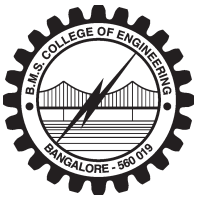
2nd proof



ಬಿ.ಎಂ.ಎಸ್. ತಾಂತ್ರಿಕ ಮಹಾವಿದ್ಯಾಲಯ, ಬೆಂಗಳೂರು

(ಸ್ವಾಯತ್ತ ವಿದ್ಯಾ ಸಂಸ್ಥೆ)

ಬುಲ್ ಟೆಂಪಲ್ ರಸ್ತೆ, ಬೆಂಗಳೂರು – 560 019

DEPARTMENT OF CIVIL ENGINEERING

Scheme & Syllabus of
B.E. 3rd to 8th Semester
(Admission year : 2008-09)

BMS COLLEGE OF ENGINEERING, BANGALORE

(Autonomous College under VTU)

Bull Temple Road, Bangalore - 560 019

BMS COLLEGE OF ENGINEERING, BANGALORE

(Autonomous College under VTU)

DEPARTMENT OF CIVIL ENGINEERING

Semester: III 2008 BATCH

Code	Subjects	Credit Hours / Week				Contact Hrs	Marks		
		L	T	P	Total		CIE	SEE	Total
09MA3ICMAT	Engineering Maths -3 (BS)	3	2	-	4	5	50	50	100
09CV3DCSOM	Strength of Materials (ES)	3	2	-	4	5	50	50	100
09CV3DCMOF	Mechanics of Fluids (ES)	2	2	2	4	6	50	50	100
09CV3DCGDY	Geodesy-I (Core)	3	-	2	4	5	50	50	100
09CV3DCBMT	Building Materials & Testing (ES)	2	-	2	3	4	50	50	100
09CV3DCGEO	Engineering Geology - I (BS)	3	-	2	4	5	50	50	100
	Total				**23**	**30**	**Total Marks**		**600**
					Total Credits Theory + Lab = 23				

Total Credits of BS - 08 **Total Credits of ES- 11** **Total Credits of Core - 04**

L - Lecture Hours/Week, **T** - Tutorial Lecture Hours/week, **P** - Practical Hours/week.

CIE - Continuous Internal Evaluation, **SEE** - Semester End Examination (of 3 hours duration)

BMS COLLEGE OF ENGINEERING, BANGALORE

(Autonomous College under VTU)

DEPARTMENT OF CIVIL ENGINEERING

Semester: IV 2008 BATCH

Code	Subjects	Credit Hours / Week				Contact Hrs	Marks		
		L	T	P	Total		CIE	SEE	Total
09MA4ICMAT	Engineering Maths -4 (BS)	4	0	0	4	4	50	50	100
09CV4DCHYM	Hydraulics & Hyd. Machines (Core)	2	2	2	4	6	50	50	100
09CV4DCAOS	Analysis of Structures -I (Core)	3	2	-	4	5	50	50	100
09CV4DCGTE	Geotechnical Engg.-1 (Core)	2	2	2	4	6	50	50	100
09CV4DCCON	Concrete Technology (Core)	2	-	2	3	4	50	50	100
09CV4DCBPD	Building Planning & Drawing (CAD)(Core)	1	-	4	3	5	50	50	100
09CV4DCGEO	Geodesy-II (Core)	2	-	2	3	4	50	50	100
Total Credits Theory + Lab = 25						**34**	**Total Marks**		**700**

Total Credits of BS - 04 **Total Credits of Core - 21**

L - Lecture Hours/Week, **T** - Tutorial Lecture Hours/week, **P** - Practical Hours/week.

CIE - Continuous Internal Evaluation, **SEE** - Semester End Examination (of 3 hours duration)

BMS COLLEGE OF ENGINEERING, BANGALORE

(Autonomous College under VTU)

DEPARTMENT OF CIVIL ENGINEERING

Semester: V 2008 BATCH

Code	Subjects	Credit Hours / Week				Contact Hrs	Marks		
		L	T	P	Total		CIE	SEE	Total
10CV5DCAOS	Analysis of Structures - II (Core)	3	2	-	4	5	50	50	100
10CV5DCHWR	Hydrology & Water Resources (Core)	4	-	-	4	4	50	50	100
10CV5DCGTE	Geotechnical Engg.-II (Core)	3	2	-	4	5	50	50	100
10CV5DCRCC	Design of RCC Structures (Core)	3	2	-	4	5	50	50	100
10CV5DCENV	Environmental Engineering - I (Core)	3	-	2	4	5	50	50	100
10CV5DCHEN	Highway Engineering (Core)	3	-	2	4	5	50	50	100
10CV5DCMIP	Minor Project/ Industrial Visit (Project)	-	-	-	1	2	50	-	50
		Total Credits = 25				**31**	**Total Marks**		**650**

Total Credits of Project - 01 **Total Credits of Core - 24**

L - Lecture Hours/Week, **T** - Tutorial Lecture Hours/week, **P** - Practical Hours/week.

CIE - Continuous Internal Evaluation, **SEE** - Semester End Examination (of 3 hours duration)

BMS COLLEGE OF ENGINEERING, BANGALORE

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DEPARTMENT OF CIVIL ENGINEERING

Semester: VI 2008 BATCH

Code	Subjects	Credit Hours / Week				Contact Hrs	Marks		
		L	T	P	Total		CIE	SEE	Total
10CV6DCDSS	Design of Steel Structures (Core)	3	2	-	4	5	50	50	100
10CV6DCENV	Environmental Engineering -II (Core)	3	-	-	3	3	50	50	100
10CV6DCESP	Extensive Survey Project (*) (Project)	-	-	-	2	4	50	50	100
10CV6DCPSC	Pre-stressed Concrete (Core)	3	-	-	3	3	50	50	100
10CV6DCTST	Transportation Systems & Traffic Engineering (Core)	3	-	-	3	3	50	50	100
10CV6DCSAC	Software Applications in Civil Engineering (Core)	-	-	4	2	4	50	50	100
10CV6DE ----	Departmental Elective Course (DEC- 1)	4	-	-	4	4	50	50	100
10CV6DE ----	Departmental Elective Course (DEC- 2)	4	-	-	4	4	50	50	100
Total Credits Theory + Lab = 25						**30**	**Total Marks**		**800**

Total Credits of Project - 02 **Total Credits of Core - 15** **Total Credits of DEC - 08**

L - Lecture Hours/Week, **T** - Tutorial Lecture Hours/week, **P** - Practical Hours/week.

CIE - Continuous Internal Evaluation, **SEE** - Semester End Examination (of 3 hours duration)

BMS COLLEGE OF ENGINEERING, BANGALORE

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DEPARTMENT OF CIVIL ENGINEERING

Semester: VI (DEPARTMENTAL ELECTIVE COURSE - 2008)

Electives	Subject Code	Course Title	Teaching Department	Credits				Contact Hours	Marks		
				L	T	P	Total		CIE	SEE	Total
DEC -I	10CV6DEADR	Advanced Design of RCC Structures	CIVIL	4	-	-	4	4	50	50	100
DEC -I	10CV6DETOE	Theory of Elasticity and Plasticity	CIVIL	4	-	-	4	4	50	50	100
DEC -I	10CV6DEOSH	Occupational Safety and Health Administration	CIVIL	4	-	-	4	4	50	50	100
DEC -I	10CV6DESMA	Structural Masonry	CIVIL	4	-	-	4	4	50	50	100
DEC -I	10CV6DEGIT	Ground Improvement Technique	CIVIL	4	-	-	4	4	50	50	100
DEC -II	10CV6DESDY	Structural Dynamics	CIVIL	3	2	0	4	5	50	50	100
DEC -II	10CV6DEPMC	Pavement Materials & Construction	CIVIL	4	-	-	4	4	50	50	100
DEC -II	10CV6DEACT	Advanced Concrete Technology	CIVIL	3	-	2	4	5	50	50	100
DEC -II	10CV6DEERS	Earth & Earth Retaining Structures	CIVIL	4	-	-	4	4	50	50	100
DEC -II	10CV6DESWM	Solid Waste Management	CIVIL	3	0	2	4	5	50	50	100

L - Lecture Hours/Week, **T** - Tutorial Lecture Hours/week, **P** - Practical Hours/week.

CIE - Continuous Internal Evaluation, **SEE** - Semester End Examination (of 3 hours duration)

BMS COLLEGE OF ENGINEERING, BANGALORE

(Autonomous College under VTU)

Proposed Scheme for Teaching and Examination for B.E Civil Engineering: 2009-2010

Semester: VII FOR 2008 BATCH

Sl. No.	Subject Code	Course Title	Teaching Department	Credits				Contact Hours	Marks		
				L	T	P	Total		CIE	SEE	Total
1.	11CV7IE---	IEC-1	-------	4	-	-	4	4	50	50	100
2.	11CV7DCIHS	Irrigation and Hydraulic Structures	CIVIL	4	-	-	4	4	50	50	100
3.	11CV7DCMAP	Major Project(Phase -1)	CIVIL	-	-	-	4	4	50	50	100
4.	11CV7DCQSC	Quantity Surveying & Costing	CIVIL	4	2	-	5	6	50	50	100
5.	11CV7DCBRI	Bridge Engineering	CIVIL	3	-	-	3	3	50	50	100
6.	11CV7DE----	Departmental Elective Course (DEC-3)	CIVIL	4	-	-	4	4	50	50	100
						Total Credits	**24**	**25**	**Total Marks**		**600**

Total credits for Core : 12 **DEC (elective) credits : 4** **IEC credits : 4** **PROJECT CREDITS : 4**

L - Lecture Hours/Week, **T** - Tutorial Lecture Hours/week, **P** - Practical Hours/week.

