BMS COLLEGE OF ENGINEERING, DEPARTMENT OF CIVIL ENGINEERING

Semester: III (Admission year: 2014 onwards)

Code	Course Title	Teaching Department	Credits				Total Credits	Contact Hours
			L	T	P	S		
15MA3GCMAT	Engineering Maths –III (BS)	MATHS	3	-	-	-	3	3
15CV3DCBMC	Building Materials & Construction (ES)	CIVIL	3	-	-	-	3	3
15CV3DCGEO	Engineering Geology (BS)	CIVIL	2	-	1	2	5	4
15CV3DCBSY	Basic Surveying (ES)	CIVIL	2	-	1	2	5	4
15CV3DCMOF	Mechanics of Fluids (ES)	CIVIL	3	1	-	-	4	5
15CV3DCSOM	Strength of Materials (ES)	CIVIL	3	1	1	-	5	7
			Total Credits				25	26

S-Self Study L- Lecture Hours/Week, T- Tutorial -2Hour/week, P- Practical- 2 Hours/week.

BMS COLLEGE OF ENGINEERING, DEPARTMENT OF CIVIL ENGINEERING

Semester: IV (Admission year: 2014 onwards)

Code	Course Title	Teaching Department	Credits				Total Credits	Contact Hours
			L	T	P	S		
15MA4GCMAT	Maths (BS)	MATHS	3		-	-	3	3
15CV4DCSTA	Structural Analysis (ES)	CIVIL	3	1	-	-	4	5
15CV4DCCON	Concrete Technology (ES)	CIVIL	2	-	1	2	5	4
15CV4DCASY	Advanced Surveying (ES)	CIVIL	2	-	1	-	3	4
15CV4DCSME	Soil Mechanics (ES)	CIVIL	2	1	-	-	3	4
15CV4DCHYM	Hydraulics & Hydraulic Machines (ES)	CIVIL	2	-	1	-	3	4
15CV4DCBPD	Building Planning & Drawing (ES)	CIVIL	1	-	1	2	4	4
			Total Credits				25	28

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V SEMESTER B.E

Course Code	Course Title	Teaching Department	Credits				Credits	Contact Hours/ week	CIE marks	SEE marks	TOTAL MARKS
			L	T	P	S					
16CV5DCISA	Indeterminate Structural Analysis (core)	CIVIL	3	1	-	-	4	5	50	50	100
16CV5DCWSE	Water Supply Engineering(core)	CIVIL	1	1	-	-	2	3	50	50	100
16CV5DCFEN	Foundation Engineering (core)	CIVIL	3	-	1	2	6	5	50	50	100
16CV5DCHEN	Highway Engineering (core)	CIVIL	3	-	1	2	6	5	50	50	100
16CV5DCHWR	Hydrology &Water Resources (core)	CIVIL	3	-	-		3	3	50	50	100
16CV5DCCDL	Cad Lab (core)	CIVIL	-	-	1	-	1	2	50	50	100
16CV6DE---	Department Elective DEC- 1	CIVIL	3	-	-	-	3	3	50	50	100
			Total				**25**	**26**			**700**

L- Lecture Hours/Week, T- Tutorial -2Hours/week, P- Practical- 2 Hours/week. S-Self Study

BMS COLLEGE OF ENGINEERING, DEPARTMENT OF CIVIL ENGINEERING

VI SEMESTER B.E

Code	Course Title	Teaching Department	Credits				Credits	Contact Hours/ Week	**CIE marks**	**SEE marks**	**TOTAL MARKS**
			L	T	P	S					
16CV6DCDSS	Design Of Steel Structures	CIVIL	3	1			**4**	5	50	50	100
16CV6DCDRC	Design of RC Structures	CIVIL	3	1		-	**4**	5	50	50	100
16CV6DCWWT	Waste water Treatment	CIVIL	2	-	1	2	**5**	4	50	50	100
16CV6DCESP	Extensive survey project	CIVIL	1	-	1	2	**4**	3	50	50	100
16CV6DCSWL	Software Applications lab	CIVIL	1	-	1	-	**2**	3	50	50	100
16CV6DE---	DEC-2	CIVIL	3	-	-	-	**3**	3	50	50	100
16CV6DE---	DEC-3	CIVIL	3	-	-	-	**3**	3	50	50	100
						Total	**25**	**26**			**700**

L- Lecture Hours/Week, T- Tutorial -2Hours/week, P- Practical- 2 Hours/week. S-Self Study

BMS COLLEGE OF ENGINEERING, DEPARTMENT OF CIVIL ENGINEERING

Department Electives

	Course Code	Course Title	Teaching Department	CREDITS				Contact Hours/ week	CIE marks	SEE marks	Total marks
				L	T	P	Total				
DEC-2	**16CV6DETOE**	Theory of elasticity	CIVIL	3	-	-	**3**	3	50	50	100
	16CV6DEGIT	Ground Improvement Technique	CIVIL	3	-	-	**3**	3	50	50	100
	16CV6DESWM	Solid Waste Management	CIVIL	3	-	-	**3**	3	50	50	100
	16CV6DEPMC	Pavement Materials & Construction	CIVIL	3	-	-	**3**	3	50	50	100
DEC-3	**16CV6DEIHS**	Irrigation and hydraulic structures	CIVIL	3	-	-		3	50	50	100
	16CV6DEERS	Earth Retaining Structures	CIVIL	3	-	-	**3**	3	50	50	100
	16CV6DESMA	Structural Masonry	CIVIL	3	-	-	**3**	3	50	50	100
	16CV6DEPAD	Pavement Design	CIVIL	3	-	-	3	3	50	50	100

BMS COLLEGE OF ENGINEERING, DEPARTMENT OF CIVIL ENGINEERING

(Admission year 2014 onwards) **VII SEMESTER B.E**

Course Code	Course Title	Teaching Department	Credits				Total Credits	Contact Hours	MARKS			SEE DURATION Hours
			L	T	P	S			CIE	SEE	TOTAL	
16CV7IE---	IEC-1	-------	3	-	-	-	**3**	3	50	50	100	3
16CV7DCDDG	Design & Drawing of RCC & Steel Structures	CIVIL	3	0	1		**4**	5	50	50	100	**4**
16CV7DCPSC	Analysis and Design of Pre-stressed concrete members	CIVIL	4	0	-		**4**	4	50	50	100	3
16CV7DCQSC	Quantity Surveying & Costing	CIVIL	3	1	-	2	**6**	5	50	50	100	**4**
16CV7DCTRS	Transportation Systems	CIVIL	3	0	-	-	**3**	3	50	50	100	3
16CV7DE----	DEC-4	CIVIL	3	-	-	-	**3**	3	50	50	100	3
16CV7DCMAP	Major Project (Phase-1)	CIVIL			-	-	**2**	-	50	50	100	
			Total Credits				**25**	**23**			**700**	

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VII SEMESTER

INSTITUTIONAL ELECTIVE- IEC-1

Subject Code	Course Title	Teaching Department	Credits			Total Credits	Contact Hours
			L	T	P		
16CV7IERSG	Remote Sensing & Geographical Information System	CIVIL	3	-	-	3	3
16CV7IEFEA	Finite Element Method of Analysis	CIVIL	3	-	-	3	3

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(Admission year 2014 onwards)

VII SEMESTER-DEPARTMENT ELECTIVES

Course Code	Course Title	Teaching Department	Credits			Total Credits	Contact Hours	Marks		
			L	T	P			CIE	SEE	Total
16CV7DEADR	Advanced Design of RC Structures	CIVIL	3	-	-	**3**	3	50	50	100
16CV7DEAFD	Advanced Foundation Design	CIVIL	3	-	-	3	3	50	50	100
16CV7DEGDR	Geometric Design of Roads	CIVIL	3	-	-	3	3	50	50	100
16CV7DEGHY	Ground Water Hydrology	CIVIL	3	-	-	3	3	50	50	100
16CV7DEIWW	Industrial Waste Water Treatment	CIVIL	3	-	-	3	3	50	50	100
16CV7DEDDB	Design and drawing of Bridges and Irrigation Structures	CIVIL	2	-	1	3	4	50	50	100
16 CV7DESDY	Structural Dynamics	CIVIL	2	1	-	**3**	3	50	50	100

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(Admission year 2014 onwards)

VIII SEMESTER B.E

Subject Code	Course Title	Teaching Department	Credits				Total Credits	Contact Hours	Marks			
			L	T	P	S			CIE	SEE	MARKS	SEE DURATION HRS
16CV8IE---	IEC-2	-	3	-	-		**3**	3	50	50	100	3
16CV8 HS CMF	Construction Project management, finance and professional ethics (HSS CORE)	CIVIL	2	-	-	1	**3**	2	50	50	100	3
16CV8DE---	Dept. Elective - 5 (DEC-5)	CIVIL	3	-	-		**3**	3	50	50	100	3
16HS 8 DE ---	HSS ELECTIVE	-	2	-	-	1	**3**	2	50	50	100	3
16CV8DCMAP	Major Project (Phase-2)	CIVIL					**11**	-	100	100	200	-
***16CV8DCITP**	Internship/Industrial Training	CIVIL	-	-	-		**2**	-	50	50	100	-
			Total Credits				**25**	**10**			**700**	

BMS COLLEGE OF ENGINEERING, DEPARTMENT OF CIVIL ENGINEERING

VIII SEMESTER-INSTITUTIONAL ELECTIVE

Subject Code	Course Title	Teaching Department	Hrs/week			Total Credits	Contact Hours
			L	T	P		
16CV8IEOSH	Occupational Safety and Health Administration	CIVIL	3	-	-	3	3

NOTE:

16CV8DMITP – Mandatory Course of Industrial training internship (to be completed either during the vacation of 6^{th}& 7^{th} semester or 7^{th}& 8^{th} Semester for a minimum period of 4 weeks. Students shall apply reasoning based on the solutions provided in the civil Engg construction projects and assess issues related to societal, health, safety, legal and cultural issues as applied to civil engineering practice.

16CV8DEINS: Independent study for one or two credits can be offered additionally to those students who fall short of minimum 200 credits.

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(Admission year 2014 onwards) **VIII SEMESTER B.E -DEPARTMENT ELECTIVE**

Subject Code	Course Title	Teaching Department	Credits			Total Credits	Contact Hours
			L	T	P		
16CV8DEERD	Earthquake Resistant Design of Structures	CIVIL	3	-	-	3	3
16CV8DEEIA	Environmental Impact Assessment	CIVIL	3	-	-	3	3
16CV8DEGEE	Geotechnical Earthquake Engineering	CIVIL	3	-	-	3	3
16CV8DEIWM	Integrated Watershed Management	CIVIL	3	-	-	3	3
16CV8DERES	Reinforced Earth Structures	CIVIL	3	-	-	3	3
16CV8DEUTP	Urban Transport Planning	CIVIL	3	-	-	3	3

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(Admission year 2014 onwards) VIII Sem B.E HSS ELECTIVE

Subject Code	Course Title	Teaching Department	Credits				Total Credits	Contact Hours	MARKS		
			L	T	P	S			CIE	SEE	TOTAL
16HS8DE LFE	Law for Engineers	Humanities	2	-	-	1	3	2	50	50	100
16HS8DE BMS	Basics of marketing and sales	MBA	2	-	-	1	3	2	50	50	100
16HS8DE EFE	Economics for Engineers	MBA	2	-	-	1	3	2	50	50	100
16HS8DEMAE	Management and Entrepreneurship	MBA	2	-	-	1	3	2	50	50	100

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DEPARTMENT OF CIVIL ENGINEERING

Course Name	**Engineering Maths –III**	Course Code	**15MA3GCMAT**	SEE Duration	SEE+CIE
Credits	**03**	L-T-P-S	**3-0-0-0**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

The purpose of the course is to make the students well conversant with Fourier- Series, Fourier Transforms, formulate physical problems in terms of Partial Differential Equations, find insight into the physical behaviour of systems from mathematical solution and develop computational skills using efficient numerical methods for problems in science and engineering.

COURSE OUTCOMES:

CO 1: Express given functions to form Fourier series.

CO 2: Demonstrate an understanding of Fourier transforms techniques.

CO 3: Employ analytical techniques to solve partial differential equations with appropriate boundary conditions.

CO 4: Compute the solution of a system of algebraic equations

CO 5: Use calculus of variations to find the extremal of a functional

MATRICES:

Introduction: Elementary row transformations, Echelon form of a matrix, rank of a matrix by elementary row transformations.

Consistency of system of linear equations and solution. Solution of a system of non-homogenous equations: Gauss elimination method, LU decomposition method, Gauss-Seidel method. Eigenvalues and eigenvectors of matrices.

Applications: Stability of a system of differential equations- an eigenvalue problem.

Suggested Reading: Inverse of a matrix using Gauss-Jordon method. Eigen value and corresponding eigenvector using Rayleigh power method, reduction of matrix to diagonal form.

7 Hours

FOURIER SERIES:

Introduction: Periodic function, Dirichlet's conditions, statement of Fourier Theorem, Fourier series of periodic function of period 2π and arbitrary period, practical harmonic analysis.

Applications: Fourier series of typical waveforms used in communication engineering-saw toothed waveform, triangular waveform, square waveform, half-wave rectifier, full wave rectifier and modified saw tooth waveform.

Suggested Reading: Half range Fourier series, Fourier series of discrete functions, Complex Fourier series. **7 Hours**

FOURIER TRANSFORMS:

Infinite Fourier transform, Fourier Sine and Cosine transforms, properties, Inverse transforms,

Suggested Reading: Convolution theorem, Fourier transforms of the derivatives of a function, Parseval's identities and physical significance of Parseval's identities. **7 Hours**

PARTIAL DIFFERENTIAL EQUATIONS:

Formation of Partial differential equations-elimination of arbitrary constants, elimination of arbitrary functions. Equations of first order- The linear equation $P\,p + Q\,q = R$ **(**Lagrange's partial differential equation).

Applications: One-dimensional heat equation and wave equation (without proof), various possible solutions of these by the method of separation of variables.

Suggested Reading: Direct integration method, method of separation of variables, D'Alembert's solution of wave equation. **8 Hours**

CALCULUS OF VARIATIONS:

Variation of function and functional, Euler's equation, variational problem, isoperimetric problems

Applications: Geodesics of a right c ircular cylinder, minimal surface of revolution, hanging cable. Brachistochrone problem.

Suggested Reading: Minimal surface of revolution, Geodesics of a right circular cone and sphere **7 Hours**.

TEXT BOOKS:

1. Higher Engineering Mathematics, B.S. Grewal, 40th edition, 2007, Khanna Publishers.
2. Advanced Engineering Mathematics, 5th edition by Dennis G. Zill and Cullen, Jones and Bartlett India Pvt. Ltd.

REFERENCE BOOKS:

1. Advanced Modern Engineering Mathematics, Glyn James, 3rd edition, 2004, Pearson Education.
2. Higher Engineering Mathematics, B.V. Ramana, 2007, Tata Mc. Graw Hill.

3. Advanced Engineering Mathematics, P. V. O'Neil, 5th Indian reprint, 2009, Cengage learning India Pvt. Ltd.
4. Advanced Engineering Mathematics, Erwin Kreyszig, 10th edition Vol.1 and Vol.2, 2014, Wiley-India.

EXPERIMENTS/EXERCISES:

- Solution of system of algebraic equations using Gauss Seidel method
- LU decomposition of matrices.
- Eigenvalues and eigenvectors of matrices-stability of a system of differential equation-Eigenvalue problem.
- Largest eigenvalue and corresponding eigenvector of a matrix.
- Diagonalisation of matrices

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Course Name	**Building Materials and Construction**	Course Code	**15CV3DCBMC**	SEE Duration	SEE+CIE
Credits	**03**	L-T-P-S	**3-0-0-0**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

To enable students to gain knowledge on various materials and processes involved in building construction. This will enable the students to apply the knowledge for building planning and drawing.

COURSE OUTCOMES:

CO1: Describe the physical and mechanical properties of a variety of construction materials.

CO2: Describe the functional components of a building.

CO3: Describe the construction process of various components of a building.

INTRODUCTION TO BUILDING MATERIALS

Physical and mechanical properties, parameters to define strength, durability and performance for the following materials.

STRUCTURAL CLAY PRODUCTS: Bricks, types of bricks, manufacturing process of bricks.

NATURAL STONE: Types, qualities of good stone for construction.

TIMBER: Natural Timber, properties, Timber products.

LIME AND CEMENT: Properties and manufacturing process.

OTHER BUILDING MATERIALS: Iron and Steel, Paints and enamels, water proofing materials

12 hours

INTRODUCTION TO BUILDING CONSTRUCTION:

Building components viz. foundations, walls, lintels roofs, openings, framed structures and masonry structures.

FOUNDATION

Function and requirements of a good foundation, Types of foundations, Preliminary investigation of soil, Safe Bearing Capacity of Soil, Introduction to spread, combined, strap, mat and pile foundations. **3 hours**

MASONRY

Definition of terms used in Masonry, Classification of Masonry, Bonds in Brick work, Reinforced Brick Masonry, Joints in stone masonry, Introduction to load bearing, cavity and partition walls. **4 hours**

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DAMP PROOFING, WATER PROOFING AND ANTITERMITE TREATMENT

Definition of technical terms, Defects, causes and sources of dampness, damp proofing and terrace water proofing methods, Pre and post constructional antitermite treatment. **3 hours**

DOORS AND WINDOWS

Definition of technical terms, Location of doors and windows, Types of Doors, Types of windows. **3 hours**

ARCHES, LINTEL AND BALCONY

Elements of an arch, Classification of arches, Definition and classification of Lintels, Definition and functions of Chejja, Canopy & Balcony **3 hours**

ROOFS AND FLOORS

Types of Roofs & Roofing materials, Types of flooring, Factors affecting selection of flooring materials, Flat roof (RCC), Types of pitched roofs. **5 hours**

STAIRS

Definition of technical terms, Requirements of good stair, Types of Stairs, Geometrical design of RCC Dog legged (Plan and sectional elevation). **3 hours**

PLASTERING AND PAINTING

Purpose of plastering, Materials of plastering, Methods of plastering, Defects in plastering, Introduction to Paintings, Purpose of Painting and Defects in Painting. **3 hours**

TEXT BOOKS:

1. **A Text Book Building Materials**, by P.G. Varghese, Prentice-Hall of India Pvt. Ltd., Publication., 2nd Edition,.2015
2. **Building Construction,** Sushil Kumar, Standard Publication and Distributors, New Delhi, 19th Edition, 2001.

REFERENCE BOOKS:

1. **Advances in Building Materials and Construction** by Mohan Rai and M.P. Jain Singh – publication by CBRI, Roorkee.
2. **Building Materials (3rd revised edition)**, S.K. Duggal, New Age International publishers, India.
3. **Building Construction**, by Dr. B. C. Punmia, Ashok Kr. Jain, Arun Kr. Jain,Laxmi Publications Pvt Ltd.

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Course Name	**Engineering Geology**	Course Code	**15CV3DCGEO**	SEE Duration	SEE+CIE
Credits	**05**	L-T-P-S	**2-0-1-2**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

1. Study of internal structure of the earth.
2. Identification and description of Minerals and Rocks based on their index properties.
3. Study of structural features (Folds, Faults, and Joints etc) of the rocks and earth and their engineering consideration.
4. Study of various Geological Maps.
5. The study of Geotechnical and groundwater potential Zones using various Techniques.
6. The study and select good building stones, sites for construction of dam, reservoir, wells and tunnels.

COURSE OUTCOMES

CO1: Explain the structural features of the earth. Identify and classify minerals and rocks.

CO2: Provide decision support on Lithological characters and related groundwater conditions.

CO3: Describe various geological maps and interpretation of geological data for tunneling, mining and mineral excavations.

CO4: Identify the suitable site for the Civil Engineering project by providing remedial measures in the structurally disturbed areas with the help of Geological investigation.

INTRODUCTION:

Introduction to Geology and its importance in Civil Engineering practices. Internal structure and composition of the earth.

MINERALOGY:

Study of rock forming and economically important minerals. Physical properties, chemical composition, uses and contribution of the following minerals in preparation of construction materials - : Quartz and its varieties: Feldspar group: Mica Group: Carbonate group: Calcite, Asbestos, Kaolin and Garnet. Ore minerals: Hematite, Magnetite, Limonite, Pyrite, Chalcopyrite, Pyrolusite, Chromite, Galena and Bauxite. **5 Hours**

PETROLOGY:

Introduction, Rock cycle and study of the following Rocks.

IGNEOUS ROCKS:

Definition, origin, classification, and forms of Igneous Rocks. Texture structure, Petrological description and Engineering importance of the following rocks: Granite Diorite, Gabbro, Dunite, Porphyries, Pegmatite, Dolerite and Basalt.

SEDIMENTARY ROCKS:

Definition, origin, classification of Sedimentary rocks. Primary structures Petrological description and engineering importance of the following Rocks. Conglomerate Breccia, Sand Stone, Shale, Limestone and Laterite.

METAMORPHIC ROCKS:

Definition, types of Metamorphism, Metamorphic structures. Petrological, description and Engineering importance of the following rocks. Slate, Schist, Gneiss, Quartzite, and Marble.Weathering and deterioration of rocks. Types and agents of weathering. **6 Hours**

APPLIED GEOLOGY:

Selection of rocks for foundation, construction, cladding, flooring, concrete aggregate, road metal, and railway ballast with examples, Site selection for Dams, Reservoirs, and Tunnels. Silting up of reservoir and remedial measures.

GEODYNAMICS:

Dynamic activities of the Earth, Plate tectonics. Geological and Engineering considerations of Land slide, (mass movements) Avalanches causes and precautions. Earthquakes - seismic waves, seismic zones, causes and effects. **10 Hours**

STRUCTURAL GEOLOGY (ROCK MECHANICS):

Introduction, Stress and Strain in rocks, Outcrop, Dip and Strike, and Compass clinometers. Study of structural features of rocks. Description of Folds, Faults and Joints, their identification in the field. Importance in various Civil Engineering projects. **5 Hours**

HYDROGEOLOGY:

Introduction, Study of Groundwater and its importance, Occurrence of groundwater in different Geological rock formation, Water table, Water level fluctuation. Types of Aquifers- Confined and unconfined Aquifers, Artificial recharge of ground water. Selection of well sites, Geological and Geophysical Methods of Groundwater exploration and Applications of Electric resistivity method. **6 Hours**

Lab components must comprise of experiments that reinforce the theoretical understanding of the corresponding theory subject. Outlines of the laboratory components should be mentioned by the respective staff members well before the commencement of the course.

