.
3. Identifies the alternative materials for sustainability.
4. Design of buildings for energy efficiency.
5. Shows the concept of the different renewable energy for building.
6. Suggest materials and technologies to improve energy efficiency of building which enhance the skill set.

COURSE CONTENTS

UNIT-I: [09 Hours]

Introduction, Embodied energy, Operational energy in Building and Life cycle energy. Ecological footprint, Bio-capacity and calculation of planet equivalent, Role of Material: Carbon from Cement, alternative cements and cementitious material, Alternative fuel for cements for reduction in carbon emission.

UNIT-II: [12 Hours]

Sustainability issues for concrete, Role of quality, minimization of natural resource utilization, High volume fly ash concrete, geo-polymer concrete etc. concrete with alternative material for sustainability, Reduction in water consumption in concrete, Recycled aggregate, Energy for grinding crushing of cement aggregate etc. and reduction. Operational energy in building role of materials and thermal conductivity.

UNIT-II: [12 Hours]

Clay Bricks, Types kilns, Comparative energy performance emission performance and financial performance, Indoor air quality, Paints, adhesive and sealants for use in building, volatile organic content (VOC) emission issues and indoor air quality for sustainability and health hazard, Operational energy reduction and net zero building, Optimization for design of building for energy efficiency and example of optimization through use of Evolutionary genetic algorithm.

UNIT-IV: [12 Hours]

Radiation budget, urban heat island; Surface water balance, Effects of trees and microclimatic modification through greening, Use of Building Integrated PhotoVoltaic (BIPV) and other renewable energy in buildings, basic concepts and efficiency, Energy codes ECBC requirement, Green Performance rating, requirements of LEED, GRIHA etc.

Self-study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Annie R. Pearce, Young Han Ahn, and Hanmi Global, "Sustainable Buildings and Infrastructure" ISBN: 978-0-415-69092-8
2. P.C. Aitcin, "Binders for Durable and Sustainable Concrete.

Subject: **Smart City Planning**								
Program: **B.Tech. offered by Civil Dept.**				Subject Code: CV0253			Semester: **I**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
2	1	0	3	24/60	-	16/40	-	100

Course Objectives:

- Students will learn about smart solutions adopted in the concept of smart city.
- Students will understand the various key aspects of smart city planning adopted across the globe.

Course Outcome:

On successful completion of course student will be able,

1. Evaluate the existing policy on Smart city development for India**.**
2. Explain and have clear ideas about smart city planning concept and strategy.
3. Adapt the smart city readiness guideline during their professional carriers.
4. Analyse the effects of smart technology adopted in various engineering fields.
5. Build a guideline for sustainable urban development which improves cities liveability.
6. Examine the effects of adoption of smart mobility technology in urban areas.

COURSE CONTENTS

Unit 1: [07 hours]

Smart city Introduction; Objectives; Strategies; Fundamentals; Focus Areas; Smart Solutions; Smart indicators, Smart city Concept priorities for India.

Unit 2: [08 hours]

Smart Mobility: PT, IPT, Parking, Traffic, Shared mobility, Best Practices in the world

Smart Water: Conservation, Smart Use of water, Best Practices in the world

Unit 3: [07 hours]

Smart Governance: Centralized data management system, Online portals, Online public services, Health care, Best Practices in the world Smart Payments, Public Safety.

Smart Urban Development: Smart buildings, green buildings, use of eco-friendly material, Smart housing, Best Practices in the world.

Unit 4: [08 hours]

Smart Energy: electricity, energy efficient appliances, E-mobility, autonomous vehicles, Best Practices in the world, Smart Telecommunication.

Smart Waste management: Recycle, Reuse technology, Best Practices in the world

References Books:

1. Smart and Sustainable Cities of the Future, Deloitte. (https://www2.deloitte.com/content/dam/Deloitte/in/Documents/public-sector/in-gps-CII-SmartCity_SustainableSmartCities.pdf)
2. Smart cities readiness guide, by Smart Cities Council. (http://www.estudislocals.cat/wp-content/uploads/2016/11/SmartCitiesReadinessGuide.pdf).

Subject: **Metro Systems and Engineering**								
Program: **B.Tech. offered by Civil Dept.**				Subject Code: CV0456			Semester: **IV**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
3	-	-	3	24/60	-	16/40	-	100

Course Objectives:

- Understand concept of Metro systems and also to get the knowledge with respect to construction, maintenance, rolling stock, signal system

Course Outcomes:

On successful completion of course student will be able,

1. Understand the importance of the metro system, method of construction of various facilities.
2. Describe traffic integration & multi modal transport system
3. Gain knowledge of signal system and control system
4. Understand rolling stock and necessity ventilation in tunnels
5. Understands Over Head Equipment(OHE), traction and power substations
6. Gain knowledge about the green building concept for metro stations.