CIE - Continuous Internal Evaluation, **SEE** - Semester End Examination (of 3 hours duration)

BMS COLLEGE OF ENGINEERING, BANGALORE

(Autonomous College under VTU)

Proposed Scheme for Teaching and Examination for B.E Civil Engineering: 2009-2010

Semester: (List & Syllabus for Institutional Elective) for 2008 Batch

Sl. No.	Subject Code	Course Title	Teaching Department	Credits				Contact Hours	Marks		
				L	T	P	Total		CIE	SEE	Total
1.	11CV7IERSG	Remote Sensing & Geographic Information system	CIVIL	4	-	-	4	4	50	50	100
2.	11CV7IEBFM	Basic Fracture Mechanics	CIVIL	4	-	-	4	4	50	50	100

L - Lecture Hours/Week, **T** - Tutorial Lecture Hours/week, **P** - Practical Hours/week.

CIE - Continuous Internal Evaluation, **SEE** - Semester End Examination (of 3 hours duration)

BMS COLLEGE OF ENGINEERING, BANGALORE

(Autonomous College under VTU)

Proposed Scheme for Teaching and Examination for B.E Civil Engineering: 2009-2010

Semester: VII (Departmental Elective- (DEC-3)) for 2008 Batch

Sl. No.	Subject Code	Course Title	Teaching Department	Credits				Contact Hours	Marks		
				L	T	P	Total		CIE	SEE	Total
1.	11CV7DEPAD	Pavement Design	CIVIL	4	-	-	4	4	50	50	100
2.	11CV7DEAFD	Advanced Foundation Design	CIVIL	4	-	-	4	4	50	50	100
3.	11CV7DEIWW	Industrial Waste Water Treatment	CIVIL	4	-	-	4	4	50	50	100
4.	11CV7DEABM	Alternate Building Material & Technology	CIVIL	4	-	-	4	4	50	50	100
5.	11CV7DEFEA	Finite Element Analysis	CIVIL	4	-	-	4	4	50	50	100
6.	11CV7DEAPS	Advanced PSC Structures	CIVIL	4	-	-	4	4	50	50	100

L - Lecture Hours/Week, **T** - Tutorial Lecture Hours/week, **P** - Practical Hours/week.

CIE - Continuous Internal Evaluation, **SEE** - Semester End Examination (of 3 hours duration)

BMS COLLEGE OF ENGINEERING, BANGALORE

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Proposed Scheme for Teaching and Examination for B.E Civil Engineering: 2009-2010

Semester: VIII 2008 Batch

Sl. No.	Subject Code	Course Title	Teaching Department	Credits				Contact Hours	Marks		
				L	T	P	Total		CIE	SEE	Total
1.	--11IE---	IEC-2	-------	4	-	-	4	4	50	50	100
2.	11CV8HSEMG	Engg. Management	CIVIL	4	-	-	4	4	50	50	100
3.	11CV8DCPPR	Professional Practice	CIVIL	3	-	-	3	3	50	50	100
4.	11CV8DE--	Dept. Elective Course-4 (DEC-4)	CIVIL	4	-	-	4	4	50	50	100
5.	11CV8DCITP	Industrial Training/Paper Presentation	CIVIL	-	-	-	3	2	50	50	100
6.	11CV8DCMAP	Major Project (Phase-2)	CIVIL	-	-	-	10	2	100	100	200
						Total Credits	**28**	**19**	**Total Marks**		**700**

Total credits for Core : 3 DEC (elective) credits : 4 IEC credits : 4 HSS credits : 4 Projects : 13

L - Lecture Hours/Week, **T** - Tutorial Lecture Hours/week, **P** - Practical Hours/week.

CIE - Continuous Internal Evaluation, **SEE** - Semester End Examination (of 3 hours duration)

BMS COLLEGE OF ENGINEERING, BANGALORE

(Autonomous College under VTU)

Proposed Scheme for Teaching and Examination for B.E Civil Engineering: 2009-2010

Semester: VIII (List & Syllabus for Institutional Elective) 2008 Batch

Sl. No.	Subject Code	Course Title	Teaching Department	Credits				Contact Hours	Marks		
				L	T	P	Total		CIE	SEE	Total
1	11CV8IEOSH	Occupational Safety and Health Administration	CIVIL	4	-	-	4	4	50	50	100

L - Lecture Hours/Week, **T** - Tutorial Lecture Hours/week, **P** - Practical Hours/week.

CIE - Continuous Internal Evaluation, **SEE** - Semester End Examination (of 3 hours duration)

BMS COLLEGE OF ENGINEERING, BANGALORE

(Autonomous College under VTU)

Proposed Scheme for Teaching and Examination for B.E Civil Engineering: 2009-2010

Semester: VIII (Departmental Elective - (DEC-4)) for 2008 Batch

Sl. No.	Subject Code	Course Title	Teaching Department	Credits				Contact Hours	Marks		
				L	T	P	Total		CIE	SEE	Total
1.	11CV8DEERD	Earthquake Resistant Design of Structures	CIVIL	4	-	-	4	4	50	50	100
2.	11CV8DEEIA	Environmental Impact Assessment	CIVIL	4	-	-	4	4	50	50	100
3.	11CV8DERES	Reinforced Earth Structures	CIVIL	4	-	-	4	4	50	50	100
4.	11CV8DEUTP	Urban Transport Planning	CIVIL	4	-	-	4	4	50	50	100
5.	11CV8DEGDR	Geometric Design of Roads	CIVIL	4	-	-	4	4	50	50	100
6.	11CV8DEFCS	Fracture Mechanics of Concrete Structures	CIVIL	4	-	-	4	4	50	50	100
7.	11CV8DESTS	Stability Analysis of Structures	CIVIL	4	-	-	4	4	50	50	100

L - Lecture Hours/Week, **T** - Tutorial Lecture Hours/week, **P** - Practical Hours/week.

CIE - Continuous Internal Evaluation, **SEE** - Semester End Examination (of 3 hours duration)

THIRD SEMESTER BE SYLLABUS
(Common to all branches except for CS and IS)

Subject	ENGINEERING MATHEMATICS – 3	Sub. Code	09MA3ICMAT	SEE Duration
Credits	04	L-T-P	3:1:0	3hrs

Unit-1

FOURIER SERIES:

Periodic function, Dirichlet's conditions, statement of Fourier Theorem, Fourier coefficients, change of interval, Even and odd functions, Half range Fourier series, Complex Fourier series, Practical Harmonic analysis. **[6 L + 2 T]**

Unit-2

FOURIER TRANSFORMS:

Infinite Fourier transform, Fourier Sine and Cosine transforms, properties, Inverse transforms, Convolution theorem (statement only), Parseval's identities.**[8 L + 2 T]**

Unit-3

PARTIAL DIFFERENTIAL EQUATIONS:

Formation of Partial differential equations (PDE) by elimination of arbitrary constants or arbitrary functions. Solution of Lagrange's linear PDE. Solution of PDE by the Method of separation of variables, Derivation of one-dimensional heat equation, wave equation, various possible solutions of these by the method of separation of variables, D'Alembert's solution of wave equation. **[9 L + 3 T]**

Unit-4

NUMERICAL METHODS – 1:

Finite Difference operators: Forward differences, Backward differences, Shift operator (no relations between the operators).

Interpolation: Newton - Gregory forward formula, Newton - Gregory backward formula. Newton's general interpolation formula, Lagrange's interpolation formula (without derivations), Inverse interpolation.

Numerical Differentiation: Derivatives using forward and backward Newton Gregory formula.

Numerical Integration**:** Trapezoidal rule, Simpson's $1/3^{rd}$ rule, Simpson's $3/8^{th}$ rule, Weddle's rule (without derivations) **[8 L + 2 T]**

Unit-5

Z- TRANSFORMS:

Definition, Properties, Transforms of common functions, Inverse transform, solution of difference equations using Z -transforms. **[4 L + 2 T]**

CALCULUS OF VARIATIONS:

Variation of function and functional, Euler-Lagrange's equation, variational problems, geodesics, Standard variational problems - minimal surface of revolution, hanging chain, Brachistochrone problem. **[4 L + 2 T]**

Text Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig, 8th Edn,. John Wiley & Sons
2. Higher Engineering Mathematics by B. S. Grewal, 40th Edn., Khanna Publishers

Reference Books:

1. Advanced Modern Engineering Mathematics by Glyn James, 3rd Edition, Pearson Education
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill Publishing Company Ltd.,

SEE Question Paper Pattern:

1. Candidate needs to answer one full question from each unit
2. Internal choice (either/or) will be there for questions in Unit-3 and Unit-5
3. No choice for questions in Units -1, 2 and 4.
4. Each full question shall cover the syllabus of the entire unit.

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III SEMESTER Civil Engineering

Subject	STRENGTH OF MATERIALS	Sub. Code	09CV3DCSOM	SEE Duration
Credits	04	L-T-P	3:2:0	3hrs

Simple Stress and Strain : Introduction, Properties of Materials, Stress, Strain, Hooke's law, St. Venant's principle, Stress – Strain Diagram for structural steel and non ferrous materials, Principles of superposition, Deformation of uniform bars, bars of varying cross sections, tapering bars of circular and rectangular cross sections. Deformation due to self – weight, Elastic constants, relationship among elastic constants, Volumetric strain, Stresses in composite sections Thermal stresses (including thermal stresses in compound bars).