TEXT BOOKS:

1. A Text of Engineering and General Geology, By Parbin Singh, 2009
2. A Text of Geology, by P.K. Mukherjee, 2006

REFERENCES:

1. A Text of Engineering and Geology, by B.S. Sathyanarayanaswamy
2. Physical Geology, By Arthur Homes
3. Principle of Engineering Geology, by KVGK Gokhale
4. Principle of Engineering Geology, by K.M. Bangar
5. Physical and Engineering Geology, by S.K. Garg
6. Geology for Engineers, By D.S. Arora
7. Engg Geology by S K, Duggalet. Al
8. Engineering Geology by D.Venkatareddy
9. Ground water Geology by Todd D.K. Jhon Willey and Sons, New York

LEARNING RESOURCES:

1. www.geoscienceworld.org
2. www.springer.com
3. http://en.wikipedia.org
4. www.gle.wisc.edu
5. www.geoexpro.com
6. http://freevideolectures.com/Course/87/Engineering-Geology

EXPERIMENTS/EXERCISES:

1. **MINEROLOGY: Study of Physical Properties of the mineral and their contribution in preparation of construction materials**
   - **Practical no. 1: Study of the Physical Properties of the following minerals**.
   - **Quartz group of Minerals:-** Rock crystal, Rose Quartz, Jasper banded Agate/Jasper, Smoky Quartz
   - **Feldspar Group:** Orthoclase, Plagioclase, Microcline.
   - **Mica Group:** Biotite Mica, Muscovite mica.
   - **Practical no. 2: Study of the Physical Properties of the following minerals.**
   - **Carbonate Group:** Calcite, Magnesite, Dolomite.
   - **Ferro-Magnesium Minerals:** Hornblende, Augite, Olivine, Asbestos, Talc, Garnet, Gypsum

- **Practical no.3: Study of the Physical Properties of the following minerals**
- **Ore Minerals:** Hematite, Magnetite, Limonite, Iron Pyrite, Chalcopyrite, Pyrolusite, Chromite, Galena, Bauxite.

2. **PETROLOGY: Identification of Rocks Based on their Index Properties**
   - **Practical no.4: Igneous Rocks:** Granite, Diorite, Gabbro, Dunite, Porphyries, Pegmatite, Dolerite and Basalt.
   - **Practical no. 5: Sedimentary Rocks:** Conglomerate, Breccia, Sandstone, Shale, Limestone and Laterite.
   - **Practical no. 6: Metamorphic Rocks:** Slate, Schist, Gneiss, Quartzite, and Marble.
3. **STRUCTURAL GEOLOGY (ROCK MECHANICS):**
   - **Practical no. 7:** Analysis and understanding of the Lithological Character of sub surface by Vertical Electrical Sounding (VES) resistivity method.
   - **Practical no. 8:** Dip and Strike Problems (two types).
   - **Practical no. 9:** Borewell Problems on level Ground (two types).
   - **Practical no. 10:** Study and Interpretation of Standard Structural Geological Maps.

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III SEMESTER CIVIL ENGINEERING

Course Name	**Basic Surveying**	Course Code	**15CV3DCBSY**	SEE Duration	SEE+CIE
Credits	**05**	L-T-P-S	**2-0-1-2**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

To enable the students to gain knowledge in the basics of surveying and instrumentation connected with it. This enables for the understanding of the infrastructure projects.

COURSE OUTCOMES

CO1: Explain the importance and principle of surveying, different types of surveys and techniques used in surveying.

CO2: Apply different methods used for linear and angular measurements, and calculate the elevation of objects.

CO3: Explain working principle and usage of different types of modern surveying instruments.

INTRODUCTION

Definition of surveying. Historical perspective of surveying. Comparison between geometry and surveying. Necessity of surveying. Plan and maps. Classification of surveying. Basic geometrical relations used for understanding surveying. Basic measurements. Control surveys –Horizontal and vertical. Cardinal principles of surveying. Error, Accuracy and precision. Numerical problems on precision and accuracy. Map & Classification. Survey of India topographical Maps and their numbering. **5 Hours**

THEODOLITE SURVEYING

Essentials of transit Theodolite, Definitions and terms, Temporary and permanent adjustments, Measurement of horizontal and vertical angles, Fundamental lines and desired relations, Sources of error in Theodolite. **5 Hours**

TRIGONOMETRIC LEVELLING

Introduction, Base of the object accessible, Base of the object inaccessible: instruments stations in same and different vertical plane, Determination of height of an elevated object, Determination of height of an elevated object from three different stations, Numerical problems.

5 Hours

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III SEMESTER CIVIL ENGINEERING

TACHEOMETRIC SURVEYING

Different types, Principles, Distance and elevation formulae for different conditions, Horizontal base substense measurements, Special instruments, Errors in stadia surveying, Numerical problems. **4 Hours**

LEVELLING

Concepts of levelling, instruments used. Terms and definitions. Reductions of level, Booking of levels, Classification of levelling. Curvature and refraction effects, Reciprocal levelling, Errors. Numerical examples on booking and reduction of levels, calculation of gradients, correction for curvature and refraction, true difference in height using reciprocal observations. Contouring, characteristics and applications. **5 Hours**

INSTRUMENTATION IN SURVEYING

Electronic Theodolites, Autolevel, Geodimeter, Tellurometer, Distomats, Total Station.

2 Hours

TEXT BOOKS:

1. Punmia. B.C., Ashok. K. Jain and Arun .K. Jain 'Surveying Vol1, Lakshmi Publications, 2014.
2. Roy. S.K., Fundamentals of Surveying' Prentice Hall of India, 1999, New Delhi.
3. Duggal. S.K, 'Surveying' Volume 1, Tata McGraw Hill, 1996, New Delhi.

REFERENCE BOOKS:

1. Kavanagh, Barry F. Surveying: Principles and Applications, 8th Edition, 2009, Prentice Hall.
2. Arthur Bannister, Stanley Raymond and Raymond Baker. Surveying, 7th Edition, Pearson Education

EXPERIMENTS/EXERCISES

1. Study of various instruments used for surveying, namely chain, tape, Compass, Dumpy level, Autolevel, Theodolite, Tacheometer, Total station and GPS
2. Study of topographic maps and preparation of a chart of conventional symbols used in toposheets.
3. To set regular geometric figures using linear measuring instruments and accessories
4. Study of prismatic compass and finding the fore bearing and back bearing of a given survey line.
5. To set regular geometric figures using prismatic compass, given the bearing of one line.

6. To find the distance between two inaccessible points using prismatic compass, chain, tape and other accessories.
7. Study of use of Dumpy level. To determine the reduced level of various points using Dumpy level.
8. To find the true difference in elevation between two points situated far apart by using reciprocal leveling.
9. To conduct profile leveling & cross-sectioning and to plot the details.
10. Leveling exercises by using Total-stations.

Course Name	**Mechanics of Fluids**	Course Code	**15CV3DCMOF**	SEE Duration	SEE+CIE
Credits	**04**	L-T-P-S	**3-1-0-0**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

- To introduce the basic concepts of fluid mechanics
- To introduce the pressure concepts, types, its determination.
- To introduce the basic concepts of fluid kinematics and fluid kinetics, their applications to civil engineering problems.
- To introduce the basic laws of fluid dynamics and their applications.

COURSE OUTCOMES:

CO1: Explain the mechanics of fluids at rest and in motion by describing and observing the fluid phenomena

CO2: Analyse fluid interactions with natural and constructed systems using the principles and laws of fluid mechanics

CO3: Apply knowledge for subsequent courses involving the analysis & design of flow related systems

INTRODUCTION:

Definition of fluid, Distinction between Solid, fluid & gases, Concept of Fluid Continuum

Fluid Properties: Mass Density, Specific Volume, Specific Weight, Specific Gravity-Definitions, Units and Dimensions, Viscosity, Newton's Law of Viscosity, Newtonian & Non-Newtonian Fluids, Ideal & Real Fluids, Compressibility, Vapor Pressure, Surface Tension, and Capillary. **4 Hours**

BMS COLLEGE OF ENGINEERING, BANGALORE-560 019
(Autonomous College under VTU)

III SEMESTER CIVIL ENGINEERING

FLUID PRESSURE & ITS MEASUREMENT:

Definition of Pressure, Pressure at a point in a static fluid, Hydrostatic pressure law, Types of Pressures, Measurement of Pressure- Simple & Differential Manometers and Mechanical Gauge.

7 Hours

HYDROSTATICS:

Definition of Total Pressure, centre of pressure, Total pressure & centre of pressure on Vertical plane surface, Inclined & curved plane surfaces. Pressure Diagram. Practical applications- Dams & Gates. **10 Hours**

KINEMATICS OF FLUID:

Description, Continuity Equation in differential form, Velocity Potential, Stream Potential, Equipotential line, Line of constant stream line, Flow net.

Classification of fluid flow, Stream line, Streak Line, Path Line, Stream tube, Acceleration of Flow in one dimensional flow, types of accelerations. **10 Hours**

DYNAMICS OF FLUID FLOW:

Concept of Inertia force and other forces causing Motion, Derivation of Euler's & Bernoulli's Equation (Both for Ideal & Real Fluids),

Applications of Bernoulli's Equation- Venturi Meter, orifice Meter & Pitot Tube Theory. Flow through Orifices and mouth pieces, Flow over Notches and weirs. **10 Hours**

PIPE FLOW SYSTEMS:

Energy losses in pipes- introduction, Darcy- Weisbach equation, Moody diagram, Energy losses in pipe lines- minor losses, multiple pipe systems. Water Hammer in Pipes: Definition, Equation for pressure rise due to gradual closure of valve, sudden closure in rigid & plastic pipes, problems, surge tanks, types & functions **5 Hours**

Boundary layer theory and applications- concept of boundary layer and its growth.

Dimensional Analysis Introduction, Dimension, Dimensional homogeneity, Methods- Rayleigh method, Buckingham Pi method, Similitude- Geometric, Kinematic & Dynamic Similarity

6 Hours

TEXT BOOKS:

1. Fluid Mechanics including Fluid Machines– P.N.Modi & S.M.Seth, Standard Book House, New Delhi, 20th Edition, 2015

REFERENCE BOOKS:

1. Fluid Mechanics- Victor L Streeter & E. Benjamin Wylie, McGraw Hill Publications.
2. Fluid Mechanics- Frank M White, Sixth Edition, the McGraw Hill Companies.
3. Fundamentals of Fluid Mechanics- Bruce R Munson & Donald F Young, John Wiley & Sons, Inc.
4. Fluid Mechanics- K.L. Kumar, S. Chand & Company Ltd, New Delhi.
5. Fluid Mechanics & machinery – C.S.P. Ojha, R. Berndtsson & P.N. Chandramouli, Oxford University Press.
6. Fluid Mechanics- R.K. Bansal, Laxmi Publications, New Delhi.

E-Books / Resources

http://nptel.ac.in/courses/105101082/
http://elearning.vtu.ac.in/10CV35.html

BMS COLLEGE OF ENGINEERING, BANGALORE-560 019
(Autonomous College under VTU)

III SEMESTER CIVIL ENGINEERING

Course Name	**Strength of Materials**	Course Code	**15CV3DCSOM**	SEE Duration	SEE+CIE
Credits	**05**	L-T-P-S	**3-1-1-0**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

After having learnt the mechanism of force transference, it is essential to know the response of the material/structure under different configuration of loading. The objectives of the course are to enable students to identify different materials and their response to loadings in terms of stresses, strains, bending moment and shear force.

COURSE OUTCOMES:

CO1: Explain stress and strain at a point and their relations in a deformable material

CO2: Apply the force equilibrium conditions and the concept of free body diagrams to determine structural responses

SIMPLE STRESSES AND STRAINS:

Introduction, Properties of Materials, Stress, Strain, Hooke's law, St. Venant`s principle, Stress–Strain Diagram for structural steel and nonferrous materials, Principles of superposition, Deformation of uniform bars, bars of varying cross ections,taperingbarsofcircularandrectangularcrosssections.Deformationduetoself–weight.

8 Hours

ELASTIC CONSTANTS:

Relationship among elastic constants, volumetric strain, Stresses in composite sections Thermal stresses (including thermal stresses in compound bars).

TRANSFORMATION OF STRESSES: Introduction, Resolution of stresses on inclined planes, General two dimensional stress system, Principal planes and Principle stresses, Plane stress and plane strain conditions, Mohr's circle of stresses

8 Hours

BENDING MOMENT AND SHEAR FORCE IN BEAMS:

Introduction, Definitions-Bending moment and Shearing force in beam, Sign convention, Relationship between loading, shear force and bending moment, SFD and BMD with salient values for statically determinate beams(cantilever Beams, simply supported beams and overhanging beams) subjected to point loads, UDL, UVL and Couple.

BMS COLLEGE OF ENGINEERING, BANGALORE-560 019
(Autonomous College under VTU)

III SEMESTER CIVIL ENGINEERING

BENDING STRESS IN BEAMS: Introduction – Bending stress in beam, Assumptions in simple bending theory, Pure bending derivation of Bernoulli's equation, Modulus of rupture, section modulus, flexural rigidity, Variation of bending stresses across the cross section of the beams

SHEAR STRESS IN BEAMS: Expression for horizontal shear stress in beam, Shear stress diagram for rectangular, symmetrical 'I' and 'T' section (Flitched beams not included).

12 Hours

ELASTIC STABILITY OF COLUMNS: Introduction–Short and long columns, Assumptions, Euler's theory on columns, Derivation of Euler's buckling load for a column with both ends hinged Effective length slenderness ratio, radius of gyration., Limitations of Euler's theory, Rankine's formula and problems.

12 Hours

TORSION OF CIRCULAR SHAFTS:

Pure torsion, torsion equation of circular shafts, Strength and stiffness, Torsional Rigidity and polar modulus, Power transmitted by shaft of solid and hollow circular sections.

THIN AND THICK CYLINDERS: Stresses in thin cylinder subjected to pressure, hoop, longitudinal and volumetric strains, Thick cylinders-Lame's equations, radial and hoop stresses (excluding compound cylinders).

6 Hours

TEXT BOOKS:

1. Mechanics of Materials by Ferdinand P. Beer and E. Russel Johnston(jr)Publisher, 6th Edition, 2013
2. Strength of materials by L.S.Srinath, Prakash Desai and Ananth Ramu Publisher, 2nd Edition, 2009

REFERENCE BOOKS:

1. Elements of Strength of Materials, Timoshenko and Young, Affliated East-West Press.
2. Mechanics of Materials, James M. Gere (5thEdition),Thomson Learning.
3. Strength of materials By I.B.Prasad, Khanna Publisher

LEARNING RESOURCES: NPTEL

EXPERIMENTS/EXERCISES:

1. Physical properties of Bricks and Blocks – Dimensionality, water absorption, density and Compressive strength
2. Impact test on Mild Steel (Charpy & Izod)
3. Hardness tests on ferrous and non-ferrous metals – Brinell's, Rockwell and Vicker's
4. Tension test on Mild steel and HYSD bars.
5. Compression test of Mild Steel, Cast iron and Wood
6. Torsion test on Mild Steel circular sections
7. Bending Test on Wood and Mild steel
8. Shear Test on Mild steel

IV SEMESTER

Course Name	**Engineering Maths-IV**	Course Code	**15MA4GCMAT**	SEE Duration	SEE+CIE
Credits	**03**	L-T-P-S	**3-0-0-0**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

To prepare students with adequate knowledge in Probability and Statistics, Complex Analysis

COURSE OUTCOMES:

CO1: Calculate solutions of algebraic and transcendental equations, ordinary differential equations numerically

CO2: Compute solution of one dimensional heat and wave equation using finite difference techniques.

CO3: Construct analytic functions and evaluate real and complex integrals.

CO5: Estimate the relation between two variables and perform regression analysis.

CO6: Apply the basic principles of probability and probability distributions.

NUMERICAL METHODS:

Solution of algebraic and transcendental equations: Newton-Raphson method. Finite Differences and interpolation: Forward differences, backward differences. Newton-Gregory forward interpolation formula, Newton-Gregory backward interpolation formula, Lagrange's interpolation formula, Lagrange's inverse interpolation.

Numerical integration: Simpson's $1/3^{rd}$, $3/8^{th}$ rule, Weddle's rule.

Numerical solution of ordinary differential equations: Euler's modified method, Runge-Kutta method of fourth order**.**

Suggested Reading: Solution of simultaneous differential equations by Picard's method, Milne's method to solve ordinary differential equations

7 Hours

NUMERICAL SOLUTION OF PARTIAL DIFFERENTIAL EQUATIONS:

Finite-Difference formulas to partial derivatives.

Applications: Solution of one-dimensional heat equation using 2-level formula and Schmidt explicit formula and Crank-Nicolson two-level implicit formula Solution of one-dimensional wave equation using explicit three level formula.

8 Hours

COMPLEX ANALYSIS-1:

Function of a complex variable, limits, continuity and differentiability of a complex valued function, Analytic functions, properties of analytic functions, Cauchy-Riemann equations in cartesian and polar form, construction of analytic functions by Milne-Thomson method, Conformal mapping- Transformations- $w = z^2$ and $w = z + \frac{a^2}{z}$ $(z \neq 0)$, Bilinear transformations.

Suggested Reading: Standard transformations $w = c + z$, $w = cz$, $w = 1/z$, properties of bilinear transformations

7 Hours

COMPLEX ANALYSIS-2:

Line integral, Problems on line integral, Cauchy's theorem, Cauchy's integral formula.

Taylor's, Maclaurin's and Laurent's series (without proof).Poles, Residues, Residue theorem (without proof).Evaluation of real definite integrals using residues - Integration around a unit circle and semicircle

Suggested Reading: Removable and essential singularities, improper real integrals with singular points on real axis.

7 Hours

STATISTICS AND PROBABILITY:

Curve fitting – Principle of least squares, fitting a straight line, fitting of a parabola, fitting of exponential curves of the form $y = a\,b^x$, $y = ae^{bx}$. Correlation and regression.

Probability distributions: Discrete distribution - Poisson distribution. Continuous distribution-normal distribution.

Suggested Reading: Fitting the curve $y = a\,x^b$, exponential distribution and uniform distribution

7 Hours

TEXT BOOKS

1. Advanced Engineering Mathematics, Erwin Kreyszig, 8th edition, 2007, Wiley-India
2. Higher Engineering Mathematics, B.S. Grewal, 40th edition, 2007, Khanna Publishers.

REFERENCE BOOKS:

1. Advanced Modern Engineering Mathematics, Glyn James, 3rd edition, 2004, Pearson Education.
2. Higher Engineering Mathematics, B.V. Ramana, 2007, Tata Mc. Graw Hill.
3. Advanced Engineering Mathematics, P. V. O' Neil, 5th Indian reprint, 2009, Cengage learning India Pvt. Ltd.
4. Introductory methods of Numerical Analysis, S. S. Sastry, 3rd edition, 1999, Prentice-Hall of India.

Course Name	**Structural Analysis**	Course Code	**15CV4DCSTA**	SEE Duration	SEE+CIE
Credits	**04**	L-T-P-S	**3:1:0:0**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

To enable the students to gain knowledge on the fundamentals of structural analysis by applying the knowledge gained through Engineering Mechanics and Strength of Materials. It enables to get the prerequisite for advanced analysis and design of structures.

COURSE OUTCOMES:

CO1: Identify forms of structures and the associated indeterminacies

CO2: Apply the force equilibrium conditions and compatibility conditions to analyze simple structures like arches, cables and evaluate structural resultants.

CO3: Apply energy principles to analyze and evaluate simple determinate structures.

Introduction to Structural Systems-Classification of structures, Structural forms, Loads, Conditions of equilibrium, Compatibility conditions, Statically determinate and indeterminate structures, degree of Static and Kinematic indeterminacy.

Analysis of Cables and Three Hinged Arches - Types of Arches, Analysis of Three hinged arches (Parabolic and Circular) with supports both at same and at different levels. Analysis of cables under point loads and UDL (supports at same level and different level)

12 Hours

Deflection of Beams- Macaulay's double integration method, Conjugate beam method and moment area method.

Consistent Deformation method; Analysis of Propped cantilever and fixed beams.

Analysis of Continuous beams: Clapeyron's theorem of three moments.

20 Hours

Strain Energy Principle-Strain energy and complimentary strain energy. Strain energy due to axial load, bending moment and shear force. Theorem of minimum potential energy, principle of virtual work. Castigliano's theorems and their applications in the analysis of beams and trusses. Maxwell – Betti theorem of reciprocal deflection.

6 Hours

Deflection of beams and trusses by Unit load method. Redundant Trusses- Analysis by unit load method.

10 Hours

TEXT BOOKS:

1. Theory of Structures Vol-1 by Pandit and Gupta, Tata McGraw Hill, New Delhi, 1st Edition
2. Basic Structural Analysis by C S Reddy, Tata McGraw Hill, New Delhi, 3rd Edition

REFERENCE BOOKS:

1. Elementary Structural analysis, Norris and Wilbur, International student edition, Tata McGraw Hill book Co, New York.
2. Structural Analysis by R C Hibler, 5th edition, Pearson Education Inc.

Learning Resources: NPTEL

Course Name	**CONCRETE TECHNOLOGY**	Course Code	**15CV4DCCON**	SEE Duration	SEE+CIE
Credits	**05**	L-T-P-S	**2-0-1-2**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

To enable students to have the knowledge on the ingredients for concrete preparation, properties of concrete and the testing of concrete properties in accordance with the IS codes.

COURSE OUTCOMES:

CO1: Apply the fundamental principles and procedures in making concrete

CO2: Apply basic requirements of the IS design specifications for designing concrete mixes

CO3: Assess the deterioration of concrete and test methods

CO4: Recognize the characteristics of special types of concrete

CONCRETE INGREDIENTS:

Hydraulic Cements: Manufacturing process, Chemical composition, types of cement, hydration of cement, micro structural development of Portland cement, testing of cement

Aggregates: Properties, types of aggregates, classification of aggregates, importance of grading, specific gravity, bulking, moisture content, deleterious materials, testing of aggregates, interfacial transition zone, recycled aggregates.