Course Content:

UNIT-I: [15 hours]

General: Overview of Metro Systems; Need for Metros; Routing studies; Basic Planning and Financials.

Civil Engineering-Overview and construction methods for: Elevated and underground Stations; Viaduct spans and bridges; Underground tunnels; Depots; Commercial and Service buildings. Initial Surveys & Investigations; Basics of Construction Planning & Management, Construction Quality & Safety Systems. Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safeguards; Track systems-permanent way. Facilities Management.

UNIT-II: [10 hours]

Electronics and communication engineering- Signalling systems; Automatic fare collection; Operation Control Centre and other control systems; Platform Screen & Doors.

UNIT-III: [10 hours]

Mechanical: Rolling stock, Tunnel Ventilation systems; Air conditioning for stations and buildings; Fire control systems; Lifts and Escalators

UNIT-IV: [10 hours]

Electrical: OHE, Traction Power; Substations- TSS and ASS; Green buildings, Carbon credit

Self-study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Jesse Russell, Ronald Cohn, "List of Metro Systems" Book on Demand Ltd.
2. Alexandros Stavdas, "Core And Metro Networks" Wiley
3. Hiu-Wah Eva Yung, "The Planning and Development of a New Metro System: The Case of the Dubai Metro" Open Dissertation Press

Subject: **Disaster Management**								
Program: **B.Tech. offered by Civil Dept.**				Subject Code: CV0457			Semester: **V**	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
3	-	-	3	24/60	-	16/40	-	100

Course Objectives:

- To understand the impact of disaster on the environment and its remedial measures.

Course Outcomes:

On successful completion of course student will be able,

1. Discuss the basic terminologies related to natural disaster and man made disaster.
2. Evaluate the correlation of hazard and vulnerability profile.
3. Analyse Disaster impact and its mitigation aspects.
4. List and describe the role of government, Ngo and different authorities.
5. To prepare RS and GIS application usage in terms of disaster management.
6. Use disaster management acts and guidelines along with the role of various stack- holders during disasters.

Course Contents

UNIT-I [10 hours]

Introduction, Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation.

Disasters classification: Natural disasters (floods, drought, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); man made disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT-II [10 hours]

Disaster Impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate-change and urban disasters. Disaster Risk Reduction.

UNIT-III [10 hours]

Disaster management cycle phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems; Post-disaster environmental response (water, sanitation, food safety, waste management, disease control).

Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National DisasterManagementAuthority.

UNIT-IV [15 hours]

Applications of Science and Technology for Disaster Management and Mitigation Geo-informatics in Disaster Management (RS, GIS and GPS), Disaster Communication System (Early Warning and Its Dissemination).

Suggested Case Studies:

Bhopal Gas Tragedy, Tusmani in Coastal South India, Avalanche in J & K, Landslides in Uttrakhand, Floods in various Indian States, Earthquakes: Gujarat, Jammu & Kashmir, Maharashtra, Serial Bomb blasts, Terrorists attacks in Mumbai/University in Lahore/ Plane Hijacking, Communal Riots and Racist Violence, Stampedes at public places.

Reference Books:

1. Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
2. Singh B. K., 2008, Handbook of Disaster Management: techniques and guidelines, Rajat Publications
3. Ghosh G.K., 2006, Disaster management, APH Publishing Corporation

Subject: **Green Building**								
Program: **B. Tech. Civil Engineering**				Subject Code: CV0562			Semester: VI	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
03	-	-	03	24/60	-	16/40	-	100

Course Objectives:

- To learn the basics of green design and sustainable development practice to enhance the built environment.
- To learn institutional guidelines for development and certification of green designs.

Course Outcomes:

On successful completion of course student will be able,

1. To understand green building and sustainable construction practices.
2. To identify green project requirements and plan strategies accordingly.
3. To analyse various green construction materials.
4. To develop design concepts for achieving green building by indoor environment quality and energy efficiency.
5. To understand green building rating systems.
6. To design green buildings by implementing rating systems and green design criteria.

COURSE CONTENTS

UNIT-I: [12 hours]

Green Building & Sustainable Development Concept: Overview of green building movement; Concept of Green building and sustainable development; Issues and strategies of Green building and sustainable development; Objectives; Principals and Benefits of Green building design; Introduction to High performance building; Integrated design process of high-performance building; Green project requirements and strategies.

UNIT-II: [10 hours]

Green Building Materials and Indoor Environment Quality: Introduction; Low emitting materials; Building and material reuse; Construction waste management; Regional materials; Life cycle cost assessment of building materials and products; Factors affecting indoor environment quality; Ventilation and filtration; Building materials and finishes: Emittance level.