Transformation of Stresses: Introduction, Stress components on inclined planes, General two dimensional stress system, Principal planes and Principle stresses, , Plane stress and plane strain conditions, Mohr's circle of stresses.

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).

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**.**

Bending Stress, Shear 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 Expression for horizontal shear stress in beam, Shear stress diagram for rectangular, symmetrical 'I' and 'T' section (Flitched beams not included).

Deflection of Beams : Introduction – Definitions of slope, deflection, Differential equation of Elastic curve Slope and deflection for standard loading classes using Macaulay's method for prismatic beams and overhanging beams subjected to point loads, UDL, UVL and Couple.

Torsion of Circular Shafts : Introduction – 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.

Elastic Stability of Columns : Introduction – Short and long columns, Euler's theory on columns, Effective length slenderness ration, radius of gyration, buckling load, Assumptions, derivations of Euler's Buckling load for different end conditions, Limitations of Euler's theory, Rankine's formula and problems.

Text Books:

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

Reference Books:

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

III SEMESTER Civil Engineering

Subject	MECHANICS OF FLUIDS	Sub. Code	09CV3DCMOF	SEE Duration
Credits	04	L-T-P	2:2:2	3hrs

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, Capillary- Definition, Units , Problems on Fluid Properties.

Fluid Pressure & Its Measurement : Definition of Pressure, Units & Dimensions, Pressure at a point in a static fluid, Hydrostatic pressure law, Absolute, Gauge & Vacuum Pressure, Measurement of Pressure- Simple & Differential Manometers-Theory & Problems, Mechanical Gauge

Hydrostatics : Definition of Total Pressure, centre of pressure, Total pressure & center of pressure on Vertical, Inclined & curved plane surfaces, Pressure Diagram, Practical applications- Dams & Gates, Problems

Kinematics of Fluid Flow : Description of Fluid Flow, Classification of fluid flow, Stream line, Streak Line, Path Line, Stream tube, Acceleration of Flow in one dimensional flow, types of accelerations, Continuity Equation in differential form, definition of velocity potential, stream potential, equipotential line, Line of constant stream line, Relation between equipotential & stream function, Flow net, Laplace Equation, Problems.

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 & problems.

Dimensional Analysis : Introduction, Dimension, Dimensional Homogeneity, Methods- Rayleigh & Buckingham Pi Method, Similitude- Geometric, Kinematic & Dynamic Similarity, Problems.

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. Hydraulics & Fluid Mechanics – P.N.Modi & S.M.Seth, Standard Book House, New Delhi.
2. Fluid Mechanics- R.K.Bansal, Laxmi Publications, New Delhi.
3. Fluid Mechanics- K.L.Kumar, S. Chand & Company Ltd, New Delhi.

Reference Books

1. Fluid Mechanics- Victor L Streeter & E. Benjamin Wylie, Mc-Graw Hill publications.
2. Fluid Mechanics- Frank M White, Sixth Edition, the Mc-Graw Hill Companies.
3. Fundamentals of Fluid Mechanics- Bruce R Munson & Donald F Young, John Wiley & Sons, Inc.

BMS COLLEGE OF ENGINEERING, BANGALORE
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III SEMESTER Civil Engineering

Subject	GEODESY-I	Sub. Code	09CV3DCGDY	SEE Duration
Credits	04	L-T-P	3: 0: 2	3hrs

Definition-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.

Horizontal control-Linear measurements using chain, tape and other accessories, Principle of linear measurements. Obstacles in surveying

Directions-Meridians, Azimuths and Bearings, Declination computations.

Vertical control-Concepts of leveling, instruments used. Terms and definitions. Principle of Auto-level, Digital leveling-digital staff and level, advantages of digital leveling, Reductions of level, Booking of levels, Classification of leveling.

Curvature and refraction effects, Reciprocal leveling, Errors, Contouring, characteristics and Applications

Angle Measurement: Vernier transits and Electronic theodolites. Term and definitions, Essential parts of a theodolite, Adjustments in a theodolite, Fundamental lines and their relationship, Setting up using a plumb bob and the optical plumb-bob, Measurement of horizontal angle by Method of Repetition and Reiteration method.

Trigonometrical Leveling- Base of the object accessible, base of the object inaccessible- single plane and double plane methods. Optical distance measurement.

Route Surveying-Elements of curve surveying-linear and instrumental methods. Simple, compound, reverse and transition curves.

Horizontal Control-Electronic distance measurement, Classification of instruments, Measuring principles, Phase difference method, corrections, Geometrical reductions, Errors and calibration. Introduction to total station

Control Surveys-Traversing, types of traverse, latitude and departure, closing error, balancing a traverse, Omitted measurement

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.

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

Text Books:

1. Punmia. B.C., Ashok. K. Jain and Arun .K. Jain 'Surveying Vol1, and Vol2, Lakshmi Publications, 2009.
2. Punmia. B.C., Ashok. K. Jain and Arun .K. Jain ' Higher surveying' Vol 3
3. Roy. S.K., Fundamentals of Surveying' Prentice Hall of India, 1999, New Delhi.
4. Chandra .A.M., 'Higher Surveying', 2002, New Age International Pvt., Ltd., New Delhi,
5. Duggal. S.K, 'Surveying' Volume 1, 2 and 3, Tata McGraw Hill, 1996, New Delhi.

III SEMESTER Civil Engineering

Subject	BUILDING MATERIALS AND TESTING	Sub. Code	09CV3DCBMT	SEE Duration
Credits	03	L-T-P	2: 0: 2	3hrs

Introduction to Building Materials : Physical, chemical and mechanical properties parameters to define strength, durability and performance

Structural Clay and its Products : Earth (clay) as building materials, adobes and cob walls, rammed earth, mud mortars burnt bricks.

Burnt clay products – un-glazed and glazed tiles, terracotta, stoneware, porcelain and earthen ware

Stones : Natural stones - Stone products

Timber : Natural timber - Timber products

Lime : Lime and its products

Cement and Supplementary Cementitious/Pozzolanic Materials : Ordinary Portland cement, aggregates (fine and coarse), water, basic admixtures, mortar, basic concrete, fly ash, blast furnace slag and silica fume

Metals and its Products : Ferrous metals – iron, steel

Non-ferrous metals – aluminum, copper, zinc, chromium, lead, tin and nickel

Other Building Materials : Paints and enamels - Tar, bitumen - Gypsum - Polymeric materials - Adhesives and sealants - Water proofing materials - Sound and heat insulating materials

Composite Materials

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. Building materials (3rd revised edition), S K Duggal, New Age International publishers, India
2. Engineering Materials (Material Science), Rangawala P C. Charotar publishing house, Anand, India

Reference Books

1. A Text Book of Building Materials, P C Verghese, Prentice Hall of India Pvt. Ltd.
2. Concrete Technology, Neville A M and Brooks J J, ELBS, London
3. Concrete Technology, Gambhir M L, Dhanpat Rai and Sons, New Delhi
4. Building Materials in Developing Countries, Spence R J S and Cook D J, John Wiley and Sons
5. Mechanical Behaviour of Engineering Materials, Joseph Marin, Prentice Hall publishers
6. Advances in Building Materials and Construction, Mohan Rai and Jai Singh M P, CBRI publication
7. Alternative building materials and technology, Jagadish KS, B B V Reddy and Nanjunda Rao K S, New Age International publishers, India.
   Laboratory manual and relevant IS codes for laboratory tests

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III SEMESTER CIVIL ENGINEERING

Subject	ENGINEERING GEOLOGY-I	Sub. Code	09CV3DCGEO	SEE Duration
Credits	04	L-T-P	3 : 0 : 2	3hrs

Introduction: Introduction to Geology and its importance in civil engineering practices. Internal structure and composition of the earth.

Minerology: Study of rock forming and economically important minerals. Physical properties, chemical composition and used of the following minerals- : **Quartz group minerals**: Quartz and its Varieties;

Feldspar: Orthoclase, Microcline, Plagioclase. : **Mica group minerals**: Biotite, Muscovite : **Ampibole group**: Harnblende : **Pyroxne group**: Augite, Hypersthene : **Silicate group**: Olivine, Serpentine, Asbestos, Kaolin, Talc, Garnet : **Sulphate group**: Gypsum and Barite : **Oxcides group**: Corondum : **Carbonates group**: Calcite, Magnisite, Dolomite : **Ore or Economic minerals**: Magnitite , Haematite, Limonite, Iron Pyrite, Chalco Pyrites, Pyrolusite, Chromite, Galena , Bauxite.

Petrology: Study of Igneous Rocks: Introduction, definition, classification of Igneous Rocks. Classification, Description of the forms of the Igneous Rocks, Texture, structure of rocks. Petrological description and Engineering importance of the following rocks: Granite, Syenite, Diorite, Gabbro, Dunite, Porphyrite, Pegmatite, Dolerite, Basalt.

Study of Sedimentary Rocks: Introduction, definition, classification of Sedimentary rocks Description of the primary structures, Pertological description and engineering importance of the following Rocks. Conglomerate, Breccia, Sand Stone, Shale, Limestone, Laterite.

Study of Metamorphic Rocks : Introduction, Definition, kinds of Metamorphism, Metaphoric Structures, Petrological, description and engineering importance of the following rocks.