Water: qualities of water, use of sea water Chemical admixtures: water reducers, accelerators retarders and air entraining admixture Mineral additives; fly ash, slag, silica fume, rice husk ash, metakaolin and limestone powder

FRESH CONCRETE AND CONCRETE PRODUCTION:

Properties of fresh concrete; Workability, Factor affecting workability, measurement of workability, slump, compacting factor, Vee-Bee consistometer and flow tests, Segregation and bleeding, shrinkage, Rheology of fresh concrete, its importance and Bingham parameters Process of manufacture of concrete: Batching, mixing, transportation, placing and compaction and curing by different methods

MIX PROPORTIONING OF CONCRETE:

Concrete mix design: Concept of mix design, role of water to cement ratio, water content, other variables and exposure conditions, IS method, ACI method, numerical problems, concept of particle packing and rheology based method of mix design

HARDENED PROPERTIES AND DURABILITY OF CONCRETE:

Engineering properties of concrete; Compressive strength and the factors affecting the strength, tensile strength, bond strength, modulus of rupture, Elasticity, factors affecting modulus of elasticity, poisons ratio, creep, provisions of IS 456 in quality control

Durability: Significance of durability, mass transport in concrete, carbonation, chloride ingress Sulphate attack, freezing and thawing

IN-SITU TESTING AND SPECIAL CONCRETES:

Non–destructive testing; rebound hammer, ultrasonic pulse velocity, penetration and pull out test, principle, applications and limitations, core extraction

Special concretes; Introduction to fibre reinforced concrete, high strength concrete, self-compacting concrete, geo polymer concrete and ready mix concrete,

TEXT BOOK:

- Properties of Concrete - A M Neville (Pearson Education Asia Pvt ltd,), Four Edition

REFERENCE BOOKS:

- Concrete –microstructure,properties and materials –PK Mehta and paulo JM Monteiro (ICI)
- Concrete Technology - A R Santhakumar (Oxford –New Delhi)
- Concrete Technology - Gambhir ML(Tata McGrawHill)
- Concrete Mix Design - N Krishna raju
- Concrete Technology Theory and Practice - MS Shetty(S Chand and company)
- Relevant codes
- Current literature

EXPERIMENTS/ EXERCISES

Tests on Fine Aggregate:

1. Specific Gravity Test
2. Sieve analysis
3. Bulking of fine aggregate
4. Unit weight % Voids

Tests on Coarse Aggregate:

1. Specific Gravity & Water absorption test
2. Sieve analysis
3. Unit weight

Tests on Cement:

1. Consistency test on cement
2. Setting time test on cermet
3. Specific gravity test
4. Fineness of cement
5. Compressive strength of cement

Tests on fresh concrete:

1. Slump test
2. Compaction factor test
3. Vee-Bee Consistometer test
4. Flow table test

Tests on hardened concrete

1. Compressive strength of concrete cube
2. Compressive strength of Cylinder
3. Split tensile strength
4. Flexural strength of concrete beam

NDT tests

1. Pulse ultrasonic test
2. Rebound Hammer test.

Course Name	**Advanced Surveying**	Course Code	**15CV4DCASY**	SEE Duration	SEE+CIE
Credits	**03**	L-T-P-S	**2:0:1:0**	**3Hours**	**50+50**

OBJECTIVES:

To enable the students to gain knowledge in the advancements of Surveying, which enables the student in a faster decision making process

COURSE OUTCOMES:

CO1: Apply fundamental principles and procedures for curve setting.

CO2: Recognize the characteristics of Triangulation.

CO3: Describe the functional components of field astronomy.

CO4: Recognize the basics of Photogrammetry Remote sensing and GIS

CURVE SETTING:

Simple Circular Curves, Elements, Setting out two theodolite method; Compound and Reverse curve, Elements, Relationship between various parts of reverse curve; Transition curve, elements, computation and setting out; Vertical curves computation and setting out.

6 Hours

TRIANGULATION:

Geodesic Surveying, Classification, Signals and towers, Base line masurement, Computations.

4 Hours

FIELD ASTRONOMY:

Definitions, Co-ordinate system, Astronomical triangle, Units of time, Determination of co-ordinates, Observations for time, Determination of Azimuth, Determination of Latitude and Longitude.

4 Hours

PHOTOGRAMMETRY:

Introduction – Basic Principles- Photo theodolites - Definitions – Horizontal and Vertical angle from teerestial photography – Horizontal position of a point from photo graphicmeasurement from camera horizontal axis - Elevation of point by photographic measurement – Focal length, Basics of Aerial Surveying.

4 Hours

REMOTE SENSING:

Introduction – Historical sketch of Remote Sensing - Idealized remote sensing – Basic principles of remote sensing – Electromagnetic energy electromagnetic spectrum – Wave length regions and their application in remote sensing – characteristics of solar radiation – Basic radiation law – EM radiation and atmosphere –Interaction of EM radiation with earth surface –remote sensing observation platform – sensors – applications.

4 Hours

GEOGRAPHIC INFORMATION SYSTEMS (GIS):

Definitions: The four M's concept – contributing disciplines for GIS, GIS objectives – components of a GIS –Topology –Data structures –Data base management –Errors in GIS –GIS software package – Linkage of GIS to remote sensing –application areas of GIS and Remote sensing; GIS concepts and spatial models; Spatial information, temporal information, conceptual models of spatial information, representation of geographic information, Data management.

4 Hours

TEXT BOOKS:

1. Kavanagh, Barry F. Surveying: Principles and Applications, Vol-2, 8th Edition, 2009, Prentice Hall.
2. Remote Sensing and Image Interpretation – Lille Sand, John Wiley and Sons, 7th Edition, 2015
3. Elements of Photogrammetry – Paul R Wolf, McGraw International, 4th Edition, 2014

REFERENCES BOOKS:

1. Principles of GIS –Peter A Burrough, Oxford Publications
2. GIS and Computer Cartography –Christopher Jones, Longman Publications
3. GIS –Bemhardsen, Wiley Publications.
4. Surveying- Vol. II – B.C. Punmia, Ashok K. Jain, Laxmi Publications.
5. Remote Sensing and GIS – M Anji Reddy.
6. Arthur Bannister, Stanley Raymond and Raymond Baker. Surveying, Vol.2, 7th Edition, Pearson Education.

EXPERIMENTS/EXERCISES:

1. Setting out a Simple Curve.
2. Setting out a Compound curve.
3. Setting out a Reverse Curve.
4. Setting out a Transition curve.
5. Setting out Bernoulli's lemniscate curve.
6. Triangulation: Baseline measurement.
7. Tracing contours.
8. Satellite stations reduction to centre.
9. GPS Survey.
10. Field Astronomy: Determination of latitude and longitude.
11. Remote Sensing: Digitization of an image.
12. GIS – Basics of data storage.

Course Name	**Soil Mechanics**	Course Code	**15CV4DCSME**	SEE Duration	SEE+CIE
Credits	**03**	L-T-P-S	**2:1:0:0**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

To provide the basic principles and to understand the engineering behaviour of soil to address practical problems in soil mechanics.

COURSE OUTCOME:

CO1: Evaluate index properties of soils, analyze and interpret the experimental data to classify and identify soil.

CO2: Describe structure of soils, soil water systems and evaluate effective stresses in soils.

CO3: Explain the concepts and evaluate permeability, compaction characteristics and shear parameters of soil.

INTRODUCTION:

Definition, origin and formation of soil. Agents causing formation of soils. List of different soil types. Definition of mass, weight. Relation between mass and weight. Units of mass and weight in SI units. Phase Diagram, Voids ratio, Porosity, Percentage Air Voids, Air content, Degree of saturation, Moisture content, Specific gravity, Bulk density, Dry density, Saturated density, Submerged density and their interrelationships , Numerical problems

8 Hours

INDEX PROPERTIES OF SOILS AND THEIR DETERMINATION:

Index Properties of soils and their significance. Various index properties and their Laboratory determination, -Water content, Specific Gravity, Particle size distribution (Sieve analysis and Hydrometer analysis), Relative density, Consistency limits and their indices, in-situ density, Activity of Clay, Thixotropy of clay, IS classification; - Plasticity chart and its importance, Field identification of soils. Numerical problems

10 Hours

CLAY MINERALOGY AND SOIL STRUCTURE:

Single grained honey-combed, flocculent and dispersed structures, Types of soil-Water, base-exchange capacity, Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite.

Effective Stress: Effective stress concept-Total pressure and Porepressure, effect of water table, Numerical problems

6 Hours

FLOW OF WATER THROUGH SOILS-I:

Darcy's law- Assumption and validity, coefficient of permeability and its Laboratory determination, factors affecting permeability, permeability of stratified soils, Seepage velocity, Superficial velocity and coefficient of percolation, Numerical problems

Compaction of soils: Definition, Principle of compaction. Standard and Modified Proctor's tests and their compactive energy. Factors affecting compaction, Field compaction control, Numerical problems

8 Hours

SHEAR STRENGTH OF SOILS:

Concept of shear strength, Mohr's strength theory, Mohr-coulomb theory, factors affecting shear strength of soils, conventional failure envelope. Total and effective shear strength parameters, Sensitivity of clay. Measurement of shear parameters-Direct shear test, unconfined compression test, and, Tri-axial shear test., Types of drainage conditions,

8 Hours

TEXT BOOKS

1. Bowles J.E. (1988), "Engineering Properties of Soil and Their Measurements", McGraw Hill Book Co. New York.
2. Lambe T.W., "Soil Testing for Engineers", Wiley Eastern Ltd., New Delhi,

REFERENCE BOOKS:

1. Punmia B.C. (2005), "Soil Mechanics and Foundation Engg.", 16th Edition, Laxmi Publications Co. , New Delhi.
2. Head K.H., (1986), "Manual of Soil Laboratory Testing", Vol. I, II, III, Princeton Press, London.
3. Braja, M. Das (2002), "Principles of Geotechnical Engineering", Fifth Edition, Thomson Asia Pte Ltd.,

4. Craig R.F. (2004), "Soil Mechanics", 7th edition, Spon press, New York.
5. GopalRanjan and Rao A.S.R. (2000), "Basic and Applied Soil Mechanics", New Age International (P) Ltd., New Delhi.
6. Lambe and Whitman (1979), "Soil Mechanics" John Wiley & Sons, New York
7. Terzaghi. K., and Peck. R.B. (1967) "Soil mechanics in Engineering practice", 2nd Edition, John Wiley and Sons, New York.
8. Relevant B.I.S codes

E-BOOKS

1. http://www.myopencourses.com/subject/e-book-on-concepts-and-techniques-in-geotechnical-and-foundation-engineering
2. http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv104-Page1.htm
3. nptel.ac.in/courses/105101084/
4. https://ay14-15.moodle.wisc.edu/prod/course/view.php?id=499

Course Name	**Hydraulics & Hydraulics Mechanics**	Course Code	**15CV4DCHYM**	SEE Duration	SEE+CIE
Credits	**03**	L-T-P-S	**2:0:1:0**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

To enable the students to gain knowledge in understanding the fundamentals of hydraulics and functioning of hydraulic machine. Expose the students to experimental techniques in hydraulics and evaluations of hydraulic machines.

COURSE OUTCOME:

CO1: Understand and analyse the Uniform & Non Uniform Flows in open channels.

CO2: Understand Impulse Momentum Equation and its applications & carry out computations on impact of jet on fixed, moving plates.

CO3: Understand the working of pumps and turbines and study the performance of these machines.

CO4: Understand the dimensional analysis and apply it in the design of prototypes.

FLOW IN OPEN CHANNELS: Definition of channel, difference between pipe and open channel flow, classification, types of flows, geometric properties of open channels.

2 Hours

Uniform flow in open channels, Chezy's & Manning's formula, Most economical open sections- rectangular, trapezoidal, circular sections- derivations. Specific Energy, definitions, Specific Energy curve, condition for Maximum discharge & Minimum specific energy, critical flow in rectangular sections.

4 Hours

FLOW IN OPEN CHANNELS (NON-UNIFORM FLOW): Definition, Types of Non- Uniform flows, Gradually Varied flow- derivation & Problems, Classification of channel bottom slopes, hydraulic jump, hydraulic jump in a rectangular channel, types & applications.

5 Hours

IMPACT OF JET ON VANES: Introduction to impulse momentum equation, Force exerted by a jet of water on fixed and moving plates- Vertical, inclined, symmetrical and unsymmetrical curved plates, series of curved vanes, velocity triangles, work done & efficiency

5 Hours

TURBINES: Definition, classification, Pelton turbine, theory, equation for work done and efficiency, problems, Francis turbine, Kaplan turbine, theory, equation for work done and efficiency, Specific speed, unit quantities, characteristic curves.

5 Hours

PUMPS: Definition, classification general principle, priming, work done, minimum starting speed

5 Hours

TEXT BOOKS:

1. Hydraulics & Fluid Mechanics – P.N. Modi & S.M. Seth, Standard Book House, New Delhi, 20th Edition, 2015

REFERENCE BOOKS:

1. Experimental Fluid Mechanics - Asawa,G.L., Vol.1, Nem Chand and Bros.,
2. Flow through Open Channels , Subramanya K, TMH Publications
3. Fluid Mechanics- R.K. Bansal, Laxmi Publications, New Delhi.
4. Fluid Mechanics- K.L. Kumar, S. Chand & Company Ltd, New Delhi.
5. Fluid Mechanics through Problems- Garde,R.J., New Age International Publications, New Delhi.
6. Flow through open channels- Ranga Raju, K.G., T.M.H. 2nd edition
7. Open Channel Hydraulics- V.T. Chow, Mc-Graw Hill Publications.

E-Books

http://nptel.ac.in/courses/105103096

http://nptel.ac.in/courses/105107059/

http://elearning.vtu.ac.in/P6/enotes/CV44/Flw_OpenCh-NB.pdf

EXPERIMENTS/EXERCISES:

1. Hydrostatic Bench
2. Reynold's Apparatus
3. Heale Shaw Apparatus
4. Pressure drop in a Venturi meter
5. Friction in pipes
6. Coefficient of discharge of an Orifice & Mouth Piece

7. Coefficient of discharge of a V- Notch
8. Coefficient of discharge of an oghee weir & a Rectangular notch
9. Coefficient of discharge of a Venturimeter
10. Study the impact of jets on vanes
11. Study on hydraulic jump
12. Centrifugal pump and turbines

Course Name	**Building Planning & Drawing**	Course Code	**15CV4DCBPD**	SEE Duration	SEE+CIE
Credits	**04**	L-T-P-S	**1:0:1:2**	**4 Hours**	**50+50**

COURSE OBJECTIVES:

To enable students to gain drafting skills and visualize the various components of a building. This will enable students to design the buildings based on the given functional requirements.

COURSE OUTCOMES:

CO1: Prepare drawings of components of a building.

CO2: Design and prepare functional drawings for buildings as per norms.

CO3: Develop drawings showing the interconnectivity of functional components of buildings along with service layouts.

Guidelines for building drawings, Scales, definition of terms used in building drawings. To prepare geometrical drawing of component of buildings i) Stepped wall footing and isolated RCC column footing, ii) RCC dog legged stairs, iii) Doors & windows (Fully paneled door & glazed window), iv) Truss (Wooden & steel)

15 Hours

Specification for residential and public building, bye laws, setback distances and calculation of carpet area, plinth area and floor area ratio.

Functional design of building using inter connectivity diagrams (bubble diagram), development of line diagram of public buildings (Primary Health Centre, office building, school building).

12 Hours

For a given single line diagram, preparation of water supply, sanitary and electrical layouts,

6 Hours

Development of plan, elevation, section and schedule of openings from the given line diagram of residential buildings, i) Two bed room single storey building, ii) Two storeyed building (Only for Practice)

15 Hours

Text Books:

1. **"Building Drawing"**, by Shah M. H. And Kale C. M., Tata McGraw Hill Publishing Co. 2002

REFERENCE BOOKS:

2. **"A Course in Civil Engineering Drawing"**, by V. B. Sikka, S. K.Kataria & Sons.
3. **"Building Construction"**, Gurucharan Sing, Standard publication
4. **IS:962-** Code of practice for architecture and building drawing National Building code, BIS, New Delhi

V SEMESTER

V SEMESTER CIVIL ENGINEERING
INDETERMINATE STRUCTURAL ANALYSIS

Course Name	Indeterminate Structural Analysis	Course Code	16CV5DCISA	SEE Duration	SEE+CIE
Credits	4	L-T-P-S	3:1:0:0	3 Hours	50+50

COURSE OBJECTIVES:
After gaining knowledge on the fundamental structural analysis of simple structures like arches, suspension cables, analysis of simple beams and frames, the present course enable the students to analyze higher order structures with more redundancies.

COURSE OUTCOMES:
CO1: Develop relevant equations for Displacement method and applying the same for analysis on structures for different loading and boundary conditions.
CO2: Develop conditions for Force method and applying the same for analysis on structures with different load and boundary conditions.
CO3: Analyze beams for shear force and bending moment for rolling loads and use of influence line diagrams.

Slope Deflection Method:
Introduction, Development of slope-deflection equations, Analysis of Beams and Orthogonal Rigid jointed plane frames (non-sway) with kinematic redundancy less than/equal to three. (Members to be axially rigid). **08 Hours**

Moment Distribution Method (Without Sway):
Introduction- Distribution factor, Carry over factor. Development of method. Analysis of beams and orthogonal rigid jointed plane frames (non-sway) with kinematic redundancy less than/equal to three. (Members to be axially rigid)
08 Hours

Moment Distribution Method (With Sway)
Analysis of rigid jointed plane frames (sway, members assumed to be axially rigid and kinematic redundancy ≤ 3). **07 Hours**

Kani's Method
Introduction, Basic Concept, Analysis of Continuous beams, Analysis of rigid jointed sway and non-sway plane frames. **04 Hours**

Flexibility Matrix Method of Analysis:
Introduction, Axis and co-ordinates, Development of flexibility matrix for plane truss element and axially rigid plane framed structural elements. Analysis of plane truss and axially rigid plane frames by flexibility method with static indeterminacy ≤3 using transformation matrix. **05 Hours**

Stiffness Matrix Method of Analysis:
Introduction, Axis and Co-ordinates, Development of stiffness matrix for plane truss element and axially rigid, plane, framed structural elements. Analysis of plane truss and axially rigid plane frames by stiffness method, with kinematic indeterminacy ≤3 using transformation matrix. **14Hours**

Rolling Load and Influence Lines:
Rolling load analysis for simply supported beams for several point loads and UDL. Influence line diagram for reaction, SF and BM at a given section for the cases mentioned above. **06 Hours**

Text Books:

Reddy C.S., "Basic Structural Analysis", Third Edition, Tata McGraw Hill Publication Company Ltd. 2010
S.P. Gupta, G.S. Pandit and R. Gupta, "Theory of Structures Vol. 2", I Edition, Tata McGraw Hill Publication Company Ltd. 1999

Reference Books:
J. Sterling Kinney, "Indeterminate Structural Analysis", Oxford and Publishing Co.
Noris C.H., Wilbur J.B., "Elementary Structural Analysis", I Edition, Mc Graw Hill International Book Edition.
C.K. Wang, "Intermediate Structural Analysis", Mc Graw Hill Publications.
Ashok K. Jain, "Advanced Structural Analysis", 3rd Edition, Nem Chand & Bros., Roorkee, India.

e-resource:

nptel.ac.in/courses/105101086/-**NPTEL**

V SEMESTER CIVIL ENGINEERING

WATER SUPPLY ENGINEERING

Subject	Water Supply Engineering	Sub. Code	16CV5DCWSE	SEE Duration	SEE+CIE
Credits	02	L-T-P Hours/ week	1:1:0	3 hrs	50 + 50

Course objective:
To provide fundamental knowledge to students about water demand, sources, conveyance, quality , treatment and its distribution.
5
Course outcome:
CO1: Describe and design various parameters of collection and conveyance of water
CO2: Evaluate water quality parameters through experiments
CO3: Describe basic structure of drinking water supply systems and design the component systems of water treatment facilities

Introduction: Human activities and environmental pollution, requirement of water for various beneficial uses, Need for protected water. 0**2 hours**

Demand of Water: Types of water demands-domestic demand, institutional and commercial, public uses, fire demand. Per capita consumption-factors affecting per capita demand, population forecasting, different methods with merits and demerits-variations in demand of water., estimation of fire demand using various formulas, peak factors, design period and factors governing the design periods 0**5 hours**

Sources, Collection and Conveyance of Water : Surface and Subsurface sources-suitability with regard to quality and quantity.
Intake structures-different types of intakes; factors for selection and location of intakes. Pumps-Necessity, types-Power of pumps; factors for the selection of a pump. Pipes-Design of the economical diameter of rising main; Nomograms-Use; Pipe appurtenances. **05 Hours**

Quality of Water: Objectives of water quality management. Concept of safe water, Whole someness & palatability, water borne diseases. Examination of water: Objectives-physical,chemical,microbiological and radiological Examinations, (BIS 3025 and BIS 1622) using analytical and instrumental techniques. Drinking water standards BIS and WHO guidelines. Health significance of Fluoride, Nitrate and heavy metals like mercury, cadmium and Arsenic. Sampling water for examination 0**5 Hours**

Water Treatment methods : Objectives- Treatment flow-chart. Aeration-Principles, types of Aerators.

Sedimentation: Theory, settling tanks, types, design. Coagulant aided sedimentation, jar test, chemical feeding, flash mixing and clariflocculator. **04 Hours**

Filtration and Disinfection; Mechanism-theory of Filtration, types of filters, slow sand, rapid sand and pressure filters including construction, operation, cleaning and their design-excluding under drainage system-back washing of filters. Operational problems in filters.Theory of disinfection, types of disinfection, Chlorination, chlorine demand, residual chlorine, use of bleaching powder. UV rays. Treatment of swimming pool water. 0**6Hours**

Softening and Miscellaneous Treatment : definition methods of removal of hardness by lime soda process and zeolite process RO and membrane technique. Removal of color, odor, taste, Adsorption techniques, Fluoridation and Defluoridation.
03 Hours

****Site Visit to water Treatment plant.**

Text Books:

1. Water supply Engineering-S.K.Garg , Khanna Publishers, 2015
2. Water supply engineering-B.C.Punmia, Arihant publicatoions, 2016

Reference Books:

1. Elements of Public health engineering-K.N.Duggal, S.Chand & Co
2. Manual of water supply and treatment-CPHEO publication
3. Water and Waste water Technology-Mark.J.Hammer,John wiley and sons.
4. Water supply and sewerage-E.W.Steel and T.J.Mc.Ghee,Mc.Graw hill publication.

V SEMESTER CIVIL ENGINEERING

FOUNDATION ENGINEERING

Course name	Foundation Engineering	Sub Code	16CV5DCFEN	SEE duration	SEE +CIE
Credits	6	L-T-P-S Credits	3: 0: 1: 2	3 hours	50+50

Course objective:

To enable the students to apply the knowledge of basics of soil mechanics for safe design of civil engineering structures such as foundations, retaining walls, and also to assess the stability of slopes.

Course Outcomes:

An ability to

CO1: Compute consolidation and settlement characteristics of soil.
CO2 : Determine lateral Earth pressure on retaining walls for its safe design
CO3 : Analyze stability of soil slopes; and suggest slope protection measures
CO4 : Suggest and plan various soil exploration techniques, and also estimate the state of stress below any type of loaded area
CO5: Evaluate bearing capacity of soil to design a shallow foundation and Explain safety measures and regulations for soil excavation.
CO6: Perform experiments to evaluate various soil properties

Consolidation of Soils: Definition, Mass-spring analogy, Terzaghi's one dimensional consolidation theory-assumption and limitations. Consolidation characteristics of soil (C_c, a_v, m_v and c_v), Time rate of consolidation, Normally consolidated, under consolidated and over consolidated soils, pre-consolidation pressure and its determination by Casagrande's method. Laboratory one dimensional consolidation test, -Determination of compression index. Consolidation settlement, numerical problems **8 hours**

Lateral Earth Pressure: Introduction to soil erosion, Retaining walls-Importance - Active and passive earth pressures, Earth pressure at rest, determination of Active and passive Earth pressure coefficient for C=0 soil and cohesive soils. Safe depth of excavation without lateral support, Earth pressure theories- Rankine's

and Coulomb's –assumptions and limitations, safe design of retaining wall, numerical problems **8 hours**

Stability of Earth Slopes: Introduction, Types of slopes, causes and types of slope failures. factors of safety, Stability of slopes- analysis by Method of slices, Fellenius method of locating centre of critical slip circle, Taylor's stability number, stability of earthen dams, vertical cut safe depth, numerical problems

Soil conservation : Soil erosion, types, conservation practices – slope protection by retaining walls, bunds and other methods, soil erosion estimation **8 hours**

Subsurface Exploration: Objectives of exploration program, Methods of exploration: Trial pits, boring. Number and depth of borings for building and dams, Types of samples- undisturbed, disturbed and representative samples. Types of Samplers, Sample disturbance, Area ratio, Recovery ratio, Standard penetration test, Typical boring log, geophysical methods, modern instruments and techniques.