UNIT-III: [13 hours]

Water and Energy efficiency designs: Introduction; Wastewater strategy and water reuse/recycling; Water fixtures and water use reduction strategies; Impact of energy and atmosphere – introduction; A building envelop; Intelligent energy management system; Mechanical system: Air conditioning, Heating and ventilation; Electric power and lighting system; Solar energy system.

UNIT-IV: [10 hours]

IGBC Guidelines: Introduction; IGBC green new building Rating system – Overview and process – project checklist; Sustainable architecture and design; Site selection and planning; Water conservation & energy efficiency; Building materials and resources; Indoor Environment quality; Innovation and development.

Reference books:

1. Kubba Sam "Green Construction Project Management and Cost Oversight", Elsevier Architecture press.
2. IGBC Green New building rating system (Version 3.0), March 2015.
3. Green building: principles and practice in residential construction by Abe Kruger and Carl Seville, Cengage Learning.
4. IGBC Green New building rating system (Version 3.0), March 2015.
5. GRIHA User Manual.

Subject: **Hazardous and Solid Waste Management**								
Program: **B. Tech. Civil Engineering**				Subject Code: CV0671			Semester: VI	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
02	01	-	03	24/60	-	16/40	-	100

Course Objectives:

- Define the terms and Understands the necessity of solid waste management. Explain the strategies for the collection of solid waste. Describe the solid waste disposal methods. Categorize Hazardous Waste.

Course Outcomes:

On successful completion of course student will be able to,

1. Identify the physical and chemical composition of solid wastes
2. Analyze the functional elements for solid waste management.
3. Classify the techniques and methods used in transformation, conservation, and recovery of materials from solid wastes.
4. Design waste disposal systems.
5. Understand the types and severity of hazardous waste,
6. Characterize and suggest treatment and disposal methods.

COURSE CONTENTS

UNIT-I: [07 hours]

Introduction, Sources of solid waste, Types of solid waste, Composition of solid waste and its determination, solid waste management: an overview.

UNIT-II: [08 hours]

Properties of Municipal Solid Waste, Solid waste generation; on-site handling, storage and processing; collection of solid wastes; transfer and transport; processing techniques; ultimate disposal. Solid Waste Management Rules 2016.

UNIT-III: [07 hours]

Engineering Systems For Resource And Energy Recovery Processing techniques; materials-recovery systems; recovery of biological conversion products; recovery of thermal conversion products; recovery of energy from conversion products; materials and energy recovery systems.

UNIT-IV: [08 hours]

Hazardous Waste Management Introduction; Concern about Hazardous Waste Management; Characteristics of Hazardous Waste; Transportation and Disposal of Hazardous Waste; Control of Hazardous Waste: Disposal of hazardous wastes. Biomedical waste disposal, E-waste management, Industrial waste Management.

Self-study

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. Integrated solid waste management, George Tchobanoglous and Hillary theisen, Samuel Vigil, McGraw Hill
2. Disposal and recovery of municipal solid waste, Michael E Henstock Butterworths, Ann Arbor Science
3. Solid waste management, P Aarne Vesilig
4. Environmental Engineering, Mackenzie L Davis, David A Cornwell
5. Wentz Charles A. Hazardous waste management, McGrow Hill international edition.

Subject: **Public Transportation Systems**								
Program: **B. Tech. Civil Engineering**				Subject Code: CV0772			Semester: VII	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
02	01	-	03	24/60	-	16/40	-	100

Course Objectives:

- To understand the problems based on routing, scheduling.
- To understand the problems based on fare structure, transit system statistics

Course Outcomes:

On successful completion of course student will be able to,

1. Explain public transportation systems, their operation, planning and economics.
2. Understand the problems of transit routing, scheduling, infrastructure facilities, fare structures and management.
3. How to conduct planning for different transport systems.
4. Explain various public transportation system and their characteristics as well as suitability.
5. Analyses the feasibility and cost benefit analysis for transport systems.
6. Understand the importance of integration of pedestrian & NMT facilities with PTS in urban areas.

Course Content

UNIT-I: [07 hours]

Development of Public Transit System:

History of Transportation, Importance of Transportation, Classification of Transportation, Urban Transportation, Regional transportation, Public Transportation Planning, Barriers for adoption, Motivating factors.

UNIT-II: [08 hours]

Public Transportation – Bus Transport: Bus Transport Characteristics, Types of Buses, Bus Stops, Bus Stop Shelters, Bus Transit Management, Estimation of the Required Fleet Strength,

Bus Route Planning, Expansion, Performance Indicators, Time Table, Bus Schedule and Crew Schedule.

Non-Motorized Urban Transportation: Role of Non-Motorized Modes of Travel, Importance of Pedestrian Facilities, Planning for Pedestrian Movement, Sidewalks, Pedestrian Crossings, Bicycle Facility Planning, Planning Considerations for Bicycle Transport, Types of Bicycle Facilities, Bicycle Network Planning, Bicycle Parking, Cycle Rickshaws, Pedestrian Malls and People Mover Systems. Guidelines for NMT facilities.