Slate, Schist, Gneiss, Quartzite, Marble, Charnockite,

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

Geomorphology: Weathering, Types of Weathering, Engineering Considerations, Soil Formation, Soil Profile, Soil Conservation, Land slide, (mass movements) causes and precautions. Earth quakes – causes and effects. Geological and engineering consideration in the design of Seismic Resistant Structures

Structural Geology: Introduction, Out Crop, Dip and strike, Campus clinometers, Description of Fold, Joints their importance in Civil Engineering, Faults, Unconformities and their recognition in the field. Their importance in civil Engineering

Groundwater Geology; Study of Groundwater and its importance, water table, water level fluctuation, types of Aquifers- Aquitard, Aquifuge, and Aquiclude. Artificial recharge of ground water. Selection of well sites, Geological and Geophysical Methods of Groundwater exploration and Applications of Electric resistivity method.

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
2. A Text of Geology, by P.K. Mukherjee

References:

1. A Text of Engineering and Geology, by B.S. Sathyanarayana swamy
2. Physical Geology, By Arthur Homes
3. Principle of Engineering Geology, by KVGK Gokhale
4. Principle of Engineering Geology, by K.M. Bangar

Physical and Enginneeing Geology, by S.K. 6. Garg , Geology for Engineers, By D.S. Arora

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IV SEMESTER BE SYLLABUS
(For the students admitted during academic year 2008-09)
(Common to all branches except for CS, IS and BT)

Subject	ENGINEERING MATHEMATICS – 4	Sub. Code	09MA4ICMAT	SEE Duration
Credits	04	L-T-P	3 : 1 : 0	3hrs

Unit-1

STATISTICS:

Curve fitting- Fitting of a straight line, parabola, curves of the form $y = ae^{bx}$, $y = ab^{x}$, $y = ax^{b}$. Correlation and Regression. **[4 L + 1 T]**

PROBABILITY –1

Probability of an event, axiomatic definition, addition theorem, Conditional probability, multiplication theorem, Bayes's theorem. **[4 L + 1 T]**

Unit-2

PROBABILITY –2

Probability distributions: Random variables, discrete probability distributions – Binomial and Poisson distributions; Continuous probability distributions- Exponential and normal distributions.

Joint Probability distributions: Case of discrete random variables, mathematical expectation, correlation, covariance.

Markov Chain: Probability vectors, stochastic matrices, fixed points, regular stochastic matrices. Markov chains, higher transition probabilities, stationary distribution of regular Markov chains and absorbing states. **[9 L + 3 T]**

Unit-3

COMPLEX ANALYSIS-1

Function of a complex variable, Analytic functions, Cauchy-Riemann equations, construction of analytic functions, Cauchy-Reimann equations in Polar form, Complex integration-Cauchy's theorem, Cauchy's integral formula, Taylor's and Laurent's series, Singular points, poles, residues, residue theorem. **[8 L + 2 T]**

Unit-4

COMPLEX ANALYSIS- 2

Transformations- $w = z^2$, $w = e^z$, $w = z + \left(a^2 / z\right)$; Bilinear transformations. **[2 L + 1 T]**

SERIES SOLUTION OF DIFFERENTIAL EQUATIONS

Series solution-Frobenius method, series solution of Bessel's differential equation leading to Bessel function of first kind, equations reducible to Bessel's differential equation, series solution of Legendre's differential equation leading to Legendre polynomials, Rodrigue's formula. **[6 L + 1 T]**

Unit-5

NUMERICAL METHODS –2

Algebraic and Transcendental Equations: Regula falsi method, Newton Raphson method, Numerical solutions of ordinary differential equations: Taylor's series method modified Euler's method, Runge-Kutta 4^{th} order method, Milne's method and Adam's - Bashforth method (No derivations of formulae). **[3 L + 2T]**

MATRICES:

Echelon form of a matrix, Rank of a matrix by elementary row transformations, Consistency of system of linear equations, Gauss elimination method, Gauss – Seidel method, Characteristic values and Characteristic vectors of matrices, Computation of largest eigen value and eigen vector using Rayleigh's power method.**[3 L + 2 T]**

Text Books:

1. Advanced Engineering Mathematics by Erwin Kreyszig, 8th Edn,. John Wiley & Sons
2. Higher Engineering Mathematics by B. S. Grewal, 40th Edn., Khanna Publishers

Reference Books:

1. Advanced Modern Engineering Mathematics by Glyn James, 3^{rd} Edition, Pearson Education
2. Higher Engineering Mathematics by B.V. Ramana, Tata McGraw-Hill Publishing Company Ltd.,
3. Probability and Statistics by Murry R Spiegel, John Schiller and AluSrinivasan, Second edition, Schaumn's outlineseries.
4. Introductory methods in Numerical Analysis by S.S. Sastry, 4^{th} edition, Prentice Hall of India

SEE Question Paper Pattern:

1. Candidate needs to answer one full question from each unit
2. Internal choice (either/or) will be there for questions in Unit-2 and Unit-5
3. No choice for questions in Units -1, 3 and 4.
4. Each full question shall cover the syllabus of the entire unit.

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IV SEMESTER CIVIL ENGINEERING

Subject	HYDRAULICS & HYDRAULICS MACHINES	Sub. Code	09CV4DCHYM	SEE Duration
Credits	04	L-T-P	2:2:2	3hrs

Flow in Open Channels : Definition of channel, difference between pipe and open channel flow, classification, types of flows, geometric properties of open channels, Uniform flow in open channels, Chezy's & Manning's formula, Most economical open sections- rectangular, trapezoidal, circular sections- derivations & problems. Specific Energy, definitions, Specific Energy curve, condition for Maximum discharge & Minimum specific energy, critical flow in rectangular sections, problems

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, and hydraulic jump in a rectangular channel, types & applications.

Dimensional Analysis : Similitude- Geometric, Kinematic & Dynamic Similarity, Similarity laws, types of models- Reynolds's & Froude's Models, merits & demerits, Scale effects, problems

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.

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, problems.

Turbines : Definition, classification, Pelton turbine, theory, equation for work done & efficiency, problems, Francis turbine, theory, equation for work done & efficiency, problems, Specific speed, unit quantities, characteristic curves

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

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. Hydraulics & Fluid Mechanics – P.N.Modi & S.M.Seth, Standard Book House, New Delhi.
2. Fluid Mechanics- R.K.Bansal, Laxmi Publications, New Delhi.
3. Fluid Mechanics- K.L.Kumar, S. Chand & Company Ltd, New Delhi.

Reference Books

1. Fluid Mechanics- Victor L Streeter & E. Benjamin Wylie, Mc-Graw Hill Publications.
2. Fluid Mechanics- Frank M White, Sixth Edition, the Mc-Graw Hill Companies.
3. Fundamentals of Fluid Mechanics- Bruce R Munson & Donald F Young, John Wiley & Sons, Inc.

IV SEMESTER CIVIL ENGINEERING

Subject	ANALYSIS OF STRUCTURES –I	Sub. Code	09CV4DCAOS	SEE Duration
Credits	04	L-T-P	3+2+0	3hrs

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 Pin Jointed Determinate Plane Trusses - Introduction and types of Trusses. Assumptions, Analysis by Method of joints and Method of sections.

Deflection of Beams - Moment area method and Conjugate beam method.

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. Deflection of beams and trusses by Unit load method.

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)

Three Moment Theorem-Clapeyron's theorem of three moments-Continuous beams.

Redundant Trusses- Analysis by unit load method.

Analysis of Two Hinged Arches-Parabolic and Circular types under point loads and UDL. Supports at same level.

Text books:

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

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.

IV SEMESTER CIVIL ENGINEERING

Subject	GEOTECHNICAL ENGINEERING – I	Sub. Code	09CV4DCGTE	SEE Duration
Credits	04	L-T-P	2:2:2	3hrs

Introduction : Historical perspective of soil mechanics, 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 inter relationships

Index Properties of Soils and Their Determination : Index Properties of soils and their significance. Understanding various index properties namely, Water content, Specific Gravity, Particle size distribution, Relative density, Consistency limits and their indices, in-situ density, Activity of Clay. Laboratory determination of index properties of soils namely, specific gravity, Particle size distribution (Sieve analysis and Hydrometer analysis only),

Laboratory determination of Liquid Limit- by Casagrande's Percussion cup device and cone penetration method, Plastic limit and shrinkage limit determination. Physical significance of the plasticity properties of soil. Understanding the concept of Soil state and soil type in describing the engineering behavior of soils

Classification of Soils : Need for soil classification, Requirements for a soil classification system, *Particle size classification* – MIT classification and IS classification; *Textural classification* – Unified soil classification and IS classification - Plasticity chart and its importance, Field identification of soils.

Clay Mineralogy and Soil Structure : Single grained, honey-combed, flocculent and dispersed structures, Valence bonds Soil-Water system, Electrical diffuse double layer, adsorbed water, base-exchange capacity, Isomorphus substitution. Common clay minerals in soil and their structures- Kaolinite, Illite and Montmorillonite. Free swell test, Free swell index. Expansivity of clay based on Plasticity index, Shrinkage index, and free swell index. Methods of determining clay minerals - Differential thermal analysis and X-ray diffraction analysis

Flow of Water through Soils-I : Darcy's law- assumption and validity, coefficient of permeability and its determination (laboratory and field), factors affecting permeability, permeability of stratified soils, Seepage velocity, Superficial velocity and coefficient of percolation,

Flow of Water through Soils-Ii : Effective stress concept-total pressure and effective stress, quick sand phenomena, Capillary Phenomena

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, Methods of accelerating consolidation settlement

Normally consolidated, under consolidated and over consolidated soils, pre-consolidation pressure and its determination by Casagrande's method and loge–log p-method. Laboratory one dimensional consolidation test, Determination of consolidation characteristics of soils-compression index, and coefficient of consolidation, determination of coefficient of consolidation by square root of time fitting method, logarithmic time fitting method and rectangular hyperbola method

Shear Strength of Soils: Concept of shear strength, Mohr's strength theory, Mohr-coulomb theory, factors affecting shear strength of soils conventional modified failure envelope. Total and effective shear strength parameters, Concept of pore pressure,

Concept of stress path, Sensitivity and Thixotropy of clay. Measurement of shear parameters- Direct shear test, unconfined compression test, and vane shear test,

Shear testing under different drainage conditions. Triaxial compression test. Mohr's circle for all the type of shear tests. P-Q diagram and modified failure envelope

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.