Stresses In Soils: Boussinesq's theory for concentrated loads, –line load, strip loads, circular loading --numerical problems. Rectangular loading: exact method, approximate method for point at centre, & corner (No derivation of equations), pressure bulb, Westergaards theory, contact pressure **8 hours**

Bearing Capacity of soils: Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure. Terzaghi's bearing capacity equations- assumptions and limitations, estimating bearing capacity of footings subjected to vertical loading, factor of safety. IS Code method, Effect of ground water table on bearing capacity. Correlation of Standard penetration test N-values with bearing capacity of soil, plate load test, types of settlement, numerical problems, modulus of subgrade reaction

Excavation and trenches- soil excavation- introduction, methods, excavation hazards, OSHA safety requirements **8 hours**

Text Books

1. Punmia B.C. (2005), 'Soil Mechanics and Foundation Engg.", 16th Edition, Laxmi Publications Co. , New Delhi.
2. Braja M. Das (2013), "Principles of Geotechnical Engineering", 5th Edition,Thomson Business Information India (P) Ltd., India.
3. Venkatramiah,(2016) soil mechanics and foundation engineering, New age int. (p) ltd.

Reference Books/Codes:

1. Bowles J.E. (2001), "Foundation Analysis and Design" 5th Edition, McGraw Hill Pub. Co. New York.
2. Bowles J.E. (2001), "Engineering Properties of Soil and Their Measurements", 4th edition, McGraw Hill Book Co. New York.
3. Craig R.F. (2008), "Soil Mechanics", 8th edition, Spon press, New York.
4. Gopal Ranjan and Rao A.S.R. (2006), "Basic and Applied Soil Mechanics", revised 2nd edition, New Age International (P) Ltd., New Delhi.
5. Head K.H., (2006), "Manual of Soil Laboratory Testing", 3rd Edition, Whittles Publishing, UK.
6. Lambe T.W. (1966), "Soil Testing for Engineers", John Wiley & Sons., New Jersey, USA.
7. Terzaghi. K. and Peck. R.B. (2009) "Soil mechanics in Engineering practice", 3rd Edition, Wiley India Pvt Ltd, New Delhi.
8. Relevant B.I.S codes, ASTM and BS codes.

E Learning resources:

1)ocw.mit.edu › Courses › Civil and Environmental Engineering
2)http://www.myopencourses.com/subject/e-book-on-concepts-and-techniques-in-geotechnical-and-foundation-engineering

3) http://nptel.ac.in/syllabus/syllabus.php?subjectId=105107120

4) http://nptel.ac.in/syllabus/syllabus.php?subjectId=105101084

List of laboratory experiments on soil

1. Determination of Water content by oven drying method and pycnometer method
2. Determination of specific gravity by density bottle and pycnometer method
3. Determination of in situ density by sand replacement and core cutter method

4. Determination of liquid limit, plastic limit and shrinkage limit.
5. Determination of grain size distribution by sieve analysis.
6. Determination of permeability of coarse grained and fine grained soil
7. Determination of shear parameters.by conventional Direct shear test
8. Determination of shear parameters by Unconfined compression test
9. Determination of shear parameters by Triaxial shear test
10. Determination of OMC and MDD by Standard proctor test

Modern tools: Digital shear testing equipments

V SEMESTER CIVIL ENGINEERING

HIGHWAY ENGINEERING

Course name	Highway Engineering	Sub Code	16CV5DCHEN	SEE duration	SEE +CIE
Credits	6	L-T-P-S	3: 0: 1: 2	3 hours	50+50

Course objective:
To provide knowledge of highway materials and methods for design and construction of highways

COURSE OUTCOMES:
An ability to:

CO 1 Identify and Prioritize highway proposals for road development and decide the route alignment

CO 2 Analyse and design the components of horizontal and vertical alignment of highways as per IRC specifications

CO 3 Apply knowledge on properties of highway materials in conducting various laboratory tests and preparing reports

CO 4 Analyse and design highway pavements and highway drainage

CO 5 Select and analyze different materials required for road construction

INTRODUCTION: Role of Transportation Engineering, Characteristics of Road Transport, Scope of highway engineering. **02 Hours**

HIGHWAY PLANNING: Necessity of highway planning, Classification of Roads, Road patterns, Planning Surveys-Interpretation of plans-Preparation of Master plans-Phasing of plan, Lucknow Road Development Plan-Problems, Road Development Plan:Vision-2021, Rural Road Development Plan:Vision-2025.

04 Hours

HIGHWAY ALIGNMENT AND SURVEYS: Requirements-Factors controlling Alignment-Surveys for highway alignment, Highway Projects- Drawings and Reports
04 Hours

GEOMETRIC DESIGN: Importance, Design Controls and Criteria, Highway cross sectional elements, Sight Distance requirements, Design of Horizontal Alignment, Design of Vertical Alignment-Problems. **07 Hours**

HIGHWAY MATERIALS: Soil Subgrade, Soil Classification-BIS and HRB methods, Plate load test-Problems, Road Aggregates-Desirable properties, Bituminous Binders-Paving

Grade Bitumen, Modified Bituminous Binders, Cut-back Bitumen and Bitumen Emulsion-Characteristics and Types. **06 Hours**

PAVEMENT DESIGN: Introduction to Flexible and Rigid pavements, Design of Flexible Pavement by CBR Method (CSA), Design of Rigid pavements by Westergard's Stress Analysis-Wheel Load Stresses-Temperature stresses, Problems on above. **07 Hours**

HIGHWAY CONSTRUCTION: Construction of Pavements- on Embankment and in Cutting, Base Course Construction-Wet Mix Macadam, Bituminous Macadam, Surface Course Construction-Bituminous Concrete, Cement Concrete. **04 Hours**

HIGHWAY DRAINAGE: Objects-Surface and Sub-surface Drainage-Design of Surface Drainage System-Problems. **03 Hours**

HIGHWAY ECONOMICS AND FINANCE: Introduction to Highway user benefits, Economic Analysis and Highway Finance in India-A Case Study. **02 Hours**

Text Books:

S. K. Khanna, C. E. G. Justo and A. Veeraragavan, "Highway Engineering", Revised 10th Edition, Nem Chand and Bros, Roorkee, 2014.
S. K. Khanna, C. E. G. Justo and A. Veeraragavan, "Highway Materials and Pavement Testing", Revised 5th Edition, Nem Chand and Bros, Roorkee, 2013.

Reference Books:

R. Srinivasa Kumar, "Textbook of Highway Engineering", Universities Press (India) Private Ltd., 2012.
S. P. Bindra, "A Course in Highway Engineering", Dhanpat Rai Publications, 5th Revised Edition, 2013.

MOOCs: https://www.nptel.ac.in/courses/105101087/

EXPERIMENTS/EXERCISES

Tests on Subgrade Soil:
Modified Compaction Test
California Bearing Ratio Test

Tests on Road Aggregates:
Aggregate Impact Test
Los Angeles Abrasion Test
Aggregate Crushing Value Test
Specific Gravity Test and Water Absorption Test
Shape Tests
Flakiness Index
Elongation Index
Angularity Number

Tests on Bituminous Materials:
Penetration Test
Ductility Test
Softening Point Test
Specific Gravity Test
Viscosity Test
Flash and Fire Point Test
Tests on Bituminous Mixes
Marshall Stability Test

V SEMESTER CIVIL ENGINEERING
HYDROLOGY AND WATER RESOURCES

Course name	**Hydrology and water resources engineering**	**Sub Code**	**16CV5DCHWR**	**SEE duration**	**SEE +CIE**
Credits	**3**	**L-T-P-S**	**3: 0: 0: 0**	**3 hours**	**50+50**

COURSE OBJECTIVE: To provide knowledge to students about causes, occurrence and estimation of rainfall and runoff

Course outcomes:

Ability to:

CO1: Describe hydrologic cycle and Analyse the rainfall data
CO2: Compute the losses from precipitation.
CO3: Estimate the runoff from a watershed
CO4: Explain methods for measurement of stream flow and steady radial flow into wells

Hydrologic Principles: Introduction, Hydrologic cycle, Importance of Hydrology. Global water availability. India's water availability. Practical applications of Hydrology, Hydrologic cycle (Horton's qualitative and engineering representations).
3 Hours

Precipitation: Weather systems, Forms and types of precipitation, Measurement of rain fall using Symon's and Siphon type of rain gauges, Optimum number of rain gauge stations, Consistency of rainfall data (double mass curve method),Computation of mean rainfall arithmetic average, Thiessen polygon and Isohyet methods, Estimation of missing rainfall data (Arithmetic average, normal ratio and regression methods).Presentation of precipitation data -moving average, mass curve, rainfall hyetographs, intensity – duration - frequency curves.
10 Hours

Losses from precipitation: Evaporation: process, factors affecting Evaporation, measurement using IS Class A Pan, Estimation using empirical formulae. Infiltration: factors affecting infiltration capacity, measurement (double ring infiltrometer). Horton's infiltration equation, infiltration indices.
10 Hours

Runoff: Concept of catchment/ watershed, Water budget equation, components, Factors affecting runoff. Rainfall - runoff relationship using simple regression analysis, SCS Curve Number Method, Hydrographs, Unit Hydrograph method.

7 Hours

Stream Flow Measurement: Measurement of stage, measurement of discharge by Area – Velocity method and slope area method, Simple stage discharge relation
5 Hours

Well Hydraulics: Aquifer parameters, Steady radial flow into wells in unconfined and confined aquifers. Types of wells, Methods of construction.

4 Hours

Text Books:

A Text Book of Hydrology- Jayarami Reddy, Lakshmi Publications, New Delhi. Edition :Third, 2016

Reference Books:
Hydrology- H.M. Raghunath, Wiley Eastern Publication, New Delhi.
Hand Book of Hydrology- Ven Te Chow , Mc Graw Hill Publications.
Hydrology and Water Resources Engineering- R.K. Sharma and Sharma. Oxford and IBH, New Delhi.
Hydrology and Water Resources Engineering- Garg S.K., Khanna Publishers, New Delhi.
Applied Hydrology- Linsley, Kohler and Paulhus, Wiley Eastern Publication, New Delhi.
Ground Water Hydrology- Todd, Wiley Eastern Publication, New Delhi.

e- learning :
http://ocw.tudelft.nl/courses/watermanagement/hydrology-of-catchments-rivers-and-deltas/lectures

http://nptel.ac.in/syllabus/105107129

http://nptel.ac.in/syllabus/105101002/

V SEMESTER CIVIL ENGINEERING
CAD LABORATORY

Course Name	CAD Lab	Course Code	16CV5DCCDL	SEE Duration	SEE+CIE
Credits	01	L-T-P-S Credits	0:0:1:0	02 Hours	50+50

COURSE OBJECTIVES:
To enable students to gain drafting skills and visualize the various components of a building. This will enable students to design the buildings based on the given functional requirements.

COURSE OUTCOMES: An ability to use CAD to:-

CO1: Prepare drawings of various components of a building.
CO2: Prepare functional drawings for buildings as per norms.

1. Introduction to Auto CAD: **2 Hours**
2. To prepare the drawing of components of building- Wall footing and RCC Column footing, Doors & windows (Fully paneled door & glazed window) **4 Hours**
3. Stair case drawing, Lintel and chajja **3 Hours**
4. Drawing of plan, elevation, section & schedule of openings of single bed room house, two bedroom houses. **3 Hours**

Text Books:
"Building Drawing" by Shah M. H. And Kale C. M., Tata McGraw Hill Publishing Co.

REFERENCE BOOKS:
1. Auto CAD Manual
2. "A Course in Civil Engineering Drawing", by V. B. Sikka, S. K.Kataria & Sons, 7th Edition:2015.
3. "Building Construction", Gurucharan Singh, Standard publication IS: 962- Code of practice for architecture and building drawing National Building code, BIS, New Delhi.

DEPARTMENT ELECTIVE

ADVANCED CONCRETE TECHNOLOGY

Course Name	Advance concrete technology	Course Code	16CV5DEACT	SEE Duration	SEE+CIE
Credits	02+01=3	L-T-P-S Credits	2:0:1:0	03 Hours	50+50

Course Outcomes

An ability to

CO1: Explain conventional concrete and their constituents
CO2: Analyse different types of special concretes and mix design procedures

Brief Review of Conventional Concrete and Constituent Materials: Brief Introduction of Concrete including composite cement and properties, Waste Materials in Concrete: Introduction to waste material including construction and demolition waste, glass, plastic, rubber and recycled concrete. Requirement of concrete for pumping.

Self-Compacting Concrete: Brief history of development, Definition, Fresh property requirements, Tests as per EFNARC and ASTM, Mix design procedures, Comparison of hardened properties with conventional concrete, Applications, Economical aspects.

Rheology of Concrete
Introduction, Factors affecting the rheology of fresh concrete, Constitute equation for measuring the rheological properties and the measuring instruments.

Fiber Reinforced Concrete: Fibers, types, characteristics, Fiber distribution, orientation and interfacial bond. Mechanical properties of FRC mix design of FRC, behavior of hardened FRC under compression, tension flexure and impact, SIFCON, Ductal Concrete.

High Performance Concretes: Concept, materials selection, mineral admixture, proportioning, strength, and durability aspects, Construction & economical Aspects, codal provisions, Applications and their performance. Light Weight and High Density Concrete: Definition, Proportioning, Properties and Applications

Geo-polymer Concrete: Brief history of development, Definition, Reaction chemistry, material characterization, mix proportioning, properties and applications

Reference Books:

1. Fiber Reinforced cement composites, by Perumalsamy.N Balaguru and surendra P.Shah, McGraw Hill International edition, Civil Engineering series.
2. Concrete technology and Design-vol.1& 2: New concrete materials by R N Swamy.
3. Self-Compacting Concrete by Geert De Schutter, Peter J.M.Bartos and Peter Domone, Whittles Publishing
4. Current Literatures
5. Concrete Technology by Dr. Aminul Islam Laskar, University Science Press.

6. Advanced Concrete Technology –Process by John Newman and Ban Seng Choo, ISBN 0 7506 5105 9, Elsevier Ltd.
7. Properties of Concrete, A.M.Neville, Pearson Education (Singapore) Pte. Ltd.,
8. Concrete Microstructure, Properties, and Materials, by P.Kumar Mehta and Paulo J.M.Monteiro.

LABORATORY :

List of Experiments

1. Mix design of concrete as per IS, ACI & BS methods for various strength requirements.
2. Characterization of Blended Cement
3. Determination of Optimum Dosage of HRWA by marsh cone test.
4. Tests on Self Compacting concrete.
5. Mix design of Geo-polymer concrete.

V SEM CIVIL ENGINEERING
DEPARTMENT ELECTIVE
ALTERNATIVE BUILDING MATERIALS AND TECHNOLOGY

Course Name	Alternative building materials and technology	Course Code	16CV5DEABM	SEE Duration	SEE+CIE
Credits	03	L-T-P-S Credits	3:0:0:0	03 Hours	50+50

COURSE OBJECTIVES:
To Introduce the students to the concept of low-energy and low-cost building, locally available materials and technologies

COURSE OUTCOME:
An ability to:
CO1: Explain Energy concepts, environmental concerns for building materials and green building ratings
CO2: Classify and explain alternate masonry units and various types of waste materials used for building construction
CO3: Discuss properties , applications of fiber reinforced concrete and ferro cement
CO4: Suggest cost effective design of buildings and describe different kinds of alternate roofing systems

INTRODUCTION: 9 HOURS
Energy in building materials, Environmental issues concerned to building materials, Embodied energy and life-cycle energy, Global warming and construction industry, Environmental friendly and cost effective building technologies, Requirements for building of different climatic regions, Traditional building methods and vernacular architecture, Green building ratings – IGBC and LEED manuals – mandatory requirements.

ALTERNATIVE MASONRY UNITS: 8 HOURS
Characteristics of building blocks for walls, Stones and Laterite blocks, Bricks and hollow clay blocks, Concrete blocks, Stabilized blocks: mud blocks, steam cured blocks, Fal-G Blocks, stone masonry block, Equipments used for production of stabilized blocks,

BUILDING MATERIALS FROM AGRO AND INDUSTRIAL WASTES:
Types of agro wastes, Types of industrial and mine wastes, Properties and applications, Field quality control test methods
OTHER MISCELLANEOUS MATERIALS : Different materials used as alternatives such as, Aluminum, Bitumen Materials, Soil Conditioning Agents, Tempered Glass, Crumb Rubber, Fibre Reinforced Polymer, Glass Fibre, Reinforced Plastics, Bamboo reinforced plastics etc., their properties and sustainability, Lime-pozzolana cements- Raw materials, Manufacturing process, Properties and uses **8 HOURS**

FIBRE REINFORCED CONCRETE **8 HOURS**

Matrix materials, Fibers: metal and synthetic, Properties and applications, Fibre reinforced plastics, Matrix materials, Fibers: organic and synthetic, Properties and applications

FERROCEMENT AND FERROCONCRETE Properties, Ferrocement and ferroconcrete building components, Materials and specifications, Properties, Construction methods, Applications

ALTERNATIVE ROOFING SYSTEMS **6 HOURS**

Concepts, Filler slabs, Composite beam panel roofs, Masonry vaults and domes

COST EFFECTIVE BUILDING DESIGN

Cost concepts in buildings, Cost saving techniques in planning, design and construction, Cost analysis: Case studies using alternatives

Text Books:

1. "Alternative Building Materials and Technologies", KS Jagadish, BV Venkatarama Reddy and KS Nanjunda Rao, New Age International publications 2014

REFERENCE BOOKS:

1. "Building materials in Developing Countries", RJS Spence and DJ Cook, Wiley pub. 1983
2. LEED India, Green Building Rating System, IGBC pub.
3. IGBC Green Homes Rating System, CII pub.

V SEM CIVIL ENGINEERING
DEPARTMENT ELECTIVE
AIR POLLUTION

Course Name	Air pollution	Course Code	16CV5DEAPL	SEE Duration	SEE+CIE
Credits	03	L-T-P-S Credits	3:0:0:0	03 Hours	50+50

COURSE OBJECTIVE:
This subject covers the sources, characteristics and effects of air and noise pollution and the methods of controlling the same. The student is expected to know about source inventory and control mechanism.

COURSE OUTCOME

CO1: Classify and analyze different types of air pollutants , explain their dispersion and effects on environment
CO2: Analyze particulates control by different methods
CO3: Explain air quality management, relevant standards and regulations
CO4: Discuss causes, effects and control of noise pollution

SOURCES AND EFFECTS OF AIR POLLUTANTS

Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion, Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles, numerical problems **8 HOURS**

DISPERSION OF POLLUTANTS

Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate - Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models – Applications. **8 HOURS**

AIR POLLUTION CONTROL

Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion – **8 HOURS**

Pollution control for specific major industries, Numerical problems.

AIR QUALITY MANAGEMENT

Air quality standards – Air quality monitoring – Preventive measures - Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality **8 HOURS**

NOISE POLLUTION

Sources of noise pollution – Effects – Assessment - Standards – Control methods – Prevention **5 hours**

CASE STUDIES: on air pollution control and noise pollution control **2 hours**

Text Books

1. Anjaneyulu, D., "Air Pollution and Control Technologies", Allied Publishers, Mumbai, 2015
2. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 2015
3. Rao M.N., and Rao H. V. N., Air Pollution Control, Tata-McGraw-Hill, New Delhi, 2015

REFERENCES

1. W.L.Heumann, Industrial Air Pollution Control Systems, McGraw-Hill, New York, 2015
2. Peavy S.W., Rowe D.R. and Tchobanoglous G. Environmental Engineering, McGraw
Hill, New Delhi, 2015

3 Mahajan S.P., Pollution Control in Process Industries, Tata McGraw-Hill Publishing Company, New Delhi,2015.
4. Garg, S.K., "Environmental Engineering Vol. II", Khanna Publishers, New Delhi

V SEM CIVIL ENGINEERING
DEPARTMENT ELECTIVE
DISASTER MANAGEMENT AND MITIGATION

Course Name	Disaster management and mitigation	Course Code	16CV5DEDMM	SEE Duration	SEE+CIE
Credits	03	L-T-P-S Credits	3:0:0:0	03 Hours	50+50

Course Objective:
The objective of the course is to make the students learn basics of disaster management and mitigation.