UNIT-III: [08 hours]

Shared Mobility: Introduction on shared mobility, Planning of Shared mobility; Planning of E-mobility;

Innovations in Urban Transportation: Need for Innovative Approaches, Classification of Urban Transportation Innovations, Track Guided Bus, Bus Rapid Transit (BRT), Bus Route Rationalization, Linear Induction Motor Technology, Magnetic Levitation (MAGLEV) Vehicles, Geographic Information System (GIS), Intelligent Transportation System (ITS), Autonomous Vehicles; High speed rail network.

UNIT-IV: [07 hours]

Public Transportation Economics: Need for economic analysis, Cost Benefit Analysis, Methods of economic evaluation, Benefit cost ration method, Rate of return method, Net present value method, internal rate of return method, numerical.

Self-study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. D. Johnson Victor & S. Ponnuswamy, Urban Transportation, Planning, Operation and Management, Tata McGraw Hill Education Private Limited.
2. Kadiyali L.R., Traffic Engineering and Transport Planning, Khanna Publishers
3. Vukan R. Vuchic, Urban Transit: Operations, Planning and Economics, Wiley Sons Publishers.
4. Peter White, Public Transport, UCL Press
5. Dr. G. J. Joshi, Transportation Planning: Principles, Practices and Policies.
6. Khisty, C J., Transportation Engineering – An Introduction, Prentice-Hall, NJ.

Subject: **Remote Sensing & Geographical Information System**								
Program: **B. Tech. Civil Engineering**				Subject Code: CV0773			Semester: VII	
Teaching Scheme				**Examination Evaluation Scheme**				
Lecture	**Tutorial**	**Practical**	**Credits**	**Continuous Internal Evaluation (CIE)- Theory**	**Continuous Internal Evaluation (CIE)- Practical**	**University Theory Examination**	**University Practical Examination**	**Total**
02	01	-	03	24/60	-	16/40	-	100

Course Objectives:

- To introduce the basic concept of remote sensing, Geographical Information System and its applications.
- To develop modern trends of GIS in various natural resources and engineering applications.

Course Outcomes:

On successful completion of course student will be able to,

1. Understand remote sensing & its applications.
2. Explain EMR & use of EMR in remote sensing.
3. Explain the effect of EMR on different mediums & its interaction.
4. Describe different platforms for remote sensing.
5. List out the applications of GIS.
6. Compare vector data with raster data

Course Contents

UNIT-I [06 hours]

Remote Sensing Process:

Introduction to Remote Sensing, data acquisition and processing, sensor systems, applications, Electromagnetic Radiation (EMR) and its characteristics, Radiation principles, Planck's Law, Stefan's law, properties of solar radiant energy, atmospheric windows.

UNIT-II [07 hours]

Physical Basis of Remote Sensing:

Interaction in the atmosphere, nature of atmospheric interaction, atmospheric effects of visible, near infrared thermal microwave wavelength, interaction at ground surface and, interaction with soils and rocks, effects of soil moisture, organic matter, particles, size and texture,

IH Soni

interaction with vegetation, spectral characteristics of individual leaf, vegetation canopies, effect of leaf pigments, cell structure, radiation geometry.

UNIT-III [09 hours]

Platform and Sensors:

Multi concept in remote sensing, general requirements of a platform, balloon aircraft, satellite platforms sun synchronous orbits, sensors for visible near infrared wavelengths, profilers, images, scanners, radiometers, optical mechanical and push button scanners, spectral, spatial, radiometric and temporal resolution, IFOV, FOV, geometric characteristics of scanners, V/H ratio, comparison of satellite/ aerial platforms and sensors and remote sensing data products, landsat and TM, SPOT, IRS, ERS; applications in mining.

Visual & Digital Image Processing:

Remote Sensing Data Products, Elements of visual Image Interpretations, Generation of Thematic Maps, Digital Image Processing System, Image Enhancement, Image Transformation, Image Classification

UNIT-IV [08 hours]

Geographical Information System:

Difference between image processing system geographical system (GIS), utility of GIS, various GIS packages and their salient features, essential components of a GIS, scanners and digitizers, raster and vector data, storage. hierarchical data, network systems, relational database, data management, conventional database management systems, spatial database management, data manipulation and analysis, reclassification and aggregation, geometric and spatial operation on data management and statistical modeling, Applications and Modern Trends of GIS in various natural resources and mining applications

Self-Study:

The self-study components will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Reference Books:

1. P.J. Curren – Principles of Remote Sensing
2. R. C. Gonzalez, R. E. Woods, Digital Image Processing
3. B. Bhatta – Remote Sensing and GIS
4. T.M. Lillensand and R.W. Keifer – Remote Sensing and Image Interpretation.