Reference Books:

1. Braja, M. Das (2002), "Principles of Geotechnical Engineering", Fifth Edition, Thomson Asia Pte Ltd.,
2. Craig R.F. (2004), "Soil Mechanics", 7th edition, Spon press, New York.
3. Gopal Ranjan and Rao A.S.R. (2000), "Basic and Applied Soil Mechanics", New Age International (P) Ltd., New Delhi.
4. Lambe and Whitman (1979), "Soil Mechanics" John Wiley & Sons, New York
5. Terzaghi. K., and Peck. R.B. (1967) "Soil mechanics in Engineering practice", 2nd Edition, John Wiley and Sons, New York.

Text 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. Bowles J.E. (1988), "Engineering Properties of Soil and Their Measurements", McGraw Hill Book Co. New York.
4. Lambe T.W., "Soil Testing for Engineers", Wiley Eastern Ltd., New Delhi
5. Relevant B.I.S codes

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Geotechnical Engineering-I
Course Code-CV4DCGTE
List of Lab Experiments

1. Tests for determination of water content by oven drying and pycnometer method.
2. Tests for determination of specific gravity by pycnometer and density bottle method.
3. Grain size analysis of soil sample (Mechanical sieve analysis and sedimentation analysis by hydrometer method).
4. In situ density by core cutter and sand replacement methods.
5. Consistency Limits - Liquid Limit (Casagrande's Percussion cup and Cone Penetration Methods), plastic limit and shrinkage limit.
6. Standard Proctor Compaction Test.
7. Coefficient of permeability by constant head and variable head methods.
8. Strength Tests
   a) Unconfined Compression Test
   b) Direct Shear Test
   c) Triaxial Compression Test (Unconsolidated undrained test)
9. Consolidation Test- Determination of compression index and coefficient of consolidation.
10. Demonstration of miscellaneous equipments such as Augers, Samplers, Rapid moisture meter and Proctor's needle.

Subject	CONCRETE TECHNOLOGY	Sub. Code	09CV4DCCON	SEE Duration
Credits	03	L-T-P	2+0+2	3hrs

Concrete Ingredients

Cement – chemical composition, hydration of cement, types of cement. Testing of cement.

Fine aggregate – Importance of Grading analysis, specific gravity, bulking, moisture content, deleterious materials. Testing of fine aggregates : Coarse aggregate – Importance of size, shape and texture, Grading of aggregates. Fineness modulus : Water – qualities of water. Use of sea water for mixing concrete. Testing of coarse aggregates. : Admixtures – chemical admixtures – plasticizers, accelerators, retarders and air entraining agents. Minerals admixtures – fly ash, Ggbs, silica fumes and rice husk ash.

Fresh Concrete : Workability - factors affecting workability - Measurement of workability – slump, Compaction factor and Vee-Bee consistometer tests, flow tests - Segregation and bleeding Process of manufactures of concrete: Batching, Mixing, Transporting, Placing and Compaction - Curing – Methods of curing – Water curing, membrane curing, steam curing. Accelerated curing.

Hardened Concrete : Factors influencing strength, W/C ratio, gel/space ratio, Maturity concept Testing of hardened concrete, relation between compressive strength, tensile strength, bond strength, Modulus of rupture, Elasticity – Relation between modulus of elasticity and Strength — Factors affecting modulus of elasticity, Poisson Ratio, Creep – Measurement of creep, factors affecting creep. Shrinkage of concrete – plastic shrinking and drying shrinkage Factors affecting shrinkage, Moisture Movement. Durability – Definition and significance of durability. Internal and external factors influencing durability, Mechanisms- Sulphate attack – Chloride attack, carbonation, freezing and thawing.

Concrete Mix Design : Concept of Mix Design, variables in proportioning and Exposure conditions

Procedure of mix design Numerical Examples of Mix Design

Insitu testing of concrete : Penetration and pull out test, rebound hammer test, ultrasonic pulse velocity, core extraction – Principal, applications and limitations.

Special Concretes: RMC, FRC, HPC, SCC, RCC, RPC, GPC.

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. Neville A.M "Properties of Concrete", ELBS, London

References Books:

1. M.S. Shetty, Concrete Technology - Theory and Practice Published by S. Chand and Company, New Delhi.
2. Gambhir M.L : "Concrete Technology", Dhanpat Rai & Sons, New Delhi
3. N Krishna Raju - "Concrete Mix Design –Sehgal – Publishers
4. Gambhir M.L : "Concrete Manual", Dhanpat Rai & Sons, New Delhi
5. Current Literature

IV SEMESTER CIVIL ENGINEERING

Subject	BUILDING PLANNING AND DRAWING	Sub. Code	09CV4DCBPD	SEE Duration
Credits	03	L-T-P	1:0:4	3hrs

Introduction to building components: (i) isolated RCC column footing (ii) wall footing (iii) RCC dog legged and open well stair case (iv) trusses (v) doors and windows (vi) lintel and chajja.

Guidelines for building drawings, definition of terms used in building drawings, 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, development of line diagram.

To prepare working drawing of component of buildings (i)Stepped wall footing and isolated RCC column footing (ii) RCC dog legged and open well stair case (iii) trusses (iv) doors and windows

Functional design of building (residential and public), positioning of various components of buildings, orientation of buildings, building standards, bye laws, setback distances and calculation of carpet area, plinth and floor area ratio.

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

Functional design of buildings using inter connectivity diagram (bubble diagram), development of line diagram only for following building (i) primary health centre (ii) college canteen (iii) office building

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

Reference books: -

1. Dr.B.C.Punmia, Ashok Kr. Jain, Arun Kr. Jain, "Building Construction", Laxmi Publications Pvt Ltd
2. Shah M. H. And Kale C. M. "Building Drawing", Tata McGraw Hill Publishing Co.
3. Gurucharan Sing, "Building Construction", Standard publication
4. National Building code, BIS, New Delhi IS:962- Code of practice for architecture and building drawin

IV SEMESTER CIVIL ENGINEERING

Subject	GEODESY–II	Sub. Code	09CV4DCGEO	SEE Duration
Credits	03	L-T-P	2:0:2	3hrs

Introduction to Geodetic Surveying,

Photogrammetry: Introduction – Basic Principles- Photo theodolites - Definitions – Horizontal and Vertical angle from teerestial photography – Horizontal position of a point from photo graphic measurement from camera horizontal axis- Elevation of point by photographic measurement –focal length

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

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. Introduction, spatial information, temporal information, conceptual models of spatial information, representation of geographic information. GIS functionality – Introduction, data acquisition, preliminary data processing, data storage and retrieval, spatial search and analysis, graphics and interaction.

Computer Fundamentals of GIS and Data storage. Fundamentals of computers vector/raster storage character files and binary files, file organization, linked lists, chains, trees, coordinate systems and map projection: Rectangular polar and spherical coordinates, types of map projections, choosing a map projections.

Digitizing Editing and Structuring Map Data: Entering the spatial data (digitizing), the non spatial, associated attributes, linking spatial and non-spatial data, use of digitizers and scanners of different types

GIS and remote sensing data integration techniques, Global positioning system-Working Principle.

Text Books:

1. Remote Sensing and Image Interpretation – Lille Sand, John Wiley and Sons
2. Remote Sensing and GIS – M Anji Reddy,

References Books:

1. Elements of Photogrammetry – Paul R Wolf, McGraw International
2. Principles of GIS – Peter A Burrough, Oxford Publications
3. GIS and Computer Cartography – Christopher Jones, Longman Publications
4. GIS – Bemhardsen, Wiley Publications

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V SEMESTER CIVIL ENGINEERING
ANALYSIS OF STRUCTURES –II

Sub Code	10CV5DCAOS	Total Hrs	52 Hours	SEE Duration
Credits	4	L–T-P	3:2:0	3hrs

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**

Slope Deflection Method:

Introduction, Sign Convention, 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, Definition of terms- 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)

06 Hours

Moment Distribution Method (With Sway)

Analysis of rigid jointed plane frames (sway, members assumed to be axially rigid and kinematic redundancy <3).

08 Hours

Kani's Methods

Introduction, Basic Concept, Analysis of Continuous beams, Analysis of rigid jointed sway and non-sway plane frames.

10 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.

07 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.,

07 Hours

Text Books:

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

Reference Books:

1. J. Sterling Kinney, "Indeterminate Structural Analysis", Oxford and Publishing Co.
2. Noris C.H., Wilbur J.B., "Elementary Structural Analysis", Mc Graw Hill International Book Edition.
3. S. S. Bhavikatti – "Structural Analysis-II", Vikas Publishers, New Delhi
4. C.K. Wang, "Intermediate Structural Analysis", Mc Graw Hill Publications.
5. Ashok K. Jain, "Advanced Structural Analysis", Nem Chand & Bros., Roorkee, India.