Course OUTCOMES:
Ability to :

CO1: Differentiate types of disasters, its causes and identify vulnerable areas in India
CO2: Suggest mitigation techniques during disaster
CO3: Explain disaster management planning methods and execution of emergency management programme

Introduction: Definiton, terms, classification of disaster-natural and manmade; global, regional, causes- social conditions, geo-climatic conditions **3 hours**

Hazard mapping: Levels of disaster as per National guide lines, approaches to study natural and man made disaster, hazard mapping of vulnerable areas in India, Response time, frequency, forewarning, exposure time of different hazards. **9 hours**

Mitigation: Risk assessment methods, Prevention, mitigation, preparedness, Tools and strategies, role of Information Technology, community based risk reduction mechanism **9 hours**

Planning: National disaster preparedness plan, planning methods, different phases of disaster management cycle, Disaster management act (2005), Disaster management Policy(2009), Public awareness creation, legal aspects, compensation, Insurance. **9 hours**

Crisis Management: Administrative and Organization, roles and responsibilities, Emergency management at field level, Health, food, nutrition, water, sanitation, social services, public awareness creation, Rumors and panic management, Case studies on various disasters mitigation, and management. **10 hours**

TEXT BOOKS

1. Singhal J.P. “Disaster Management”, Laxmi Publications, 2010.
ISBN- 10:9380386427 ISBN13:978-9380386423

2).Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. ISBN -10:1259007367, ISBN 13:978-1259007361]

REFERENCES

1.Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2.Government of India, National Disaster Management Policy,2009.
3) various e-learning -,www.ndmindia.nic.in
4).Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management,NIDM, New Delhi, 2011

5).Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

6)Pradeep sahni, Alka Dhameja, Uma Medury, “Disaster mitigation experiences and reflection”, PHI

BMS COLLEGE OF ENGINEERING, BANGALORE-560 019
(Autonomous College under VTU)

DEPARTMENT OF CIVIL ENGINEERING

GLOBAL WARMING AND CLIMATE CHANGE

Course Name	Global warming and climate change	Course Code	16CV5DEGWC	SEE Duration	SEE+CIE
Credits	03	L-T-P-S Credits	3:0:0:0	03 Hours	50+50

OBJECTIVES

1. To know the basics, and importance of global warming
2. To know the concept of mitigation measures against global warming

OUTCOME

CO1: Describe causes and effects of green house gases
CO2: Explain causes and impact of climate change and global measures taken
CO3: Suggest mitigation techniques for climate change

EARTH'S CLIMATE SYSTEM

Role of ozone in environment-ozone layer-ozone depleting gases-Green House Effect, Radiative Effects of Greenhouse Gases-The Hydrological Cycle-Green House Gases and Global Warming – Carbon Cycle. **(8 hours)**

ATMOSPHERE AND ITS COMPONENTS

Importance of Atmosphere-Physical Chemical Charcterestics of Atmosphere-Vertical structure of the atmosphere-Composition of the atmosphere-Atmospheric stability-Temperature profile of the atmosphere-Lapse rates-Temperature inversion-effects of inversion on pollution dispersion. **(8 hours)**

IMPACTS OF CLIMATE CHANGE

Causes of Clmate change : Change of Temperature in the environmen-Melting of ice Pole-sea level rise-Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water Resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for Different Regions– Uncertainties in the Projected Impacts of Climate Change – Risk of Irreversible Changes. **(8hours)**

OBSERVED CHANGES AND ITS CAUSES

Climate change and Carbon credits- CDM- Initiatives in India-Kyoto Protocol-Intergovernmental Panel on Climate change- Climate Sensitivity and Feedbacks – The Montreal Protocol – UNFCCC – IPCC –Evidences of Changes in Climate and Environment – on a Global Scale and in India . **(8 hours)**

CLIMATE CHANGE AND MITIGATION MEASURES

Clean Development Mechanism –Carbon Trading- examples of future Clean Technology – Biodiesel – Natural Compost – Eco- Friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels – Solar Energy – Wind – Hydroelectric Power – Mitigation Efforts in India and Adaptation funding.Key Mitigation Technologies and Practices – Energy Supply – Transport – Buildings – Industry – Agriculture –

Forestry - Carbon sequestration – Carbon capture and storage (CCS)- Waste (MSW & Bio waste, Biomedical, Industrial waste – International and Regional cooperation. **(8hours)**

TEXT BOOK

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

REFERENCES

1. Adaptation and mitigation of climate change-Scientific Technical Analysis. Cambridge University Press, Cambridge, 2006.

2. Atmospheric Science, J.M. Wallace and P.V. Hobbs, Elsevier / Academic Press 2006.

3. Jan C. van Dam, Impacts of "*Climate Change and Climate Variability on Hydrological Regimes*", Cambridge University Press, 2003.

VI SEMESTER

VI SEMESTER CIVIL ENGINEERING
Design of Steel Structures

Course Name	Design of steel structures	Course Code	16CV6DCDSS	SEE Duration	SEE+CIE
Credits	04	L-T-P-S Credits	3:1:0:0	03 Hours	50+50

Course Objective:

To teach the students, the method of design of various steel structural members and their connections.

Course Outcome:

CO1.: Knowledge of limit state design and its techniques.
CO2: An ability to analyse and design structural steel joints.
CO3 : An ability to analyse and design structural steel members subjected to flexure, tension and compression.
CO4: An ability to understand the concepts of plastic analysis and use for the design of structural elements.

Introduction: Advantages and disadvantages of steel structures, Loads and load combinations, Design considerations, Limit state method (LSM) of design, Failure criterion of steel, codes, Specifications and section classification. **04Hours**

Design of Tension Members: Introduction, Types of tension members, Slenderness ratio, Behavior of axially loaded tension members, Modes of failure, Factors affecting the strength of tension members, Design of axially loaded tension members with bolted and welded connection, Lug angles. **06Hours**

Design of Compression Members: Introduction, Behavior of compression members, Sections used for compression members, built up sections, Effective length of compression members, Design of compression members with lacing, Design of simple slab base and gusseted base. **12Hours**

Design of beams: Introduction, Beam sections, factors affecting lateral stability, Behavior of simple rolled steel beams in bending, Design of laterally supported and laterally unsupported rolled steel beams.
Design of Plate Girders: Basic design of plate girders using tension field method (Economical depth, Stiffeners only) **10hours**

Bolted Connections: Introduction, Behavior of bolted joints, Design of Simple joints with ordinary black bolts and High strength Friction Grip Bolts(HSFG), Moment resistant connections(moment parallel and perpendicular to the plane of joint),beam to beam and beam to column connection (framed connection only) **08Hours**

Welded Connections: Introduction, Welding process, Advantages of welding, Types and properties of welds, Types of joints, weld symbols, Weld specifications, Effective areas of welds, Design of welds, Design of Simple joints, Moment resistant connections(moment parallel and perpendicular to the plane of joint),beam to beam and beam to column connection (framed connection only) **06 Hours**

Plastic Behavior Structural Steel: Introduction, plastic theory, Plastic hinge concept, plastic collapse load, conditions of plastic analysis, Theorems of plastic collapse, Plastic analysis of Continuous Beams (No design) **06 Hours**

Note: Study of this course shall be based on IS 800-2007

Text Books:

1. Design of steel structures-N Subramanian,Oxford publishers, Published: 2011
2. Limit state design of steel structures-Duggal,Tata- Mcgraw Hill Publishers, 2nd Edition

Reference Books:

1. Limit state design of steel structures (Based on IS-800-2007 in SI Units)-Dr.Ramchandra and Virendra Gehlot,Scientific Publishers
2. Design of steel structures by Limit state method-S.S.Bhavikatti,I.K.International publishers.
3. Steel structures-Design and practice by N. Subramanian, oxford university press

VI SEMESTER CIVIL ENGINEERING
Design of RC Structures

Course Name	Design of RC structures	Course Code	16CV6DCDRC	SEE Duration	SEE+CIE
Credits	04	L-T-P-S Credits	3:1:0:0	03 Hours	50+50

COURSE OBJECTIVE:
To provide fundamental knowledge of concrete and steel reinforcement used for reinforced concrete design, and knowledge of design methodologies for different load conditions.

COURSE OUTCOME:

CO1: Explain the fundamental principles and procedures in the component design of reinforced structures.

CO2: Apply the principles of analysis of the Indian code design specification, the concepts of strain compatibility and equilibrium concepts to determine the strength of RC members.

CO3: Design of simple RC components as per IS Codes.

Objectives and Methods of Analysis and Design, and Properties of Concrete and Steel: Introduction, Objectives of the Design of Reinforced Concrete Structures, Method of Design, Analysis of Structures, Design Loads, Loads and Forces, Properties of Concrete. Workability and Durability of Concrete, Properties of Steel.

Philosophies of Design by Limit State Method: Introduction, Basic principles of working stress method, Principles of limit state method, Partial safety factors, Characteristic and design loads, Characteristic and design strength, Stress block parameters for limit state of collapse by flexure Ultimate flexural strength of singly reinforced rectangular sections, Doubly reinforced rectangular sections, flanged sections, Ultimate shear strength of RC sections, Ultimate torsional strength of RC sections, Concepts of development length and anchorage. Analysis examples of singly reinforced, Doubly reinforced, flanged sections, Shear strength and development length

Serviceability limit states: General aspects of serviceability, Deflection limit as in IS: code, Calculation of deflection (Theoretical method) Cracking in structural concrete members, Calculation of deflections and crack width.

Design of Beams: General Specification for flexural design of beams-Practical requirements, Size of beam, Cover to reinforcement, Spacing of bars, Design procedures for critical sections for bending moment and shear, Anchorages of bars, Check for development length, Reinforcement requirements, Slenderness limits for beams to ensure lateral stability, Design examples for simply supported and Cantilever beams for rectangular and Flanged sections.

Design of Slabs: General consideration of design of slabs, Rectangular slabs spanning one direction Rectangular slabs spanning in two directions for various boundary conditions. Design of simply supported, cantilever and continuous slabs.

Design of Columns: General aspects, Classifications Effective length of column, Loads on columns, Slenderness ratio for columns, Minimum eccentricity, Design of short axially loaded columns, Design of column subject to combined axial load and uni-axial moment Biaxial moment using SP – 16 charts.

Design of Footings: Introduction, load for footings. Design basis for limit state method, Design of isolated rectangular footing for axial load and uniaxial moment.

Design of Stair cases: General feature, Types of stair case, loads on stair cases, effective span as per IS code provisions, Distribution of loading on stairs, Design of Open Well & Dog Legged Stair case.

TEXT BOOKS

1. Limit State design of reinforced concrete by PC Verghese, PHI-Learning Pvt. Ltd, New Delhi, 2nd edition (2012)

2. Reinforced Concrete Design – S. Unnikrishnan Pillai and Devadas Menon, tata McGraw-Hill Publishing Company Limited, New Delhi., 3rd edition 2009

REFERENCE BOOKS

1.Limit State design of reinforced concrete – BC Punmia, Ashok Kumar Jain and Arun Kumar Jain- Laxmi Publications, New Delhi

2 Reinforced concrete structures - Park and Paulay- John Wiley and sons, Singapore

3. Limit state design of reinforced concrete structures – P Dayaratnam, Oxford and IBH

Publishing company Pvt ltd., New Delhi

4. Design of Reinforced concrete structures – N. Krishna Raju, CBS Publishers, New Delhi

WASTE WATER TREATMENT

Subject	Waste Water Treatment	Sub. Code	16CV6DCWWT	SEE Duration	SEE+CIE
Credits	05	L-T-P-S Credits	2:0:1:2	3 Hrs	50 + 50

COURSE OBJECTIVE:

To provide knowledge about waste water characteristics, their disposal, treatment methods and to design sewers

COURSE OUTCOME:

CO1: Describe strength of waste water and select appropriate treatment and disposal methods
CO2: Explain the concepts of sewage systems and design sewers
CO3: Describe and design various components of waste water treatment facilities

Introduction: Necessity for sanitation, methods of domestic waste water disposal, types of sewage systems and their suitability.

Design of Sewers: Hydraulic formulae for velocity, effects of flow variations on velocity, self-cleansing and non-scouring velocities, design of hydraulic elements for circular sewers flowing full and flowing partially full. (No derivations) **07 Hours**

Materials of Sewers: Sewer materials, shapes of sewers, laying of sewers, joints & testing of sewers, ventilation & cleaning of sewers. **04 Hours**

Sewer Appurtenances: Catch basins, manholes, flushing tanks, oil and grease traps, drainage traps. Basic principles of house drainage. Typical layout plan showing house drainage connections, maintenance of house drainage. **05 Hours**

Waste Water Characteristics: Sampling, significance, techniques and frequency. Physical, chemical and biological characteristics, Aerobic and anaerobic activity, CNS cycles. BOD and COD. Their significance problems. 0**5 Hours**

Disposal of Effluents: Disposal of effluents by dilution, self-purification phenomenon. Oxygen sag curve, Zones of purification, sewage farming sewage sickness, effluent disposal standards for land, surface water & ocean. Numerical problems on disposal of effluents. Streeter Phelps equation. **04 Hours**

Treatment of Waste Water: Flow diagram of municipal waste water treatment plant. Preliminary & primary treatment: Screening, grit chambers, skimming tanks, and primary sedimentation tanks – design criteria & design examples. **05 Hours**

Secondary Treatment Suspended growth and fixed film bioprocess.
Tricking filter–theory and operation, types and designs. Activated sludge process – principle and flow diagram, modifications of ASP, F/M ratio. Design of ASP **05 Hours**

Low cost treatment methods: Septic tank, oxidation pond and oxidation ditches– design. Reuse and recycle of waste water**.** **04 Hours**

Site visit to sewage Treatment plant

Text Books:

1. Sewage disposal and air pollution engineering. S.K.Garg,Khanna publishers, 2015
2. Sewage disposal and engineering. B.C.Punmia.Arihant publications, 2016

Reference Books:

1. Water and waste water engineering vol-II: Fair, Geyer and Okun: John Willey Publishers, New York.
2. Waste water treatment, disposal and reuse: Metcalf and Eddy Inc: Tata McGraw Hill Publications.
3. Manual on waste water treatment: CPHEEO, ministry of urban development, Delhi.

VI SEM CIVIL ENGINEERING

EXTENSIVE SURVEY PROJECT

Sub Code	**16CV6DCESP**	**Total Hrs**	**Field Hours+ 39 Hours**	**L:T:P: S = 1:0:1:2 Credits**
Credits	**4**	**Exam Marks**	**CIE+SEE=50+50**	**Contact hours 3 hrs**

The extensive survey project shall be conducted at a suitable site for a period of one week, where possible arrangement shall be made for all the students and teacher to camp near the project site.

Field data shall be collected using modern surveying tools such as total station, auto levels etc. Students shall be encouraged to down load and process the data each day.

Project could be chosen from the following set.

Projects:

- Housing and town planning
- Hydraulics & Irrigation
- Roads and Bridges
- Water Supply and Sanitation
- Public health
- Infrastructure related projects.
-

Proposed Evaluation: Students are expected to prepare a detailed report giving the introduction, projects details and design for a final viva-voce examination.

VI SEM CIVIL ENGINEERING

SOFTWARE APPLICATION IN CIVIL ENGINEERING

Sub Code	16CV6DCSWL	Total Hrs	26 Hours	SEE Duration	L:T:P credits
Credits	2	Exam Marks	CIE+SEE=50+50	2 hrs	1:0:1

Course outcome:

1. An ability to understand Computational techniques related to civil engineering structural elements.
2. An ability to analyse and design RCC and steel structures using the software tools
3. An ability to model Civil Engineering structural elements using the software tools to understand their behavior

1. Analysis of structural elements such as Beam, column, slab, footing for a given loading and boundary conditions

2. Design of structural members such as Beam, column, slab, footing for given loading and boundary conditions

3. Analysis and design of rolled steel roof trusses

4. To analyse and design a RCC/Steel frame completely

5. FEM modeling of simple structural elements (Beams, columns slabs, trusses, frames, masonry elements, soil behavior etc.,) for different loading and end conditions, to evaluate the load versus deflection diagrams etc.,

MS EXCEL

6. Calculation of areas and volumes for the given data
7. Plotting of different types of graphs for the given data

References:

Training manuals and User manuals

VI SEM CIVIL ENGINEERING
ELECTIVE: THEORY OF ELASTICITY

Course	Theory of Elasticity	Sub. Code	16CV6DETOE	SEE Duration	SEE+CIE
Credits	3	L-T-P-S Credits	3:0::0:0	3 Hrs	50 + 50

Course Objectives:

- Introduce continuum mechanics to students and prepare them to take Finite Element Analysis
- **Course outcome**:
  An ability to
  CO1: Explain the concepts of stress invariants and strains transformations,
  CO2: Discuss stress-strain relations and Torsion of Circular and non-circular sections

1. Concepts of stress at a point and stress tensors, Transformation of stresses, Stress Invariants - Principal stresses, Maximum Shear stresses and their planes (3D problems), Octahedral stress, Hydrostatic state of stress, Equilibrium equations.
2. Concepts of strain at a point and strain tensor, Engineering strain, Transformation of strains, Principal strains, Maximum strains and their planes, Compatibility equations.
3. Constitutive Laws, Generalized Hooke's Law, Stress – Strain relations, Strain – Displacement relations, equilibrium and compatibility conditions in Cartesian and polar co-ordinates in two dimensions, Airy's stress function.
4. Torsion of circular sections, St.Venant's theory, membrane analogy.
5. Stress concentration due to circular holes in plates, effect of concentrated load in straight boundaries.

Text book:

1. Advanced Mechanics of Solids, 3rd edition, L S Srinath, McGraw Hill pub., 2009

Reference Books:

Theory of Elasticity - Timoshenko & Goodier - McGraw Hill
Elasticity tensor, Dyadic and Engineering applications- Chow P.C. & Pagano N.J - D.Von Nastrand
Theory of Elasticity- Sadhu Singh- Khanna Publishers
Theory of Elasticity - Verma P.D.S - Vikas Publishing Pvt. Ltd
Plasticity for Structural Engineers- Chenn W.P and Hendry D.J- Springer Verlag
Continuum Mechanics Fundamentals- Valliappan C.- Oxford IBH Publishing Co. Ltd.,
Applied Stress Analysis- Sadhu Singh- Khanna Publishers
Engineering Solid Mechanics - Abdel Rahman Ragab, Salah E A Bayoumi- CRC press, London
Applied Elasticity- Sitharam T G and Govindaraju- Interline publishing
Advanced Mechanics of Materials- Seely and Smith- John Wiley

VII SEMESTER

Course Name	**REMOTE SENSING AND GIS**	**Course Code**	**16CV7IERSG**	**SEE Duration**	SEE+ CIE
Credits	03	**L:T:P:S**	3:0:0	**3 hours**	**50+50**

COURSE OBJECTIVES

To introduce remote sensing and GIS as a Vital tool for faster decision making. The main aim of the course is to impart knowledge on the concepts and application of remote sensing and GIS for general and specific tasks.

COURSE OUTCOMES

An Ability to

CO1: Explain the principles of Geodatabase

CO2: Discuss the application of multicriteria decision analysis for various issues.

CO3: Recognize the various advances in GIS

CO4: Outline the applications of enterprise and expert GIS

UNIT I

Geodatabase: Types of geodatabase, Advantages of geodatabase, Basic geodatabase structure, Topology, Relational classes, geometric networks, raster data - Creating geodatabase, organizing data, defining databaseStructure - Understanding spatial reference in geodatabase - Modifying spatial domain, Simple feature creationingeodatabase, Creating and editing map topology, Types of geodatabase annotation - Adding behavior to a Geodatabase **6 hrs**

UNIT II

Multi-Criteria Decision Analysis and SDSS: Elements of multi-criteria decision analysis, classification of decision problems, evaluation criteria, hierarchical decision alternatives and constraints, alternatives anddecision variables, deterministic variables, criteria weighting , estimation weights, ranking methods, decisionrules, multi-attribute decision rules, sensitivity analysis, multi-criteria spatial decision support systems (SDSS).

SDSS for location planning, application-specific capabilities; requirements of a SDSS.

8 hrs

UNIT III

Advanced GIS

Introduction to Geographic Resources Analysis Support System (GRASS) GIS Raster data handling Reclassification, recode map algebra Resampling and interpolation of raster data. Overlaying Spatial analysis Neighborhood analysis and cross-category statistics -buffering Cost surfaces --Terrain and watershed analysis –Modeling raster data-Vector data handling-Topological operations -Buffering –Overlay –Dissolve –clip, union intersect –Network analysis–Spatial interpolation–handling lidar point cloud data. **8 hrs**

UNIT IV

Expert GIS: Introduction to concepts of Expert GIS, Data formats, Proprietary file formats, translator and Transfer formats, open formats, standards, metadata, standards gazetteer, XML and GML, Spatial databases, Relational databases, object databases, GIS and databases, advanced database technology, derived mapping –

Generalization, text placement, automated cartography, data from imagery, Web GIS, simple maps in webpages, internet mapping sites, internet softwares, Mobile GIS – positioning, location based services, personal and Vehicle navigation, LBS for mass market, telematics. –Applications **6 hrs**

UNIT V

Enterprise GIS: User need assessment; old and new spatial database models, SDE layers, Geo database, Architecture design, capacity planning (Hardware), security planning, RDBMS software selection, GIS software selection, planning for migration. Enterprise GIS management. **6hrs**

UNIT VI

Case Studies: GIS analysis in transportation, GIS analysis in water management, urban development, environmental analysis, hydrological modeling, Habitat suitability modeling, virtual cities 3D modeling and visual simulation, Automata based models of Urban system, Other applications. **6hrs**

TEXT BOOKS

1.GIS and Multi-criteria decision analysis by Jacek Malczewski, John Wiley and sons.2015

2.Concepts and Techniques of Geographic Information Systems CP Lo Albert K W Yeung, 2015 Prentice Hall of India.

3.Geographic Information Systems – An introduction by Tor Bernhardsen, John Wiley and Sons, Inc,New York, 2014.

REFERENCE BOOKS

1.Remote sensing and Image interpretation by Thomas M. Lillesand and Ralph W. Kiefer, JohnWiley and Sons Inc., New York, 2014

2.Geographical Information Systems – Principles and Applications, Volume I edited by David J.

Maguire, Micheal F Goodchild and David W Rhind, John Wiley Sons. Inc., New York 2014

3.Geographical Information Systems – Principles and Applications, Volume II edited by David J.

Maguire, Micheal F Goodchild and David W Rhind, John Wiley Sons.Inc., New York 2014.

.nptel.ac.in/courses/105102015/50

. www.gistutor.com › ESRI ArcGIS

Course	Finite Element Method Of Analysis	Course Code	16CV7IEFEA	SEE Duration
Credit	03	L-T-P	3:0:0	3hrs
Total Hrs	39 Hrs	SEE+CIE	50+50	

Course Objectives:

The objective of the course is to teach the fundamentals of finite element method with emphasize on the underlying theory, assumption, and modeling issues associated with solids and structures.

Course Outcomes: At the end of the course, the student will be able to:

CO1 **APPLY** basics of Theory of Elasticity to continuum problems.
CO2 **FORMULATE** finite element like bar, truss and beam elements for linear static structural analysis.
CO3 **DEVELOP** finite element models for 2D elements.
CO4 **COMPUTE** Mass matrices for bar and beam elements.
CO5 **SOLVE** problems of limited complexity in Linear static and Dynamics of structures.
CO6 **UTILIZE** finite element software to simulate practical problems.

UNIT -1

Fundamental concepts: Principles of Elasticity: Concept of stress – Stress at a point – equilibrium equations. Strain displacement relationships in matrix form – Constitutive relationships for plane stress and plane strain. 03 Hrs

Introduction to Finite element method (FEM), Basic concept, Historical background, Engineering applications, Classification of elements, Banded matrix and node numbering, Steps for solving problems using FEM. Commercial packages – Preprocessor, Solver and Post processor. 02 Hrs

Approximate method of structural analysis – Rayleigh-Ritz method, Galerkin's method, Finite element method, etc. Rayleigh-Ritz method applied to simple axially loaded members and beam. 04Hrs

UNIT - 2

One dimensional problems: Finite Element Modeling using two noded bar element– Definition of generalized coordinates and identification of degrees of freedom. Polynomial based interpolation model, Convergence criteria, Shape functions, Stiffness matrix by minimum potential energy principle, Properties of stiffness matrix, Global stiffness matrix, Consistent load vectors for traction and body force and Temperature effects. Numerical problems on simple bars subjected to forces and temperature change for displacements, reactions and stresses. 06 Hrs

UNIT - 3

Analysis of Trusses and beams: Formulation of stiffness matrix for trusses. Hermite shape functions, Formulation of stiffness matrices for beams, Consistent load vectors for uniformly distributed load and triangular load. Numerical examples on beams and Trusses. 06 Hrs

UNIT - 4

Two dimensional problems: Nodal displacement parameters, PASCAL's triangle – geometric isotropy. Shape functions in Cartesian and Natural coordinates for three noded triangular (CST) and four noded quadrilateral elements. Concept of isoparametric elements, Development of strain-displacement matrix and stiffness matrix, Jacobian matrix, consistent nodal load vector. 07Hrs

Sub-parametric and Super-parametric elements and Numerical integration using gauss quadrature approach. Higher order elements – Serendipity and Lagrangian family of Finite elements. 04Hrs

UNIT - 5

Structural dynamics: Steps in FEM applied to problems in Structural dynamics – Consistent and lumped mass matrices – evaluation of Eigen values and Eigen vectors for simple bars and beams. 07 Hrs

TEXT BOOKS

1. Krishnamoorthy C.S., "Finite Element Analysis", 2nd ed., Tata-McGraw-Hill Education Pvt. Ltd., 2004.
2. Desai.Y.M.,Eldho.T.I., and Shah. A.H., "Finite Element Method with Applications in Engineering", Pearson publication, 2011.

REFERENCE BOOKS

1. Chandrupatla T.R., and Belegundu A.D., "Introduction to Finite Elements in Engineering", 2nd ed., Prentice Hall, India, 2003.
2. Zienkiewicz O.C., "The Finite Element Method – Basic & Fundamentals", 7th ed., Book-Aid International, 2013.
3. Reddy J.N., "An Introduction to the Finite Element Method", 3rd ed., McGraw-Hill, 2005.
4. Cook R.D., "Concepts and Applications of Finite Element Analysis", 4th ed., John Wiley & Sons, 2004.
5. Rajashekaran S., "Finite Element Analysis in Engineering Design", Wheeler Publishing, 2006.
6. Logan D.L., "First Course in the Finite Element Method", 4th ed., Cengage Learning, 2007.
7. Hughes T.J.R., The Finite Element Method: Linear Static and Dynamic Finite Element Analysis", 1st ed., Dover Publications, 2000

E-Books / Web References

http://nptel.ac.in/courses/112104115/

MOOCs

1. Finite Element Method (FEM) Analysis and Applications https://www.edx.org/course/finite-element-method-fem-analysis-tsinghuax-70120073x
2. A Hands-on Introduction to Engineering Simulations https://www.edx.org/course/hands-introduction-engineering-cornellx-engr2000x

Alternate assessment tool (AAT) for CIE: Utilization of finite element software to simulate practical problems – ABAQUS/ANSYS.

Scheme of Examination: Answer any **Five** full questions out of **seven** questions.**Note:** At least one question from each units.

Course Name	Design and Drawing of RCC and Steel Structures	Course Code	16CV7DCDDG	SEE Duration	SEE+CIE
Credits	4	L-T-P-S	2:0:2:0	4 Hours	50+50

Course Objective:

To provide knowledge of design and detailing of RCC and Steel Structural components

Course Outcomes:

An ability to:

CO1: Design and prepare working drawings of RCC Structural components

CO2: Design and prepare working drawings of Steel Structural components

PART A: RCC Structures

Given data **-**Drafting only

1. Beam slab floor system consisting of one way and two-way slabs and continuous beam (1- Sheet) **6 Hrs**

Design and Drawing

2. Square, Rectangular and Circular water tanks (3 – Sheets) **8 Hrs**
   (2-Isolated Column & footing with eccentricity & rectangular combined footing(2 Sheets) **8 Hrs**
3. Cantilever and counterfort retaining walls (2 – Sheets) **8Hrs**

PART B: Steel Structures

Given data-Drafting only

1. Beam to Beam and Beam to column (framed and seated), Bolted and welded connections. (2- Sheets) **6Hrs**
   Design and Drawing

2.Column and column bases (slab base & gusseted base) (2- Sheets) **8 Hrs**

3.Simple and Built up beams and welded plate girder (1- Sheet) **8 Hrs**

TEXT BOOKS

1. N. Krishnaraju, Structural Design & Drawing Reinforced Concrete & Steel, University Press.
2. S. Krishnamoorthy, Structural Design and Drawing (Concrete Structures), CBS publishers, New Delhi. Tata McGraw publishers.
3. N. Subramanian, Design of Steel Structures, Oxford University, Press.

REFERENCE BOOKS:

9. IS: 456-2000, IS: 800–2007, SP-16, SP-34, SP 6 (1) – 1984 or Steel Table.
10. B.C. Punmia, Reinforced Concrete Structures,Laxmi Publishing Co.
11. S.N.Sinha, Reinforced Concrete Design, McGraw-Hill Education
12. Negi, Design of Steel Structures, Tata McGraw Hill Publishers.

Question paper pattern:

To answer question no. 1 or 2 completely.

Question no. 1 Part A: 70 marks, Part B – 30 marks.

Question no. 2 – Part B: 70 marks, Part A – 30 marks.

Course Name	Analysis and Design of PSC members	Course Code	16CV7DCPSC	SEE Duration	SEE+CIE
Credits	4	L:T:P:S	4:0:0:0	3 hours	50+50

Course Objectives

To understand the fundamental concept of pre-stressing and to analyze and design flexural members

Course outcome:

An ability to

1. Comprehend pre-stressing and its techniques.

2.Evaluate the nature of stresses in the flexural member.

3.Design the flexural member.

Introduction, Materials of pre stressing, Pre stressing systems

Basic concepts of pre stressing, historical development need for high strength of steel and concrete, terminology, advantages and applications. High strength concrete and high tensile steel Tensioning device, post tensioning systems, thermo electric pre stressing, chemical pre stressing. **7 hrs**

Analysis of PSC beams

Basic assumptions, analysis of pre-stress, resultant stresses at a section, pressure line or thrust line. Concept of load balancing, stresses in tendons, cracking moments **10 hrs**

Losses of pre stress, Deflection of pre-stressed concrete members

Nature of losses of pre stress, losses due to elastic deformation, loss due to shrinkage, creep, relaxation of stresses in steel, friction, anchorage slips, total losses allowed for design. Factors influencing the deflections, Importance of control of deflection. Short term and long term deflections. 0**8hrs**

Flexure and shear strength of pre stressed concrete sections

Types of flexural failure, strain compatibility, code procedures, Full and partial pre-stressed sections. Principal stresses, design of section for Flexure, ultimate shear resistances, design of shear reinforcements**.** **10hrs**

Transfer of pre-stress in PSC members

Transmission of pre stressing force by bond, transmission length, bond stresses, end zone reinforcement, flexural bond stresses as per code practice. **5hrs**

Anchorage zone stresses, Design of pre tensioned and post tensioned flexural members

Introduction, stress distribution in end block, investigation of anchorage zone stresses, anchorage reinforcement. Dimensioning of flexural members, estimation of self-weight of the beam, design of post and pre tensioned beams, design of partially pre stressed members**. 12hrs**

Scheme of Question paper: The examiner has to set a total of six questions choosing one from each unit, which includes a compulsory question covering the entire syllabus, and the student has to answer five full questions.

Text Books

1)Pre stressed concrete by N.KrishnaRaju, 5thEdnTataMcgraw-Hill Publishing company limited

2)Pre stressed concrete by P.Dayaratnam,4thEdn, Oxford &IBH Publishers

References

1)Pre-stressed concrete, Analysis and Design Fundamentalsby Antoine Ewaaman, McGraw Hill Publishers

2)Pre-stressed concrete by S.K.Mallik&A.P.Gupta, Oxford & IBH Publishing Co.

3)Pre-stressed concrete bridges by V.N.Vazirani and S.P Chandola 3rded. Khanna Publishers, New Delhi

4)Pre-stressed concrete by G.S.Pandit&Gupta CBS Publishers, New Delhi

Course Name	Quantity Surveying and Costing	Course Code	16CV7DCQSC	SEE Duration	SEE+CIE
Credits	06	L-T-P-S	3:1:0:2	4 Hours	50+50

COURSE OBJECTIVES:

To provide basic knowledge of estimation and analyse the methods of estimation for various civil engineering works

COURSE OUTCOMES:

CO1: Estimate the material quantities of various Civil Engineering works

CO2: Apply Cost Estimate

CO3: Perform Rate analysis

CO4: Write specifications for various items

INTRODUCTION:

Estimation, types of estimation, approximate methods of estimation, Detailed methods of estimation, cost of materials and labour. **4Hrs**

ESTIMATION OF BUILDINGS:

Introduction, terms used in estimation, units of measurement, abstract. Methods of taking out quantities– center line method, long wall and short wall method. Preparation of detailed and abstract of estimates for the following Civil Engineering works – Masonry buildings with flat roofs. **RCC structural elements such as slabs, column, isolated footings and beams**. **15 Hrs**

ESTIMATION OF OTHER CIVIL WORKS:

Steel trusses, RCC slab culvert, manhole and septic tanks. **8 Hrs**

EARTHWORK ESTIMATION:

Methods of earthwork estimation. Estimation of earthwork of roads by mid sectional area method, mean sectional area method, trapezoidal and prismoidal formula methods.

8 Hrs

SPECIFICATIONS:

Introduction, Definition of specifications, objectives of writing specifications, essentials in specifications, general and detailed specifications of common item of works in buildings only. **8 Hrs**

ANALYSIS OF RATES: Definition. Working out quantities and rates for the following standard items of works – Earth work in different types of soils**, plain cement concrete of different mixes**, **brick and stone masonry, flooring**, plastering, RCC works.

12 Hrs

TEXT BOOK

1. Estimating and Costing in Civil Engineeringby B. N. Dutta, UBS Publishers and distributors Pvt. Ltd, New Delhi

REFERENCE BOOKS:

1. Quantity Surveying-P.L.Basin S. Chand: New Delhi.
2. Estimating & Specification - S.C. Rangwala:: Charotar publishing house, Anand.
3. Text book of Estimating & Costing- G.S. Birde, DhanpathRai and sons : New Delhi.
4. A text book on Estimating, Costing and Accounts- D.D. Kohli and R.C. Kohli S. Chand : New Delhi.

Course Name	Transportation Systems	Course Code	16CV7DCTRS	SEE Duration	SEE+CIE
Credits	03	L-T-P-S	3:0:0:0	3 Hours	50+50

COURSE OBJECTIVES:

To provide the basic knowledge of Transportation systems, Components of permanent way, types of rails and its components, Design of Rail Geometrics, to understand the Layout of an airport and its classification, Design of Runway and Taxiways and Introduction to harbor and tunnel engineering, to provide the basics of traffic engineering and introduction to intelligent transportation systems.

COURSE OUTCOMES:

CO1: Identify the components of permanent way and their required quantity of materials for construction.

CO2: Design the geometrics of a Railway Track.

CO3:Calculate the corrected runway length and taxiway geometrics.

CO4: Recognise the fundamentals of Harbour and Tunnel Engineering.

CO5: Explain the concepts of Traffic Engineering.

Introduction: Role of railways in transportation, Indian Railways, selection of routes.

02 Hours

Permanent way: Introduction, requirements for an ideal permanent way, typical cross sections of single and double line B.G. tracks – in cutting , embankment. Gauges and types of gauges with dimensions. Coning of wheels and tilting of rails. Problems on these. Rails functions requirements, types of rail sections.

04 Hours

Ballast and Sleepers: Functions, requirements, types, track fittings and fasteners, calculation of quantity of materials needed for laying a track.

Traction and tractive resistances, tractive power, Hauling capacity.Problems on above. **05 Hours**

Geometric Design of Track – Necessity of Geometric Design of railway track, gradient and types of gradient. Speed of train, curve, transition curve, super elevation, cant-deficiency, negative cant- speed calculation based on Indian Railways Formulae for High speed tracks only-problems on above. **08 Hours**

AIRPORT, TUNNELS & HARBOUR ENGINERING

Introduction: Introduction to airport engineering, Layout of an airport with component parts and functions of each, Aircraft Characteristics – Airport Classifications - Site selection-Regional Planning. **03 Hours**

Runway Design- Orientation of runway by using wind rose diagram, the runway configurations- basic length of the runway –corrections to runway length by ICAO and FAA specification- runway cross sections- problems on above. **06 Hours**

Taxiway Design: Factors affecting the layout of the taxiway-geometrics of taxiway-design of Exit taxiways- ICAO Specifications. Problems on above. **03 Hours**

Tunnels: Introduction – types of tunnels, advantages and disadvantages. **02 Hours**

Harbours: Introductions, classifications, natural phenomenon affecting the design of harbour viz. wind, wave, tide and currents. Harbor layout with component parts **02 Hours**

Introduction to Traffic Engineering: Definition, objectives and scope of Traffic Engineering, factors affecting road traffic; Concepts of passenger car units for mixed traffic flow. **04 Hours**

A Site visit is recommended

Text Books:

1. Saxena and Arora, "Railway Engineering", DhanpatRai and Sons, New Delhi.
2. Khanna, Arora and Jain – Airport Planning and Design – NemchandRoorkee.
3. SrinivasanRHarbour, Dock & Tunnel Engineering, Charotar Publishing House.

4. Kadiyali, L.R. `Traffic Engineering and Transport Planning', Khanna Publishers
5. Khanna, S.K. Justo,C.E.G. and Veeragavan. A " Highway Material Testing", Nemchand and Bros, Roorkee, 2009

DEPARTMENT ELECTIVES

VII SEMESTER

Course Name	**Advanced Design of RC Structures**	Course Code	**16CV7DEADR**	SEE Duration	SEE+CIE
Credits	**03+00**	L-T-P-S	**3:0:0:0**	**3 Hours**	**50+50**

Course Objectives:

To provide the knowledge of Design of RCC Structures like water tanks, different types of footings and retaining walls.

Course Outcome:

An ability to:

CO1: Analyze and design the components of water tank and curved beams

CO2: Analyze and design the components of slabs and foundations**.**

Design of Water Tanks:

Design of RCC OHT (Rectangular, circular) **8 Hours**

Beams curved in plan:

Introduction–Design Principles–Structural Design of beams curved in plan of circular and rectangular types. Deep Beams: Introduction – flexural and shear stresses in deep beams.
8 Hours

Flat slabs:
Introduction, Components- I.S. Code Provisions – Design methods, Design for flexure and shear. **6 Hours**

Grid Floor Slabs:

Design of grid floor slabs by approximate methods **6 Hours**

Design of Culverts and Flyovers
Box and slab culvert, flyovers. **8 Hours**

TEXT BOOKS

1. Varghese P.C, Advanced Reinforced Concrete, Prentice Hall of India.
2. B C Punmia, Reinforced Concrete Structures, Vol-II, Laxmi Publications (P) Ltd, New Delhi.

REFERENCE BOOKS

1. P C Varghese, Limit State Design of Reinforced Concrete Vol-II, Prentice Hall of India (P) Ltd, New Delhi.
2. Jain A.K, Limit State Design of Reinforced Concrete, Nemchand & Bros., Roorkee.
3. Vazirani V N & M M Ratwani, Analysis of Structures- Vol-II, Khanna Publishers, New Delhi.
4. S. S. Bhavikatti, Advanced RCC Design-Vol-II, New Age International Publication, New Delhi.
5. IS Codes: IS: 456, IS:875, SP:16, SP:34.
6. H.J. Shah, Reinforced Concrete, Charoatr Publishers.

E-book

1. NPTEL-Course Material-nptel.ac.in.

Course Name	**Advanced Foundation Design**	Course Code	**16CV7DEAFD**	SEE Duration	SEE+CIE
Credits	**03**	L-T-P-S	**3:0:0:0**	**3 Hours**	**50+50**

Course Objectives:

Understand the need for having foundation and their types to suit the practical requirements. Develop an understanding about the requirements of foundations for their satisfactory performance.

Course Outcomes:

An ability to

CO1: Classify and suggest foundation type for various field and loading conditions, understand the basic requirements of a satisfactory foundation and the determinants of foundation location and depth, and proportion shallow foundations.

CO2: Estimate individual vertical and lateral pile load capacity, pile group capacity, and pile group efficiency.

CO3: Explain the causes of expansive nature of clays, simple methods to assess the swelling potential and methods to prevent and overcome swelling of expansive clays

SHALLOW FOUNDATIONS

Introduction, Types of shallow foundations. Basic requirements of satisfactory foundation - Location and depth criterion, stability criterion, settlement criterion. Determination of foundation location and depth. Bearing capacity theories-Terzaghi, Meyerhof, Skempton, Vesic and Brinch Hansen. Settlement of shallow foundation, types-immediate, consolidation and differential settlements. Principles of design of footing, proportioning of isolated, combined rectangular and trapezoidal footings (proportioning only) **12 hours**

PILE FOUNDATIONS

Introduction, Necessity of pile foundation, classification. Load carrying capacity by dynamic formula- Engineering News formulae and Hiley's formulae, static method, Correlations with SPT and CPT, Pile load test. Negative skin friction, pile groups, group action of piles in sand and clay, group efficiency, Concepts of Wave Equation Analysis (WAP) and Case Method Analysis by Wave Equation Analysis (CAPWAP) of Piles. Pile Driving Analyser(PDA) and Pile Integrity Test (PIT) **12 hours**

LATERALLY LOADED PILE FOUNDATIONS

Pile and pile groups subjected lateral loads. Batter piles, response to shear and moment loads, boundary conditions. Methods of design of laterally loaded vertical piles. Lateral load capacity by Reese and Matlock method (Elastic method) and Broms method (plastic method) **12 hours**

FOUNDATIONS ON EXPANSIVE SOIL

Introduction, Identification, Mineral structure, free swell test, Index properties of expansive soils, Definition of swell pressure, swell potential, their determination, CNS layer, foundation treatment for structures in expansive soil **3hours**

TEXT BOOKS

1. Murthy V.N.S., (2007) "Advanced Foundation Engineering", 1st Edition, C.B.S Publishers, Bangalore
2. Varghese P.C., (2007) "Foundation Engineering"- Prentice hall of India, New Delhi

REFERENCE BOOKS:

1. Bowles J.E. (1988), "Engineering Properties of Soil and Their Measurements", McGraw Hill Book Co. New York.
2. Braja, M. Das (2010), "Principles of Foundation Engineering", Seventh Edition, World Press.
3. Donald Coduto P (1994) "Foundation Design-Principles and Practices", Prentice Hall.
4. Relevant B.I.S codes.

E-BOOKS

1. http://nptel.ac.in/courses/105107120/

Course Name	**Geometric Design of Roads**	Course Code	**16CV7DEGDR**	SEE Duration	SEE+CIE
Credits	**03**	L-T-P-S	**3:0:0:0**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

To understand the design aspects of road geometrics to address the practical problems in highway engineering.

COURSE OUTCOME:

An ability to

CO1: select appropriate cross sectional elements of a roads

CO2: Analyse the horizontal alignment of a roads

CO3: Analyse the vertical alignment of a roads

CO4: Design various types of intersections of a roads

INTRODUCTION:

Importance of Geometric Design, Geometric Controlsand Criteria as per IRC and AASHTO standards and specifications, **PCU Concepts, factors controlling PCU for different design purpose 02 Hours**

CROSS SECTIONAL ELEMENTS:

Pavement surface characteristics – friction – skid resistance–Problems – pavement unevenness - light reflecting characteristics, Camber – objectives – types of camber – methods of providing cambers in the field – problems, Carriage way, Kerbs, Medians, Road margins, Roadway, Right of way, Design of Road humps as per latest IRC provisions. **08 Hours**

SIGHT DISTANCE:

Importance-Types, Stopping Sight Distance, Overtaking Sight Distance, Criteria for Sight Distance requirements, Sight distance at uncontrolled intersection, derivation, factors affecting sight distance, IRC standards and problems on above. **06 Hours**

HORIZONTAL ALIGNMENT:

Definition, Design Speed, Horizontal Curves, Superelevation, Radius of Horizontal Curve, Assumptions – problems – method of providing super elevation for different curves,

Widening of Pavement on Horizontal Curves – objectives – Mechanical widening – psychological widening, Horizontal Transition Curve – objectives – Ideal requirements – Types of transition curve – Method of evaluating length of transition curve, Set-back distance on horizontal curve, **Curve Resistance** and problems on above**08 Hours**

VERTICAL ALIGNMENT:

Gradient – Types of gradient – Design criteria of summit and valley curve – Design of vertical curves based on SSD – OSD – Night visibility considerations – Design standards for hilly roads – problems on the above. **08 Hours**

INTERSECTION DESIGN:
Principle – At-grade and Grade separated junctions – Types – Un-channelized Intersections, Channelized Intersections, **Rotary Intersection – Problems, Signalized Intersections. 06 Hours**

Text Books:

1. S. K. Khanna, C. E. G. Justo and A. Veeraragavan, "Highway Engineering", Revised 10th Edition, Nem Chand and Bros, Roorkee, 2014.
2. R. Srinivasa Kumar, "Textbook of Highway Engineering", Universities Press (India) Private Ltd., 2012.

REFERENCE BOOKS:

3. L. R. Kadiyali& N. B. Lal, "Princple and Practice of Highway Engineering", Khanna Publications, 2005.
4. Relevant IRC Publications –such as IRC99, IRC-35, IRC-82, etc

E-BOOKS

1. nptel.ac.in/downloads/105101087/
2. http://freevideolectures.com/Course/91/Introduction-to-Transportation-Engineering/23

Course Name	**Groundwater Hydrology**	Course Code	**16CV7DEGHY**	SEE Duration	SEE+CIE
Credits	**03**	L-T-P-S	**3:0:0:0**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

The objective of this course is to understand the ground water availability, flow and storage with relevant techniques of practical relevance.

COURSE OUTCOME:

An ability to

CO1: Explain the fundamental concepts of the occurrence and movement of groundwater

CO2: Estimate the ground water flow rate and flow direction using modeling techniques

CO3: Estimate the yield from a well and analyse the performance of a recharge well

CO4: Analyse the movement of pollutants in groundwater and explain the freshwater and groundwater interface

CO5: Explain various surface and subsurface groundwater investigation methods

INTRODUCTION:

Groundwater utilization &historical background, groundwater in hydrologic cycle, groundwater budget, and groundwater level fluctuations **3 Hrs**

OCCURRENCE AND MOVEMENT OF GROUNDWATER:

Origin & age of ground water, rock properties affecting groundwater, groundwater column, zones of aeration & saturation, aquifers and their characteristics/classification, groundwater basins & springs,

Darcy's Law, permeability & its determination, Dupuit assumptions, Groundwater flow rates & flow directions, general flow equations through porous media, Groundwater Interaction with Streams and Lakes **9Hrs**

WELL HYDRAULICS:

Steady/ unsteady, uniform/ radial flow to a well in a confined/ unconfined /leaky aquifer, partially penetrating/horizontal wells, testing for yield, Hydraulics of recharge wells. Concept & methods of artificial ground water recharge, wastewater recharge for reuse **10 Hrs**

POLLUTION AND QUALITY ANALYSIS OF GROUNDWATER:

Sources of groundwater pollution, advection and dispersion, criteria & measures of ground water quality, ground water salinity, groundwater remediation 0**4 Hrs**

SALINE WATER INTRUSION IN AQUIFERS:

Ghyben-Herzberg relation between fresh & saline waters, shape & structure of the fresh & saline water interface, upcoming of saline water, saline water intrusion control **6 Hrs**

SURFACE/ SUB-SURFACE INVESTIGATION OF GROUND WATER:

Geological /geophysical exploration/ remote sensing / electric resistivity /seismic refraction based methods for surface investigation of ground water, test drilling & ground water level measurement, sub-surface ground water investigation **7 Hrs**

TEXT BOOKS

1. Todd D.K., Ground Water Hydrology, John Wiley and Sons, 2000.
2. K. R. Karanth, "Hydrogeology", TataMcGraw Hill Publishing Company.