V SEMESTER CIVIL ENGINEERING
HYDROLOGY AND WATER RESOURCES ENGINEERING

Sub Code	10CV5DCHWR	Total Hrs	52 Hours	SEE Duration
Credits	4:0:0=4	L-T-P	4:0:0	3hrs

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

02 Hours

Precipitation: Definition. 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's polygon and Isohyetal methods). Estimation of missing rainfall data (Arithmetic average, normal ratio and regression

methods). Presentation of precipitation data (moving average curve, mass curve, rainfall hyetographs, intensity – duration-frequency curves). 07 Hours

Losses From Precipitation: Introduction. Evaporation: Definition, Process, factors affecting, measurement using IS Class A Pan. Estimation using empirical formulae. Infiltration: Definition, factors affecting infiltration capacity, measurement (double ring infiltrometer). Horton's infiltration equation, infiltration indices. 07 Hours

Runoff: Definition. Concept of catchment. Water budget equation. Components. Factors affecting. Rainfall - runoff relationship using simple regression analysis. **03 Hours**

Stream Flow Measurement: Introduction. Measurement of stage. Measurement of discharge by Area – Velocity method and slope area method. Simple stage discharge relation. 06 Hours

Hydrographs: Definition. Components of Hydrograph. Unit hydrograph and its derivation from simple storm hydrographs. Base flow separation. S – Curve and its uses. **04 Hours**

Ground Water Hydrology And Well Hydraulics: Scope and importance of ground water hydrology. Aquifer parameters. Steady radial flow into wells in unconfined and confined aquifers. Types of wells, Methods of construction. **06 Hours**

Water Resources: Introduction. Water wealth. River basins and their potential. Importance of water resources projects in India. Water resources development in Karnataka. **06 Hours**

Text Books:

1. Engineering Hydrology- Subramanya K, Tata McGraw Hill, New Delhi.
2. A Text Book of Hydrology- Jayarami Reddy, Lakshmi Publications, New Delhi.

Reference Books:

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

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V SEMESTER CIVIL ENGINEERING

GEOTECHNICAL ENGINEERING-II

Sub Code	10CV5DCGTE	Total Hrs	52 Hours	SEE Duration
Credits	4	L-T-P	3:2:0	3hrs

Prerequisite: Nil

Course Objectives:

To provide the application of Principles of Soil Mechanics to practical problems in geotechnical Engineering

Outcome of the course:

By the end of the course successful students should:

- Able to apply the concepts of soil mechanics to various practical situations in civil engineering practice.
- Understand the physical significance of field investigation and interpreting the results obtained.

Contribution of Course to meeting the Professional Component: This course is an engineering topic of professional significance for graduating Civil Engineers

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1. Definition, Principle of compaction. Standard and Modified Proctor's tests and their compactive energy. Factors affecting compaction, effect of compaction on soil properties, Field compaction control, Proctor's needle, nuclear density meter. Field compaction equipments. Determination of CBR **03 Hours**
2. **Subsurface Exploration**: Importance of exploration program, Methods of exploration: Trial pits, boring. Types of samples- undisturbed, disturbed and representative samples. Types of Samplers, sample disturbance, area ratio, Recovery ratio, clearance, Stabilization of boreholes - Typical boring log. Number and depth of borings for building and dams. Sounding tests–Standard penetration test and Cone penetration test Geophysical methods-Electrical resistivity and Seismic refraction methods, Soil exploration report. **03 Hours**
3. **Stresses In Soils:** Boussinesq's theory for concentrated, line, strip loads, circular and rectangular loading (No derivation of equations to be asked for examination) **03 Hours**

4. **Stresses In Soils** (Cont'd): Newmark's chart, Pressure bulb. Westergaard's theory. Contact pressure. **03 Hours**

5. **Stability of Earth Slopes**: Types of slopes, causes and type of failure of slopes. Definition of factor of safety, Stability of finite and infinite slopes- Method of slices. **03 Hours**

6. **Stability of Earth Slopes (Contd.):** Friction Circle method, Fellenius method of locating centre of critical slip circle, Taylor's stability number. **03 Hours**

7. **Lateral Earth Pressure**: Active and passive earth pressures, Earth pressure at rest, Earth pressure coefficient and their range. Earth pressure theories- Rankine's and Coulomb's –assumptions and limitations, **03 Hours**

8. **Lateral Earth Pressure (Contd.)**: Graphical solutions for active earth pressure (cohesionless soil only) –Culmann's and Rebhann's methods Lateral earth pressure in cohesive and cohesionless soils, Earth pressure distribution. **03 Hours**

9. **Bearing Capacity**: Definitions of ultimate, net and safe bearing capacities, Allowable bearing pressure. Terzaghi's bearing capacity equations- assumptions and limitations bearing capacity of footing subjected to vertical loading. **03 Hours**

10. **Bearing Capacity (Cont'd)**: Meyerhof's bearing capacity equations-assumptions and limitations bearing capacity of footing subjected to eccentric loading. **03 Hours**

11. Effect of ground water table on bearing capacity. Plate load test, Correlation of Standard penetration test N-values and cone penetration resistance with bearing capacity of soil **03 Hours**

12. **Foundation Settlement**: Settlement Analysis, data for settlement analysis, computation of settlement-immediate, consolidation and secondary settlements (no derivations), Tolerance. BIS specifications for total and differential settlements of footings and rafts **03 Hours**

Text Books

1. Punmia B.C. (2005), 'Soil Mechanics and Foundation Engg.", 16th Edition, Laxmi Publications Co. , New Delhi.
2. Braja M. Das (2002), "Principles of Geotechnical Engineering", 5th Edition,Thomson Business Information India (P) Ltd., India.

Reference Books/Codes:

1. Bowles J.E. (1996), "Foundation Analysis and Design" 5th Edition, McGraw Hill Pub. Co. New York.
2. Bowles J.E. (1988), "Engineering Properties of Soil and Their Measurements", McGraw Hill Book Co. New York.
3. Craig R.F. (2004), "Soil Mechanics", 7th edition, Spon press, New York.
4. Gopal Ranjan and Rao A.S.R. (2000), "Basic and Applied Soil Mechanics", New Age International (P) Ltd., New Delhi.
5. Head K.H., (1986), "Manual of Soil Laboratory Testing", Vol. I, II, III, Princeton Press, London.
6. Lambe T.W., "Soil Testing for Engineers", Wiley Eastern Ltd., New Delhi
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, ASTM and BS codes

V SEMESTER CIVIL ENGINEERING
DESIGN OF RCC STRUCTURES

Sub Code	10CV5DCRCC	Total Hrs	52 Hours	SEE Duration
Credits	4	L-T-P	3:2:0	3hrs

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.

05 Hours

Philosophies of Design by Limit State Method: Introduction, Principles of limit states, 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.

09 Hours

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.

05 Hours

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 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.

07 Hours

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.

08 Hours

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 and biaxial moment using SP – 16 charts.

05 Hours

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 pedestal.

07 Hours

Design of Stair cases: General features, types of stair case, loads on stair cases, effective span as per IS code provisions, distribution of loading on stairs, Design of stair cases.

6 Hours

Note: Study of this course should be based on IS: 456-2000

Text Books:

1. Limit State Design of Reinforced Concrete, by P.C.Varghese, Prentice-Hall of India Pvt. Ltd., New Delhi.
2. Reinforced Concrete Limit State Design, by Ashok K. Jain, Nem Chand & Bros, Roorkee.

Reference Books:

1. Limit State Design of Reinforced Concrete Structures, by P.Dayaratnam, Oxford & I.B.H. Publishing Company Pvt. Ltd., New Delhi.

2. **Design of Reinforced concrete structures** - N. Krishnaraju, - (IS: 456 – 2000) CBS publishers, New Delhi.
3. **Reinforced Concrete-** Park & Paulay – John Wiley & Bros.
4. **Limit State design of Reinforced concrete**- B.C. Punmia, Ashok kumar Jain & Arun kumar Jain – Laxmi Publication, New Delhi.
5. **Reinforced Concrete,** by S.K.Mallick and A.P.Gupta, Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi.
6. **Design of Concrete Structures,** by Arthur H. Nilson, David Darwin and Charles W. Dolan, Tata McGraw-Hill Publishing Company Limited, New Delhi.
7. **Properties of Concrete,** A.M.Neville, Pearson Education (Singapore) Pte. Ltd.,
8. **Reinforced Concrete Design,** by S.Unnikrishna Pillai and Devdas Menon, Tata McGraw-Hill Publishing Company Limited, New Delhi.

V SEMESTER CIVIL ENGINEERING
ENVIRONMENTAL ENGINEERING-I

Sub Code	10CV5DCENV	Total Hrs	52 Hours	SEE Duration
Credits	4	L-T-P	3:0:2	3hrs

Introduction; Human activities and environmental pollution, Requirement of water for various beneficial uses, Need for protected water.

02 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. Fire demand by kuichling's formula, Freeman formula and national board of fire underwriters formula, peak factors, design period and factors governing the design periods.

06 Hours

Sources: Surface and Subsurface sources-suitability with regard to quality and quantity.