REFERENCE BOOKS:

1. Raghunath H.M., Ground Water Hydrology, Wiley Eastern Ltd., Second reprint, 2000.
2. Bear J., Hydraulics of Groundwater, McGrow-Hill International, 1979.
3. Willis, R. and W.W.G. Yeh, Groundwater Systems Planning and Management, Prentice-Hall, 1987.
4. S.P. Garg, Groundwater and Tube Wells, Oxford & IBH Publishing Co., 1993.

Course Name	**Industrial Waste Water Treatment**	Course Code	**16CV7DEIWW**	SEE Duration	SEE+CIE
Credits	**03**	L-T-P-S	**3:0:0:0**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

The principal objective of Industrial wastewater treatment is generally to allow industrial effluents to be disposed of without danger to human health or unacceptable damage to the natural environment. The main aim of this course is to impart knowledge on the concept and application of industrial pollution prevention, cleaner technologies, industrial wastewater treatment and disposal of effluents.

COURSE OUTCOME:

An ability to

CO1: Describe the effects of industrial waste water on streams and treatment plants.

CO2: Explain the process of natural purification of streams and various pre-treatment methods.

CO3: Recognize sources, characteristics and treatment methods of industrial waste water.

INTRODUCTION:

Importance of treatment of industrial waste water, Difference between domestic and industrial wastewater, effects on streams and on Municipal Sewage treatment plants, and receiving water bodies. **6 Hours**

NATURAL PURIFICATION STREAMS:

Stream quality, dissolved oxygen Sag curve in Streams, Stream sampling, effluent and stream standards and legislation to Control water pollution. Streeter-Phelps formulation, Numerical problems on DO prediction. 0**6 Hours**

PRETREATMENT OF WASTE WATER:

A number of strategies will be examined for the pretreatment/treatment of Industrial waste water. The effects of various pretreatment methods are discussed independently and in

combination. Pre-treatment method includes-Volume reduction, Strength reduction, Neutralization, Equalization and Proportioning. 0**8 Hours**

TREATMENT METHODS:

Removal of Inorganic, Organic solids, suspended and colloidal solids, Treatment and disposal of sludge Solids. 06 **Hours**

COMBINED TREATMENTMETHODS:

Feasibility of combined treatment of industrial raw wastewater with Domestic Wastewater, Discharge of raw, partially treated and completely treated wastewaters to streams.
06 **Hours**

Case studies

Characteristics and Composition of waste water and Manufacturing processes of Industries like Paper and pulp, Cotton textile industry; Tanning Industry, cane sugar industry & distillery industry; Dairy industry; Steel and cement Industry, Pharmaceutical Industry.
08 **Hours**

TEXT BOOKS:

1. M.N.RAO AND A.K.DATTA (2015) - Wastewater Treatment.
2. Nemerow N.L., (2006) – Industrial Wastewater Treatment- Contemporary New York. Practice and Vision for the Future, Elsevier Science and technology.

REFERENCE BOOKS:

1. Ross **R.D. (1968), "Industrial Waste Disposal", Reinhold Environmental Series,**
2. Mahajan (1984) –" Pollution control in Process industries". TMH, New Delhi.
3. G.L.KARIA AND R.A.CHRISTIAN (2008) - Wastewater Treatment-concepts and Design Approach PHI learning, New Delhi-110001.
4. Eckenfelder (2000), "Industrial Water pollution Control"- McGraw hill Company, New Delhi American Chemical Society, Washington D.C. USA.

Course Name	**DESIGN AND DRAWING OF BRIDGES& IRRIGATION STRUCTURES**	Course Code	**16CV7DEDDB**	SEE Duration	SEE+CIE
Credits	**03**	L-T-P-S	**2:0:1:0**	**3 Hours**	**50+50**

Course Objectives:

To enable the students to design basic types of bridges and irrigation structures and to prepare their drawings.

Course Outcomes:

An ability to:

CO1: Design and Draw different types of bridges.

CO2: Design and draw major hydraulic structures.

PART-A : Bridges

Introduction - Standard Specifications for Road Bridges – Indian Road Congress Standards – Carriage way Width & clearances – Design Loads – IRC Standard live loads – Basic Design Principles of Bridge Sub-Structures Design of Reinforced cement concrete slab culvert , Design of deck slab using Piguard's curves.

Bridge drawing using the data given for

a) RCC T – Beam and slab bridge

b) Steel Plate Girder Bridge for railways.

c) Slab culvert

PART –B IRRIGATION STRUCTURES

Design and Prepare detailed drawings of major hydraulic structures associated with irrigation. Drawing will be done to details furnished

a). Surplus weir

b). Canal Regulator

c). Canal drop

Text Book

1. N.KrishnaRaju, "Design of Bridges" Oxford & IBH Publishing Ltd. 4th Edition - 2009.

2. Ponnuswamy "Bridges Engineering" Tata McGrawHill– 2nd Edition, 20071. Arora KR "Irrigation Water Power & Water Resources Engineering"- - Standard Publishers Distributors – 2010.

3. C Satyanarayana Murthy "Water Resources Engineering: Principles and Practice" - New Age International Publishers - 2000.

4. P.N. Modi, "Irrigation, Water Resources, and Water".

5. R.K. Sharma "Text Book of Irrigation Engineering and Hydraulic Structures" - Oxford and IBH Publishing Co., New Delhi.

6. B.C. Punmia and PandeLal, "Irrigation and Water Power Engineering" - Laxshmi Publications, New Delhi – 2009.

Question paper pattern:

Q1 is compulsory and answer any one full question from Q2 and Q3

Q1 – Theory questions for 30 marks from both bridge and irrigation.

Q2 – Part-A bridge drawing – 40 marks, Part B – Irrigation Drawing – 30 marks

Q3 – Part-A bridge drawing – 40 marks, Part B – Irrigation Drawing – 30 marks

BMS COLLEGE OF ENGINEERING, BANGALORE-560 019
(Autonomous College under VTU)

DEPARTMENT OF CIVIL ENGINEERING

Course Name	**Structural Dynamics**	Course Code	**16CV7DESDY**	SEE Duration	SEE+CIE
Credits	**03**	L-T-P-S	**2:1:0:0**	**3 Hours**	**50+50**

Course Objective:

- Enable the students to understand time dependent response of linear systems
- To enable students to learn the physical behaviour of vibrating systems through experimental modules

Course outcomes:

An ability to

1. Compute natural frequency and free vibration response of SDOF systems
2. Set-up the equation of motion and obtain the Dynamic magnification factor of SDOF systems subjected to harmonic inputs
3. Set-up equation of motion of free-vibration response of MDOF systems and continuous systems, solve them to obtain natural frequencies (Eigen values) and mode shapes (Eigen vectors)
4. Conduct free vibration tests to obtain natural frequency and damping

1. **Introduction:** Introduction to Dynamical problems in Civil Engineering, Concept of degrees of freedom, D'Alembert's principle, principle of virtual displacement, energy principles
2. **Dynamics of Single-degree-of-freedom systems**: Mathematical models of un-damped and damped SDOF system, Free vibration response of damped and un-damped systems, response to harmonic loading, support motion, evaluation of damping, vibration isolation, transmissibility, response to periodic forces. Numerical methods applied to SDOF, Direct integration and Duhamel integral, principle of vibration-measuring instruments– seismometer and accelerometer
3. **Dynamics of Multi-degree freedom systems and continuous systems**: Mathematical models of un-damped and damped MDOF systems, Free vibration of un-damped MDOF systems - Natural frequencies and mode shapes – orthogonality conditions, free vibration of damped MDOF systems, modal analysis – free and forced vibration with and without damping. Introduction to dynamics of continuous systems - free flexural vibration response uniform beams with various boundary conditions
4. **Introduction to experimental dynamics:** Free vibration - tests on SDOF and MDOF systems to obtain natural frequencies and mode shapes, obtaining damping through logarithmic decrement

Text Books:

1. *Mario Paz* , Structural Dynamics – Theory and computation, 4th edition, , Kluwer publication
2. *William T Thomson* ,Theory of Vibrations with application, 5th edition, , Pearson publication

Reference Books:

Anil K. Chopra ,Dynamics of Structures - -Prentice Hall of India

R.W. Clough &J.Penzien ,Dynamics of Structures --McGraw Hill

John M Biggs ,Introduction to Structural Dynamics--McGraw Hill pub

Schaum's outline series – Machanical vibrations-S Graham Kelly-McGraw Hill, India

M Mukhyopadhyay, Structural Dynamics--CRC Press, India

Subject	**MAJOR PROJECT (Phase-1)**	**Sub. Code**	**16CV7DCMAP**	
Credits	**02**	**SEE + CIE**	**50+50**	

Course Outcomes:

CO1: Identify a current problem through literature/field./case studies and define the background objectives and methodology for solving the same.

CO2: Write report and present it effectively.

The phase 1 of the project shall comprise of

- Problem identification in close collaboration with industry
- Literature Survey
- Deriving work content and carry out of project requirement analysis
- Submission of interim report
- Presentation to an expert committee

Evaluation guidelines to be developed

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VIII SEMESTER B.E

Course	**Occupational Safety And Health Administration**	**course Code**	**16CV8IEOSH**	**SEE Duration**
Credits	**03**	**L:T:P**	**3:0:0**	**3 Hrs**
Total Hrs.	**40**	**SEE+CIE**	**50+50**	

COURSE OBJECTIVES:

To introduce occupational safety and health as a vital tool for enforcing safe working conditions. The main aim of the course is to impart knowledge on the concept and application of safety and health issues at work environment.

COURSE OUTCOME
An ability to
CO1 : Demonstrate the knowledge of principles of safety and Legislation
CO2: Explain accident Investigation and Reporting
CO3: Recognize the various hazards and Risk analysis
CO4: Illustrate the various Occupational health and Toxicology issues.

UNIT I

Principles of safety:

History of Safety movement. Evolution of modern safety concept.-
general concepts of management planning for safety for optimization of productivity. Productivity, quality and safety line and staff. Functions for safety -budgeting for safety. safety policy. Incident Recall Technique (IRT), disaster control, job safety analysis, safety survey, safety inspection. 8Hrs

UNIT II

Laws and Legislation

Occupational safety and Health act, Guide lines, Occupational safety and Health administration, Right to know laws, EHS (environment, Health and safety) and its compliance. 4 Hrs

UNIT III

Accident Investigation and Reporting

Causes of an accident, reportable and non-reportable accidents, reporting to statutory authorities principles of accident prevention accident investigation and analysis records for accidents, departmental accident reports, documentation of accidents unsafe act and condition, domino sequence–supervisory role–role of safety committee cost of accident. Recommended practices for compiling and measuring work injury experience –permanent total disabilities, permanent partial disabilities, temporary total disabilities -Calculation of accident indices. 8Hrs

UNIT IV

Fire prevention and control

Sources of ignition –fire triangle–principles of fire extinguishing–active and passive fire protection systems–various classes of fires A, B, C, D, E–types of fire extinguishers–fire stoppers–hydrant pipes–hoses–monitors–fire watchers–lay out of stand pipes –fire station - fire alarms and sirens–maintenance of fire trucks–foam generators–escape from fire rescue operations–fire drills –notice -first aid for burns.

Sprinkler -hydrants-stand pipes–special fire suppression systems like deluge and emulsifier, selection criteria of the above installations, reliability, maintenance, evaluation and standards–alarm and detection systems. Other suppression systems –CO2 system, foam system, dry chemical powder (DCP) system, halon system –need for halon replacement –smoke venting. Portable extinguishers –flammable liquids –tank farms – indices of inflammability-fire fighting systems. 8Hrs

UNIT V

Hazard risk analysis

Introduction, hazard, hazard monitoring -risk issue, group or societal risk, individual risk, voluntary and involuntary risk, social benefits Vs technological risk, approaches for establishing risk acceptance levels, Risk estimation.

Hazard assessment, procedure, methodology; safety audit, checklist analysis, what if analysis, safety review, preliminary hazard analysis(PHA), human error analysis, hazard operability studies(HAZOP),safety warning systems-Fault Tree Analysis and Event Tree

Analysis, Logic symbols, methodology, minimal cut set ranking -fire explosion and toxicity index(FETI), various indices-Hazard analysis(HAZAN)-Failure Mode and Effect Analysis(FMEA)-Basic concepts of Reliability

6 Hrs

UNIT VI

Occupational health and Toxicology

Concept and spectrum of health functional units and activities of occupational health services, pre-employment and postemployment medical examinations

-occupational related diseases, levels of prevention of diseases, notifiable occupational diseases such as silicosis, asbestosis, pneumoconiosis, siderosis, anthracosis, aluminosis and anthrax, lead nickel, chromium and manganese toxicity, gas poisoning (such as CO, ammonia, coal and dust etc) their effects and prevention –cardio pulmonary resuscitation, audiometric tests, eye tests, vital function tests. Industrial toxicology, local, systemic and chronic effects, temporary and cumulative effects, carcinogens entry into human system

6 Hrs

TEXT BOOKS:

1. Occupational safety and Health for Technologists, Engineers and Managers: Geotsch.D.L.Prentice Hall publishing.
2. Essentials of safety management: Kaila and singh, Himalaya publishing house.
3. Fire safety in Buildings. V.K.Jain, NewAge Publishers

REFERENCES:

4. National safety council of India, GOI Publication.
5. Loss prevention society of India publication
6. Industrial Accident prevention. Heinrich H.W. Mcgraw hill publication
7. Industrial accident prevention. Colling.D.A.Prentice hall publishing.
8. *nptel.ac.in/courses/107103004/35*
9. *nptel.ac.in/courses/112107143/40*

Course Name	Construction project management , finance and professional Ethics	Course Code	16CV8HSCMF	SEE Duration	SEE+CIE
Credits	03	L-T-P-S	2:0:0:1	3 Hours	50+50

COURSE OBJECTIVES:

To provide basic knowledge of project management and economics, concepts of contract and ethics in Civil Engineering profession..

COURSE OUTCOMES: An ability to:

CO1: Demonstrate the knowledge of organization structure of a project and apply scheduling techniques for managing construction projects.

CO2: Apply the concept of time value of money to different real time situations.

CO3: Analyse different economic feasible alternatives using present worth/rate of return methods of investment.

CO4: Examine the economics of a project and appraise financial statements

CO5: Apply professional ethics in engineering practice through case studies.

Project Organization, Introduction, Bar Charts, Work Breakdown Structure, Time estimates, Applications of CPM and PERT- Scheduling, Monitoring and Upating.

6Hrs

Engineering economics, Time value of money, discounted cash flow, NPV, ROR, Bases of comparison, Incremental analysis, and Benefit-Cost analysis – **6 Hrs**

Finance-Capital budgeting, Working capital management, Construction accounting, Income statement, Financial statements, Appraisal through financial statements-ratio's analysis, case studies– **6 Hrs**

Contracts – General conditions of contract, types of contracts, breach of contract, Arbitration **4Hrs**

Professional ethics- Importance, motivation, impact of violation of professional ethics on society, remedies case studies **4Hrs**

References:

1. Chitkara K K, "Construction Project Management, Planning, Scheduling and Controlling, McGraw Hill Education, 3rd Ed., 2014.
2. Srinath L.S, "**PERT and CPM**", East West Press Pvt Ltd New Delhi.
3. Van Horne J.C, "**Fundamentals of Financial Management**" Prentice Hall, 2009
4. Blank L and Anthony T, " Basics of Engineering Economy", McGraw Hill Education, Indian Edition, 2013.
5. K G Krishnamurthy, S V Ravindra**, "Professional Practice",** PHI, 2014
6. Wueste, Daniel E, '**Introduction, Professional Ethics and Social responsibility'**, Rowman and Littlefield Publishers, Inc. London, 1994

E-Resources:

Mooc: https://onlinecourses.nptel.ac.in/noc17_mg01/preview

http://nptel.ac.in/courses/109104068/30

DEPARTMENT ELECTIVES

VIII SEMESTER

Course	EARTHQUAKE RESISTANT DESIGN OF STRUCTURES	Course Code	16CV8DEERD	SEE Duration	SEE+CIE
Credit	03	L-T-P	3:0:0	3hrs	50+50

COURSE OBJECTIVES:
- The knowledge of structural dynamics shall be utilized to introduce the students to (a) engineering seismology and (b) concepts for earthquake resistant design
- Design and detailing aspects to achieve ductility in structures shall be emphasized

PRE-REQUISITE:
Structural Dynamics

Course outcomes;
CO1: Describe the fundamentals of engineering seismology
CO2: Characterize the Earthquake ground motions and prepare the basis for estimation of seismic forces
CO3: Analyse , design and detail , buildings for seismic resistance through concepts of ductility as per BIS codes
CO4: Identify and comprehend failure patterns of buildings during earthquake

Introduction to engineering seismology, seismic waves, characteristics of earthquake and its quantification – Magnitude and Intensity scales, seismic instruments.

Seismic response of buildings, structures and sites, study of response of buildings and structures during past earthquakes.
The Response Spectrum – elastic and elasto-plastic spectra, tripartite plot, use of response spectrum in earthquake resistant design.

Dynamics of multi-storeyed buildings – natural frequencies and mode shapes, Analysis of multi-storeyed buildings, obtaining seismic forces using IS-1893.
Structural Configuration for earthquake resistant design, frames, shear walls and dual systems, Effect of infill masonry walls on frames, problems of the soft first-storey, Capacity design procedures.

Ductility and energy absorption in buildings, Reinforced concrete for earthquake resistance, confinement of concrete for ductility, ductility of columns and beams – codal provisions

Behaviour of masonry buildings during earthquakes, failure patterns, strength of masonry in shear and flexure, concepts for earthquake resistant masonry buildings.

TEXT BOOK AND CODES:

1. P Agarwal and M Shrikande, "Earthquake Resistant Design of Structures", Prentice Hall (India) Ltd, New Delhi, 2006.
2. IS – 1893 (Part I): 2002, IS – 13920: 1993, IS – 4326: 1993, IS-13828: 1993
3.

REFERENCE BOOKS:

1. D J Dowrick, "Earthquake Risk Reduction"- John Wiley and Sons, 2003
2. Minoru Wakabayashi, "Design of Earthquake Resistant Buildings", McGraw Hill Pub.
3. G GPenelis and A J Kappos, "Earthquake Resistant Concrete Structures", Chapman and Hall, 1999
4. T Paulay and M J N Priestley, "Seismic Design of Reinforced Concrete and MasonryBuildings", John Wiley and Sons, 1992
5. S.K.Duggal, (2007), "Earthquake Resistant Design of Structures", OxfordUniversity Press, New Delhi 2007.
6. Steven L Kramer, "Geotechnical Earthquake Engineering", Pearson Education pub.
7. Anil K Chopra, "Dynamics of Structures – Theory and Application to Earthquake Engineering"- 2nd ed., Pearson Education pub.
8. Anderson,R.A., "Fundamentals of Vibrations"- McMillan
9. Clough and Penzien, "Dynamics of Structures"- McGraw Hill
10. Mukyopadhyaya, "Vibration and Structural Dynamics", Oxford &IBH
11. James Ambrose and Dimitry Vergun, "Design for Earthquakes"-avid Key, "Earthquake Design Practice for Buildings".

Course Name	Environmental Impact Assessment	Course Code	16CV8DEEIA	SEE Duration	SEE+CIE
Credits	03	L-T-P-S	3:0:0:0	3 Hours	50+50

COURSE OBJECTIVES:

To introduce the methodology of environmental impact assessment (EIA) as a vital tool for sound environmental management and decision-making. This course will explore the need for environmental impact assessments, the different types of assessments, and the regulatory and technical requirements of preparing an assessment.

COURSE OUTCOME:

An ability to

CO1: Explain the major principles and mechanisms of Environmental Impact Assessment.

CO2: Describe the different stages of Environmental Impact Assessment in India.

CO3: Illustrate the process of issues concerning societal, ethical and legislative needs.

INTRODUCTION:

Definition, Evaluation of EIA in India, Development activity and Ecological factors, Relationship between EIA, EIS, and FONSI. Purpose and Need for EIA studies, Base line information. **6 Hrs**

FUNDAMENTAL APPROACH TO EIA/ EIA PROCEDURES:
Step- by- step procedure for conducting EIA, Advantages and Limitations of EIA. Hierarchy in EIA. Statutory Requirements in EIA, MoEF Guidelines in Siting Developmental Projects.

6 Hrs

Methodologies of EIA:

Contents of EIA. Methodologies and Evaluation Techniques of EIA, their selection for Specific Projects. Frame work of impact Assessment related to Indian conditions. **6 Hrs**

ENVIRONMENTAL ATTRIBUTES:

Assessment and prediction of impacts on Attributes -Air, Water, Noise, Land, Ecology, Soil, Cultural and Socio-economic Environment. EIA guidelines for development projects, Rapid and comprehensive EIA. **6 Hours**

PUBLIC PARTICIPATION IN EIA:

Basic Definitions, Regulatory Requirements, Objectives, Advantages and Disadvantages, Selection of Public Participation Techniques. **6 Hours**

IMPACT QUANTIFICATIONS:

EIA for Water resource developmental projects, Highway projects: Nuclear Power plant projects, Hazardous Waste disposal Sites, Mining project (Coal, Iron ore), Thermal Power Plant, Infrastructure Construction Activities. **9 Hours**

Text Books:

1. **Environmental Impact Assessment** –L.W.Canter (1996), McGraw Hill Inc.

2. **Environmental impact Assessment methodologies** - Anjaneylu.Y.

Reference Books:

1. **Environmental Impact analysis** - Jain R.K, Urban & Stacey—Van Nostrand Reinhold Co

2. **Guidelines for EIA of Developmental Projects**. Ministry of Environment and Forests, Government of India.

E-BOOKS:

1. http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv104-Page1.htm
2. nptel.ac.in/courses/105101084/https://ay14-15.
3. moodle.wisc.edu/prod/course/view.php?id=499.

Course Name	**Geotechnical Earthquake Engineering**	Course Code	**16CV8DEGEE**	SEE Duration	SEE+CIE
Credits	**03**	L-T-P-S	**3:0:0:0**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

To provide basic knowledge about Dynamic soil properties, Causes and mitigation of Earthquakes, measurement of Earthquakes, and Design of earthquake resistant of foundations and retaining walls.

COURSE OUTCOME: An ability to

CO1: Explain the basic concepts of earthquake, its causes, evaluation and mitigation.