03 Hours

Collection and Conveyance of Water: 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. **06Hours**

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 andArsenic. Sampling water for examination. **06 Hours**

Water Treatment: Objectives- Treatment flow-chart. Aeration-Principles, types of Aerators. **02 Hours**

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

Filtration; 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. **06 Hours**

Disinfection; Theory of disinfection, types of disinfection, Chlorination, chlorine demand, residual chlorine, use of bleaching powder. UV rays. Treatment of swimming pool water. **04 Hours**

Softening: definition methods of removal of hardness by lime soda process and zeolite process RO and membrane technique. **03 Hours**

Miscellaneous Treatment: Removal of color, odor, taste, Adsorption techniques, Fluoridation and Defluoridation. **04 Hours**

Distribution Systems: Requirements, Layouts, Methods of distribution. **02Hours**

Plumbing Systems In Buildings: Pipe appurtenances, Layout of water supply pipes, Hot water supplies, Plumbing in High rise buildings **04 Hours**

Text Books:

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

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.

ENVIRONMENTAL ENGINEERING-I LABORATORY

Examination of Water:

1. Determination of pH by pH meter, Tubidity by Nephelometer
2. Determination of conductivity by Nephelometer.
3. Determination of Acidity, Alkalinity
4. Determination of Total hardness.
5. Determination of Calcium, magnesium.
6. Determination of Iron by Phenanthroline method.
7. Determination of Dissolved oxygen
8. Determination of Optimum Dosage of Alum.
9. Determination of percentage of available chlorine in bleaching powder, Residual chlorine and chlorine demand.
10. Determination of Chlorides.
11. Determination of Sulphates.
12. Determination of Sodium and Potassium by flame photometer.
13. Bacteriological Examination.

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V SEMESTER CIVIL ENGINEERING
HIGHWAY ENGINEERING

Sub Code	10CV5DCHEN	Total Hrs	52 Hours	SEE Duration
Credits	4	L-T-P	3:0:2	3hrs

1. Role of Transportation Engineering-Characteristics of Road Transport–scope of highway engineering **02 Hours**

2. **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-Road Network for 2021-problems **03 Hours**

3. **Traffic Engineering:** Introduction- Traffic Flow- PCU Values- Traffic Engineering studies- Volume-Speed- Capacity-Accident- O-D-Parking-(Only Introduction and no analysis and problems on studies). **03 Hours**

4. **Highway Alignment and Surveys**: Alignment-Surveys for highway location-Reports- Highway Projects- Realignment and new alignment. **04 Hours**

5. **Geometric Design**: design factors-Highway cross sectional elements-pavement surface characteristics-Camber-Sight distance requirement- Horizontal alignment-design speed-super elevation-transition curves-set back distance- vertical alignment – gradients-curves- problems on above. **06 Hours**

6. **Highway Materials and Pavement Design** : desirable properties of sub grade soil- Soil Classification – IS – HRB methods- Plate load test and CBR Test-Problems - Road aggregates - Desirable properties - Tests - Bituminous materials-Desirable properties-Tests. **06 Hours**

7. Pavement design – Flexible and Rigid pavements- Design of flexible pavement by CBR Method (CSA) - Design of Rigid pavements- wheel load stresses-Westergaard equations-Temperature stresses- problems on above. **06 Hours**

8. **Highway Construction**: Earthwork- Excavation- Embankment- Different types of base course constructions-WBM-WMM-Bituminous Macadam-Surface courses-Bituminous concrete-Cement Concrete. **06 Hours**

9. **Hill Roads**:-general consideration –alignment-geometric elements-Design and construction-Maintenance **04 Hours**

10. **Highway Drainage**: objects-surface drainage- -design of surface drainage system- Subsurface drainage-lowering of water table-control of seepage flow-control of capillary rise-road construction in waterlogged areas. **06 Hours**

11. **Highway Economics:** benefits- Road user cost- financial Viability-Economic Evaluation-B/C ratio, NPV and IRR Methods- problems on above. Highway finance-options -BOT and BOOT. **04 Hours**

Text Book:

1. Khanna, S.K. and Justo,C.E.G. " Highway Engineering", Nemchand and Bros, Roorkee, 2009
2. Kadiyali. L R. "Traffic Engineering and Transport planning", Khanna publishers, 2009

Reference:

1. Rao, G V., "Principles of Transportation and Highway Engineering", Tata Mcgraw Hill, 2005
2. Khanna, S.K. Justo,C.E.G. and Veeragavan. A " Highway Material Testing", Nemchand and Bros, Roorkee, 2009

HIGHWAY ENGINEERING LABORATORY

1. **Coarse Aggregate:** Gradation- - Shape tests-Aggregate Impact Test- Los Angeles Abrasion Test – Compressive strength of Aggregates- Specific Gravity Test and Water Absorption Test-Rothfutch Method of gradation Mix

2. **Bitumen:** Penetration Test-Ductility Test- Softening point Test-Flash and Fire Point Test- Viscosity test- Stripping Test-

3. **Tests on Soil Sub grade**: Compaction- Dry density- OMC- CBR Test

References:

- Khanna, S.K. Justo,C.E.G. and Veeragavan. A " Highway Material Testing", Nemchand and Bros, Roorkee, 2009

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MINOR PROJECT/ INDUSTRIAL VISIT

Sub Code	**10CV5DCMIP**	**Total Hrs**	**52** Hours	**SEE Duration**
Credits	**1**	Contact hours	**2 hrs/week**	**3hrs**

Course objective:

To expose students to industrial environment and practices in a few of the following construction sectors:

- Manufacturing of construction materials – cement, brick, steel etc.,
- Infrastructure projects
- Irrigation and power generation structures
- Water supply and sewage treatment plants
- Any other interesting ongoing projects.

Proposed Evaluation: Students are expected to prepare a concise report giving the introduction and details of the projects which they have observed and present it.

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VI SEM CIVIL ENGINEERING
DESIGN OF STEEL STRUCTURES

Sub Code	10CV6DCDSS	Total Hrs	52 Hours	SEE Duration
Credits	4	L-T-P	3:2:0	3hrs

Introduction: Advantages and Disadvantages of Steel structures, Loads and Load combinations, Design considerations, Limit State Method (LSM) of design, Failure criteria for steel, Codes, Specifications and section classification.

04 Hours

Bolted Connections: Introduction, Behavior of Bolted joints, Design strength of ordinary Black Bolts, Design strength of High Strength Friction Grip bolts (HSFG), Simple Connections, Moment (small and heavy) resistant connections

08 Hours

Welded Connections: Introduction, Welding process, Welding electrodes, Advantages of Welding, Types and Properties of Welds, Types of joints, Weld symbols, Weld specifications, Effective areas of welds, Design of welds, Simple joints, Moment resistant connections.

04 Hours

Plastic Behaviour of Structural Steel: Introduction, Plastic theory, Plastic hinge concept, Plastic collapse load, conditions of plastic analysis, Theorem of Plastic collapse, Methods of Plastic analysis, Plastic analysis of continuous beams. (No design)

07 Hours

Design of Tension Members: Introduction, Types of tension members, Slenderness ratio, Behaviour of tension members, Modes of failure, Factors affecting the strength of tension members, Angles under tension, other sections, Design of tension member, Lug angles.

06 Hours

Design of Compression Members: Introduction, Failure modes, Behavior of compression members, Elastic buckling of slender compression members, Sections used for compression members, Effective length of compression members, Design of compression members, built up compression members. Design of simple slab base and gusseted base

14Hours

Design of Beams: Introduction, Beam types, lateral stability of beams, factors affecting lateral stability, Behavior of simple beams in bending (without vertical stiffeners), Design of laterally supported and laterally unsupported beams.

07 Hours

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

Text Books:

1. Design of Steel Structures-N.Subramanian, Oxford publishers.
2. Design of Steel Structures by Limit state method – S.S.Bhavikatti, I.KInternational publishers.

Reference:

1. Limit state design of steel structures (based on IS- 800-2007 in SI Units)" - Dr.Ramachandra & Virendra, Gehlot,Scientific publishers.
2. Limit State Design of Steel Structures. Duggal. TATA Mc-graw Hill 2010

VI SEM CIVIL ENGINEERING
ENVIRONMENTAL ENGINEERING-II

Sub Code	10CV6DCENV	Total Hrs	26 Hours	SEE Duration
Credits	3	L-T-P	3:0:0	3hrs

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)

03 Hours

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

02 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.

03 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.

03 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.

03 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.

04 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.

04 Hours

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

04 Hours

Text Books:

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

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.

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VI SEM CIVIL ENGINEERING
EXTENSIVE SURVEY PROJECT

Sub Code	10CV6DCESP	Total Hrs	Field Hours+26Hours	SEE Duration
Credits	2	Contact hrs	4hrs/week	3hrs

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
PRE-STRESSED CONCRETE

Sub Code	10CV6DCPSC	Total Hrs	39 Hours	SEE Duration
Credits	3	L-T-P	3:0:0	3hrs

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 electricpre stressing, chemical pre-stressing.

07 hours

Analysis of Pre-Stress and Bending Stresses:
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

04 hours

Losses of Pre Stress, Deflection of Pre Stressed Concrete Members:
Nature of losses of prestress, losses due to elastic deformation, loss due toshrinkage, creep, relaxation of stresses in steel,friction,anchorage slips,total losses allowed for design. Importance of control of deflection, factors influencing the deflections, hart term deflections, prediction of long time deflections, various code practices

09hours

Flexure, Shear and Torsional Strength of Pre-Stressed Concrete Sections:
Types of flexural failure, strain compatibility method, code procedures, section with steel in compression zone. Shear and principal stresses, ultimate shear resistances, design of shear reinforcements, pre stressed concrete members in torsion, design of reinforcement for torsion, shear and bending.