CO2: Identify dynamic soil properties and Compute factor of safety against liquefaction

CO3: Design earthquake resistant shallow foundations and retaining walls

INTRODUCTION:

Historical background, earthquake records of India, Plate tectonics, causes, Seismic waves, faults types, hypocenter, epicenter, focal depth, seismograph, parameters of ground motion, measurement of ground motion-accelerometers, magnitude and intensity of earthquake and its relationship , seismic zones, risk evaluation and mitigation, earthquake resistant structures, awareness campaign **8Hrs**

Fundamentals of Vibrations:

Introduction, Fundamental definitions, System with single degree of freedom, Free and Forced vibration of a spring-mas system, Free and steady-state forced vibration with viscous Damping, Rotating –mass-type Excitation, Determination of Damping Ratio, Vibration-measuring Instruments, System with two degrees of freedom-vibration of a mass-spring system and problems. **8 Hrs**

Dynamic soil properties

Introduction, soil properties for dynamic loading, Lab-field measurement, factors affecting ground motion, peak horizontal ground acceleration. **4Hrs**

Liquefaction

Introduction, factors governing, liquefaction Analysis- cyclic stress ratio, remedial measures for liquefaction, numerical problem on factor of safety against liquefaction. **4 Hrs**

Design of earthquake resistant shallow foundation and deep foundation

Introduction, Bearing capacity analysis for liquefied soil, granular soil with earthquake induced pore water pressure, analysis for cohesive soil weakend by earthquake, and concepts of design criteria for deep foundation – piles 0**8 Hrs**

Retaining wall analysis for earthquakes:

Introduction,.pseudostatic method, method of analysis for liquefied soil, analysis for reinforced concrete retaining walls, sheet pile walls, and braced excavation 0**7Hrs**

TEXT BOOKS:

1. **Basic geotechnical earthquake Engineering, -**Kamalesh Kumar, New age international publishers, first edition, (2008)
2. **Principles of Soil Dynamics -**Braja M. Dass, and G.V. Ramana, CL Engineering publishers; second edition (2010)

REFERENCE BOOKS:

1. ***Soil dynamics and machine foundations-*** Swami saran, Galgotia Publications, New Delhi
2. ***Geotechnical Earthquake Engineering-***Steven L Kramer, Pearson publication, first edition (1996)

E-Resources:

1. **Nptel courses**: http://nptel.ac.in/courses/105101134/

Course Name	Integrated Watershed Management	Course Code	16CV8DEIWM	SEE Duration	SEE+CIE
Credits	03	L-T-P-S	3:0:0:0	3 Hours	50+50

COURSE OBJECTIVES:

Objective of this course is to understand fundamental concepts of watershed behavior, planning and management, various methods available to estimate runoff and quantify soil erosion. Also the course helps to understand the techniques for the assessment of management of flood and droughts, the concepts of conjunctive use of water resources for effective watershed management.

COURSE OUTCOME:

An ability to

CO1: Explain the fundamental concepts of watershed behavior and watershed management and explain the application of modern techniques in watershed management

CO2: Apply different models to estimate runoff and soil erosion from a watershed

CO3: Identify the types and sources of water pollution

CO4: Apply various methods to assess / model flood and drought

INTRODUCTION:

Concept of watershed, introduction to watershed management, different stakeholders and their relative importance, watershed management policies and decision making **3 Hrs**

INTEGRATED WATERSHED MANAGEMENT:

Integrated water resources management, natural resources management, agricultural practices, integrated farming, Soil erosion and conservation; conjunctive use of water resources, rainwater harvesting, water conservation and recycling, Community participation, Private sector participation, Institutional issues, Socio-economy, Integrated development, Watershed Management Practices in Arid and Semiarid Regions, Case studies. **7 Hrs**

WATERSHED MODELING:

Standard modeling approaches and classifications, system concept for watershed modeling, overall description of different hydrologic processes, modeling of rainfall-runoff process, subsurface flows and groundwater flow

Soil erosion, estimation of soil erosion **10 Hours**

MANAGEMENT OF WATER QUALITY:

Water quality and pollution, types and Sources of pollution, water quality modeling, environmental guidelines for water quality 0**6 Hours**

STORM WATER AND FLOOD MANAGEMENT:

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

Drought Management:

Drought assessment and classification, drought analysis techniques, drought mitigation planning. **9 Hours**

USE OF MODERN TECHNIQUES IN WATERSHED MANAGEMENT:

Applications of Geographical Information System and Remote Sensing in Watershed Management, Role of Decision Support System in Watershed Management
4 Hours

TEXT BOOKS

1. Vir Singh, Raj, Watershed Planning and Management, Yash Publishing House, Bikaner, 2000.

REFERENCE BOOKS:

1. Allam, Gamal Ibrahim Y., Decision Support System for Integrated WatershedManagement,< Colorado State University, 1994.
2. Black Peter E., Watershed Hydrology, Prentice Hall, London, 1991.
3. Michael A.M., Irrigation Engineering, Vikas Publishing House, 1992.
4. Murthy, J.V.S., Watershed Management in India, Wiley Eastern, New Delhi, 1994.

5. Purandare, A.P., Jaiswal A.K., Waterhed Development in India, NIRD, Hyderabad, 1995.
6. V.P. Singh & Donald K. Frevert "Watershed Models" Taylor & Francis
7. E.M. Tideman "Watershed management :Guidelines for Indian Conditions" Omega Scientific Publishers

E-BOOKS

1. http://nptel.ac.in/syllabus/105101010/
2. http://nptel.ac.in/syllabus/105107068/

Course Name	**Reinforced Earth Structures**	Course Code	**16CV8DERES**	SEE Duration	SEE+CIE
Credits	**03**	L-T-P-S	**3:0:0:0**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

To provide basic knowledge of Reinforced Earth structures, materials used, their properties and the design procedures for Reinforced Earth retaining walls and roads.

COURSE OUTCOME: An ability to

CO1: Explain the basic concepts and components of Reinforced Earth constructions.

CO2: Classify geosynthetic materials, and outline their properties

CO3: Design Reinforced Retaining walls and pavements; summarize various applications of geosynthetics in civil Engineering

INTRODUCTION:

Historical background, development of concept of reinforced soil, Mechanism of reinforced soil, advantages of reinforced earth structure over similar structures.
03 Hours

BASIC COMPONENTS OF REINFORCED SOILWALL:

Introduction, general, **Soil or fill-matrix**- choice of soil, backfill criteria. Reinforcement bars, Metallic strips, Metallic grids, sheet reinforcement. **Facing Elements**- metal facing and concrete panel facing. **03 Hours**

MATERIALS:

Introduction and overview, Historical developments, Recent developments. Classification based on materials, Geosynthetics – geotextiles, geogrids, geomembranes, geocomposites, geonets and other products, geomats, geomeshes, geowebs, natural geotextiles, basic functions etc. **06 Hours**

PROPERTIES, TESTING & EVALUATION OF GEOSYNTHETICS:

Physical properties- (type of structure, specific gravity, mass per unit area, thickness and stiffness).

Mechanical properties- (index and performance properties)-tensile properties (grab tension test); compressibility property; seam strength; burst strength; tear strength and puncture strength; friction; pull out resistance.

Hydraulic properties-porosity; percentage open area; apparent opening size; permittivity; transmissivity; soil retention.

Endurance properties- Installation damage; creep and stress relaxation; abrasion and clogging;

Degradation of geosynthetics due to temperature, oxidation, hydrolysis, chemical action and ultraviolet Testing & Evaluation- Hydrodynamic sieving test, Permeability test, Transmissivity test, Geotextile-Soil Filtration test etc.

09 Hours

DESIGN OF REINFORCED EARTH STRUCTURE:

Introduction, principles of design, Internal and external stability, Design of retaining walls using metallic strips , Design of pavement using geogrids, concepts of embankments on soft soil , reinforced soil slopes, and bearing capacity improvement.

12 Hours

APPLICATION OF GEOSYNTHETICS:

Use of geosynthetics in Civil engineering for filtration and drainage, uses in roads, use in landfills, **Future trends in geosynthetic applications-**Combined geosynthetics, smart geosynthetics, active geosynthetics, Case studies.

06 Hours

TEXT BOOKS:

1. **Designing with Geosynthetics**- Koerner. R.M. - Prince Hall Publication, 1994.
2. **Reinforced soil and its Engineering Applications** – Swami Saran., I.K. International Pvt. Ltd.

REFERENCE BOOKS:

1. **Earth reinforcement and Soil structure**- Jones CJEP- Butterworths, London, 1996.
2. **Earth Reinforcement Practices** - Hidetoshi Octial, Shigenori Hayshi& Jen Otani - Vol. I, A.A. Balkema, Rotterdam, 1992.
3. **Reinforced Earth**- Ingold, T.S. - Thomas, Telford, London.
4. **Geosynthetics in Civil Engineering –** Edited byR.W. Sarsby, CRC Press, Boca Raton**.**
5. **Geosynthetics** - New Horizons, Eds. G.V. Rao, PK Banerjee, J.T. Shahu, G.V. Ramana, Asian Books Private Ltd., New Delhi, 2004.

E-Resources: Nptel courses: http://nptel.ac.in/downloads/105106052/

Course Name	**Urban Transport Planning**	Course Code	**16CV8DEUTP**	SEE Duration	SEE+CIE
Credits	**03**	L-T-P-S	**3:0:0:0**	**3 Hours**	**50+50**

COURSE OUTCOME:

An ability to

CO1: Outline the types of surveys to provide the data required for transportation planning

CO2: Develop trip production models & compute trip attraction rates

CO3: Develop various trip distribution models & calibrate using gravity model

CO4: Build aggregate mode split models &analyse transportation network flows

CO5: Discuss characteristics of mass transit systems

INTRODUCTION:

Characteristics of different modes of transportation; Principles of co-ordination and operation control, Elements in urban transit system **03 Hours**

TRANSPORTATION PLANNING PROCESS:

Interdependence of Land Use and Traffic, Systems Approach, **Stages in Transport Planning.** **04 Hours**

TRANSPORT SURVEYS:

Study Area, Zoning, Planning of different types of surveys and interpretation, travel demand; Traffic surveys for mass transit system planning. **08 Hours**

TRIP GENERATION:

Trip Purpose, Factors governing Trip Production and Attraction, **Trip Production Models**, Category Analysis. **06 Hours**

TRIP DISTRIBUTION:

Methods of trip distribution, Application of gravity model, Calibration of gravity model, Problems. **08 Hours**

MODAL SPLIT AND TRIP ASSIGNMENT:

Factors affecting modal split; Modal split in transport planning; Purpose of Trip Assignment, principles of traffic assignment; Assignment techniques **06 Hours**

MASS TRANSIT SYSTEMS: -

Types-characteristics-objective and Planning- Current developments in India **04 Hours**

Text Books:

1. Kadiyali, L.R., 'Traffic Engineering and Transportation Planning' – Khanna Publication, 2011.

2.C. JotinKhisty& B. Kent Lall, "Transportation Engineering-An Introduction", Prentice Hall of India Private Limited, Third Edition, New Delhi, 2006.

REFERENCE BOOKS:

AdibKanafani, "Transportation Demand Analysis", McGraw Hill Book Company, New York.

Juan de Dios Ortuzar& Luis G. Willumsen, "Modelling Transport" 4th Edition, Wiley

E-BOOKS

nptel.ac.in/courses/105107067/

nptel.ac.in/downloads/105106058/

VIII SEMESTER CIVIL ENGINEERING

Subject	**INDUSTRIAL TRAINING**	**Sub. Code**	**16CV8DMITP**
Credit	**2**	**CIE +SEE**	**50 +50**

All the students are encouraged to undergo a minimum of 4 weeks industrial training in an ongoing construction project and submit a report consisting the details of the organization, project details and specific construction aspect which they have learnt during that period for CIE to be recognized as an audit course.

VIII SEMESTER CIVIL ENGINEERING

Subject	**MAJOR PROJECT** **Phase -2**	**Sub. Code**	**16CV8DCMAP**
Credits	**10**	**SEE+CIE**	**100+100**

Course Outcomes:

CO1: Identify a current problem through literature/field./case studies and define the background objectives and methodology for solving the same.

CO2: Analyse, design and develop a technology/process

CO3: Implement and evaluate the technology at the laboratory level

CO4: Write report and present it effectively.

The Phase II of the project shall consist of

- Experimental design/set-up
- Experimental work/studies
- Report Writing
- Evaluation of project report by the internal /external guides

May be carried out using in-house facilities or in an industry by specified number of students in a group.

HSS ELECTIVE

VIII SEM

Course Name	**LAW FOR ENGINEERS**	**Course Code**	**16HS8DELFE**	**SEE Duration**	**SEE+CIE**
Credits	**03**	L-T-P-S	**2-0-0-1**	**3 Hours**	**50+50**

Course Objective

To examine and review the laws complying with environment, health and safety.

Course Outcomes

After the completion of the course the students will be able to

CO1: Enumerate the principles of sustainable development.

CO2: Discuss the significance of various legislations pertaining to civil engineering.

Environmental Law Origin of Environmental Law, Concept of Pollution – Sources of Pollution, Types of Pollution, and Effects of Pollution. Nature and Scope of Environmental Law – Importance. Case study. **6HRS**

Labour Law

Provisions of various labor laws-Workmen's Compensation Act 1923; Disablement, Total Permanent disablement, Temporary disablement, Formula for compensation; Minimum wages act, 1948; Payment of bonus Act, 1965; Weekly holidays Act, 1942; Payment of Wages Act, 1936; Employees Insurance Act, 1948. **8 HRS**

Indian Penal Code

A brief introduction to criminal liability of civil engineers in constructions as per the Indian Penal Code. **6 HRS**

IPR and Law of Torts

Definition, categories of torts, Breach of Duty and Damages. **6 HRS**

Text/Reference books:

1. B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.
2. Ratanlal and Dhirajlal&: The Law of Torts.
3. S. Shantha Kumar- Introduction to Environmental Law.
4. Madhavan Pillai - Labour and Industrial Laws.
5. Bare Acts referred to above.

Reference books:

1. VR.Krishna Iyer-Environmental pollution and the law.
2. Suresh Jain and Vimal Jain- Environmental law in India.
3. Goswami VG- Labour and Industrial law.
4. Indian law Institute- Law and labour management relations in India.
5. Avtar Singh- The law of torts.

Course Name	**MANAGEMENT AND ENTREPRENEURSHIP**	Course Code	**16HS8DEMAE**	SEE Duration	SEE+CIE
Credits	**03**	L-T-P-S	**2-0-0-1**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

To prepare students with broad understanding of business as well as more focused learning in key management areas. The course also equip the students to think like entrepreneurs.

COURSE OUTCOMES:

An ability to,

CO1: Discuss the importance of management and its approaches.

CO2: Explain the various features and environment of management process.

CO3: Summarize types, characteristics, schemes, and policies of entrepreneurship

CO5: State various funding support available to entrepreneurs.

CO6: Prepare project reports for decision making.

PART - A (MANAGEMENT)

UNIT – 1

MANAGEMENT: Introduction - Meaning - nature and characteristics of Management, Evolution of Management Thought. Management as a science or art of profession. Scope and functional areas of management. 02 Hrs

UNIT – 2

Functional areas of Management: **Planning -** Nature, Planning process - Objectives - Types of plans (Meaning only) - Decision making - Importance of planning - steps in planning & planning premises - Hierarchy of plans. 10Hrs

ORGANIZING AND STAFFING: Nature and purpose of organization - Principles of organization – Types of organization - Departmentation - Committees – Centralization Vs Decentralization of authority and responsibility - Span of control - MBO and MBE (Meaning only) Nature and importance of Staffing.

DIRECTING & CONTROLLING: Meaning and nature of directing - Leadership styles, Communication - Meaning and importance –Coordination, meaning and importance and Techniques of Co -ordination. Meaning and steps in controlling - Essentials of a sound control system.

UNIT – 5 10 Hours

ENTREPRENEUR: Entrepreneurship- definition. Types of Entrepreneur, Intrapreneur. Growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry

INSTITUTIONAL SUPPORT: Different Schemes; TECKSOK; KIADB; KSSIDC; KSIMC; DIC Single Window Agency: SISI; NSIC; SIDBI; KSFC.

Laws Concerning Entrepreneur: partnership laws, business ownership, sales and income taxes and workman compensation act. 5 Role of various national and state agencies which render assistance to small scale industries.

UNIT-8

PREPARATION OF PROJECT : Meaning of Project; Project Identification; Project Selection; Project Report; Need and Significance of Report; Contents; formulation; Guidelines by Planning Commission for Project report; Network Analysis; Errors of Project Report; Project Appraisal. Identification of Business Opportunities: Market Feasibility Study; Technical Feasibility Study; Financial Feasibility Study & Social Feasibility Study. 04 Hrs

RECOMMENDED BOOKS:

1. Principles of Management – P.C. Tripathi, P.N. Reddy – Tata McGraw Hill, 2007.

2. Dynamics of Entrepreneurial Development & Management – Vasant Desai:, Himalaya Publishing House, 2007.

3. Management Fundamentals Concepts, Application, Skill Development – Robert Lusier – Thompson, 2007.

REFERENCE BOOKS:

1. Entrepreneurship Development – Poornima M Charanthimath Pearson Education 2006.
2. Entrepreneurship and management - Shashi k Gupta- Kalyani publishers, Latest edition.

Course Name	Basics of Marketing and Sales	Course Code	16HS8DEBMS	SEE Duration	SEE+CIE
Credits	**03**	L-T-P-S	**2-0-0-1**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

To prepare students with basic knowledge in Marketing and Sales

COURSE OUTCOMES:

Upon successful completion of the course the student will be able to

CO1: Outline the basic principles of marketing and sales

CO2: Discuss strategies and types of marketing and pricing of new products

CO3: Explain concepts of sales management and role of sales manager

CO4: Demonstrate knowledge of online marketing

CO5: Exemplify related case studies

Introduction to Marketing: 5 Hours

Definitions of market, marketing, Marketing Management Orientation- production, product, selling, marketing and societal marketing, marketing environment, marketing research

Customer driven Marketing strategy& mix 7 Hours

Market Segmentation- bases, Market targeting- strategies, Positioning, basics of Marketing mix – product- levels, Individual product and service decisions, price- broad categories of new product pricing, place- channel member tasks and channel levels, promotions- the promotion mix

Introduction to sales Management 6 Hours

Meaning, Importance, Personal selling, Trends in Sales management**,** qualities and responsibilities of a sales manager, selling skills, selling process

Online Marketing & Selling on the Internet 6 Hours

Marketing and the Internet, Online Marketing Domains, Online Marketing Presence, internet based selling- Internet trading in India

Case studies 2 Hours

Case studies pertaining to Indian and global contest

TEXT BOOKS

1. Marketing Management: A South Asian Perspective, Kotler , Keller, Koshy & Jha, 13/e, , 2012, Pearson.
2. Sales Management, Tapan Panda & Sunil Sachdev, 6/e, 2003, Oxford University Press.

REFERENCE BOOKS:

1) Marketing Management: A Strategic Decision Making Approach, RamaswamiNamakumari, 5/e, 2013, McGrawHill Education

2) Marketing, Etzel, Stanton, Walker&Pandit, 14/e, 2009, McGraw Hill Education

3) Principles of Marketing Management, Kotler, Armstrong, Agnihotri, Haque, 13/e, 2010, Pearson

4) Sales Management: Teamwork, Leadership and Technology, Charles, Futurell, 6/e, 2001, Thomson South Western

5) Sales & Distribution Management, Havaldar and Cavale, 2/e, 2011, McGraw Hill Education

Course Name	**Economics for Engineers**	Course Code	16HS8DE EFE	SEE Duration	SEE+CIE
Credits	**03**	L-T-P-S	**2-0-0-1**	**3 Hours**	**50+50**

COURSE OBJECTIVES:

To familiarize students with of the basic concepts of economics, understand the micro and macro aspects and to apply them in the Engineering profession.

COURSE OUTCOMES:

An ability to,

CO1: Comprehend basic principles of Economics in Engineering.

CO2: Explain the fundamental concepts of supply and demand and apply them for functioning of a firm and industry in civil engineering.

CO3: Perform cost and production analysis, assess profits, calculate BEP and Payback period for decision-making.

CO4: Discuss concepts of macroeconomics and identify indicators to evaluate the economics in construction industry.

CO5: Explain Banking and financial system and related policies

CO6: Outline the importance of public Economics, Welfare, and Distribution of Wealth.

Introduction to Economics

Economics – Meaning, Nature, Scope and Significance, Micro and Macro Economics, the Logic of Economics. The three problems of Economic Organization, Society's technological possibilities, Market Mechanism.

Self-Study: The role of Government in a mixed economy **4 Hrs**

Fundamental Concepts, Supply and Demand

Opportunity Cost, Equi-Marginal Principle, Time perspective, Incremental Concept, Time Value of Money, The Demand Schedule, Supply, Equilibrium, Law of Demand, Elasticity of Demand, Law of Supply, Factors Affecting Demand and Supply. **6 Hrs**

Self-Study: Demand and Supply in Construction industry.

Cost Analysis and Production Analysis

Concepts, Types of cost, Cost curves, Cost – Output Relationship in the short run and in the long run, LAC curve. Concepts, production function with one variable input - Law of Variable Proportions. Production function with 2 variable inputs and Laws of returns to scale, Indifference Curves, ISO-Quants & ISO-Cost line, Economies of scale, Diseconomies of scale. Break Even Analysis – Meaning, Assumptions, Determination of BEA, Limitations, Uses of BEA in Managerial decisions. **6 Hrs**

Self-Study: Opportunity Costs and Markets

Macro Economics

Concepts, Aggregate Demand and Supply, Measuring Economy, GDP, Money Supply, Interest Rates, Consumption, Savings, Investment, Business Cycles **4 Hrs**

Self-Study: Economic cycles in India and Construction Industry

Money and Financial System

Financial System, Banking, Capital Market, Central Bank and Functions, Monetary Policy, Fiscal Policy, EX-IM Policy, Industrial policies of the past and present. **4 Hrs**

Self-Study: LPG Policy and developments in infrastructure sector.

Economic Growth

Population Growth and Development, Unemployment, Economic Consequences of Government Debt, Stabilizing the economy, Economic Growth and Human Welfare **2 Hrs**

Self-Study: Technological Advances and Economic Growth

TEXT BOOKS

1) Indian Economy, Datt and Mahajan, 64th revised edition, 2012, S.Chand
2) Economics, Samuelson and Nordhaus, 19th edition, 2010, McGraw Hill Education – India

REFERENCE BOOKS:

1) Principles of Economics, Mankiw Gregory N., 2002, Thompson Asia
2) Managerial Economics, V. Mote, S. Paul, G. Gupta, 2004, Tata McGraw Hill
3) Indian Economy, Misra, S.K. and Puri, 2009, Himalaya
4) Textbook of Business Economics, Pareek Saroj, 2003, Sunrise Publishers

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