09hours

Anchorage Zone Stresses, Design of Pre Tensioned and Post Tensioned Flexural Members:
Introduction, stress distribution in end block, investigation of anchorage zone stresses, (IS method only) anchorage reinforcement Dimensioning of flexural members, estimation of self weight of the beam, design of post and pre tensioned beams.

Note: Study of this course should be based on IS: 1343: 1980, IS: 201

10hours

Text Books:

1. Prestresssed concrete - N.Krishna Raju, Tata mcgraw-Hill Publishing company limited
2. Pre-stressed Concrete- P. Dayarathnam : Oxford and IBH Publishing Co

Reference Books:

1. Design of Prestresssed concrete structures- T.Y.Lin and Ned H. Burns - John Wiley & Sons, New York.
2. Prestressed concrete bridges by Rin
3. Fundamental of pre-stressed concrete- N.C. Sinha & S.K. Roy
4. Pre-stressed Concrete- N. Rajgopalan

VI SEM CIVIL ENGINEERING
TRANSPORTATION SYSTEMS & TRAFFIC ENGINEERING

Sub Code	10CV6DCTST	Total Hrs	39 Hours	SEE Duration
Credits	3	L-T-P	3:0:0	3hrs

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 and electrified tracks. Gauges and types of gauges with dimensions. Coning of wheels and tilting of rails. Problems on these. Rails functions requirements, types of rail sections, defects in rails. Rail joints, Creep of rails. **05 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. **04 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. **06 Hours**

Points and Crossing: Necessity and its components, turnout, design of turnout, Types of switches, crossings, track junctions. Problems **04 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. **02 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. **05 Hours**

Taxiway Design: Factors affecting the layout of the taxiway-geometrics of taxiway-design of Exit taxiways- ICAO Specifications. Problems on above. **02 Hours**

Tunnels: Introduction – types of tunnels, advantages and disadvantages, Economics of tunnelling, tunnel surveying, **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

TRAFIC ENGINEERING

Introduction: Components of road traffic - the vehicle, driver and road. Objectives and scope of traffic engineering. Road user characteristics; human and vehicle characteristics, factors affecting road traffic; Concepts of passenger car units for mixed traffic flow. **04 Hours**

Traffic Engineering Studies and Analysis, methods of traffic study, equipment, data collection, analysis and interpretation (including case studies) of (i) Spot speed (ii) Speed and delay (iii) Volume (iv) Origin - destination (v) Parking . Traffic manoeuvres and Stream Characteristics; application in intersection design. –Application of Sampling techniques**.** **06 Hours**

Traffic Regulations and Control: General regulations; Regulations on Vehicles, drivers and flow; other regulations and control. Traffic management; noise and air pollution due to road traffic and method of control **02 Hours**

Traffic Control Devices: Traffic signs, markings, islands and signals. Different methods of signal design;-IRC and Webster Methods–Problems-Signal system ordination. Design of road lighting. **06 Hours**

ITS: Introduction to Intelligent Transport System- Application of ITS to Traffic Management **02 Hours**

Text Books:

1. Saxena and Arora, "Railway Engineering", Dhanpat Rai and Sons, New Delhi.
2. Khanna, Arora and Jain – Airport Planning and Design – Nemchand Roorkee.
3. Srinivasan R Harbour, Dock & Tunnel Engineering, Charotar Publishing House.
4. Kadiyali, L.R. 'Traffic Engineering and Transport Planning', Khanna Publishers

VI SEMESTER
SOFTWARE APPLICATION IN CIVIL ENGINEERING

Sub Code	10CV6DCSAC	Total Hrs	52 Hours	SEE Duration
Credits	2	L-T-P	0:0:4	3hrs

1. Data download from total station, generation of contours, block leveling, longitudinal and cross sectional diagrams, and capacity volume calculation. **12 Hours**

2. Reinforcement detailing of foundation, column, beam, slab, lintel, chajja and staircase as per the relevant codes. **12 Hours**

3. Analysis of frames, analysis and design of simply supported beam, cantilever beam, fixed beam, column, foundation and slab using commercially available general purpose software. **28 Hours**

References:

1. Training manuals and User manuals

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VI SEM CIVIL ENGINEERING
ADVANCED DESIGN OF RCC STRUCTURES

Sub Code	10CV6DEADR	Total Hrs	52 Hours	SEE Duration
Credits	4	L-T-P	4:0:0	3hrs

Design of RCC overhead circular and rectangular water tanks with supporting towers **08 Hours**

Design of silos, bunkers using Janssen's Theory and Airy's Theory **07 Hours**

Design of bridge deck slabs **08 Hours**

Introduction to shell and folded plate roofs, their forms and structural behaviour. Design of simple cylindrical shell roof by beam theory only. **06 Hours**

Yield line analysis of slabs by virtual work. **05 Hours**

Design of box sections **06 Hours**

Design of grid Floors Slabs by approximate method **06 Hours**

Design of flat slabs by Direct Design Method (with and without drops) **06 Hours**

Note: Study of this course should be based on IS 456 -2000

Text Books:

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

Reference Books

1. Plain and Reinforced Concrete – Vol-II- Jai Krishna and Jain,: Nem Chand Bros, Roorkee.
2. Analysis of Structures- Vol-II : Vazirani V N & M M Ratwani : Khanna Publishers, New Delhi.
3. Design Construction of Concrete Shell Roofs : Ramaswamy G S : CBS Publishers and Distributors, new Delhi.
4. Advanced Structural Design- Bensen C
5. IS 456 – 2000 IS 3370 – 1967 (Part I, II and IS 1893)
6. Advanced RCC Design- Vol-II,- S. S. Bhavikatti New Age International Publication, New Delhi.

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VI SEM CIVIL ENGINEERING
THEORY OF ELASTICITY AND PLASTICITY

Sub Code	10CV6DETOE	Total Hrs	52Hours	SEE Duration
Credits	4	L-T-P	4:0:0	3hrs

Course Objectives:

- Introduce continuum mechanics to students and prepare them to take Finite Element Analysis
- Introduce plasticity and failure theories

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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 and non-circular sections, St.Venant's theory, membrane analogy, sand heap analogy, torsion of multi-celled thin walled open and closed sections.
5. Analysis of stress and strain in Axisymmetric cases.
6. Stress concentration due to circular holes in plates, effect of concentrated load in straight boundaries.
7. Plasticity-General concepts, yield criteria, flow laws for perfectly plastic and strain hardening material- simple applications.
8. Theories of failure.

Text book:

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

Reference Books:

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

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VI SEM CIVIL ENGINEERING
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

Sub Code	10CV6DEOSH	Total Hrs	52 Hours	SEE Duration
Credits	4	L-T-P	4:0:0	3hrs

Introduction: Occupational safety and Health act, Guide lines, Occupational safety and Health administration, Right to know laws, EHS (environment, Health and safety) and its compliance. **06 Hours**

Safety Management: Organizational safety management, planning, organizing, directing and monitoring. **05 Hours**

Ergonomics: Need, Task analysis, preventing ergonomic hazards, Ergonomics programme. **04 Hours**

Occupational Hazards: Occupational hazard in construction industry, cement industry, IT and IT enabled industries, Telecommunication industries, and nuclear processing units. **08 Hours**

Occupational Hazard Analysis: Hazard analysis, control, human error model, Fault tree analysis and Emergency response system. **05 Hours**

Accidents: Causation, investigation methods, Models, prevention. **06 Hours**

Fire Prevention and Protection: Types of fires, Fire development and its severity, Effect, Extinguishing fire, Electrical safety, Fire safety in buildings and industries. **07 Hours**

Occupational Health: Health and safety considerations, Personal protection equipments (PPE) **03 Hours**

Health Issues In Industries: Construction, textile, Steel, food processing, Pharmaceutical, BT, IT, IT enabled industries, BPO and Telecommunication industries. **08 Hours**

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.

Reference:

1. Fire safety in Buildings. V.K.Jain, NewAge Publishers
2. National safety council of India ,GOI Publication.
3. Loss prevention society of India publication
4. Industrial Accident prevention. Heinrich H.W. Mcgraw hill publication
5. Industrial accident prevention.Colling.D.A.Prentice hall publishing.

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VI SEM CIVIL ENGINEERING
STRUCTURAL MASONRY

Sub Code	10CV6DESMA	Total Hrs	52 Hours	SEE Duration
Credits	4	L-T-P	4:0:0	3hrs

Course Objectives:

- Students are expected to understand the strength and elastic properties of masonry and its constituent materials and failure modes
- Students shall be introduced to design of load bearing masonry buildings

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Introduction, Masonry Units, Materials and Types: History of masonry Characteristics of Brick, stone, clay block, concrete block, stabilized mud block masonry units – strength, modulus of elasticity and water absorption. Masonry materials – Classification and properties of mortars, selection of mortars.

Strength of Masonry in Compression: Behaviour of Masonry under compression, strength and elastic properties, influence of masonry unit and mortar characteristics, effect of masonry unit height on compressive strength, influence of masonry bonding patterns on strength, prediction of strength of masonry in Indian context, failure theories of masonry under compression. Effects of slenderness and eccentricity, effect of rate of absorption, effect of curing, effect of ageing, workmanship on compressive strength

Flexural and shear bond, flexural strength and shear strength: Bond between masonry unit and mortar, tests for determining flexural and shear bond strengths, factors affecting bond strength, effect of bond strength on compressive strength, orthotropic strength properties of masonry in flexure, shear strength of masonry, test procedures for evaluating flexural and shear strength.

Design of load bearing masonry buildings: Permissible stresses, stress reduction and shape reduction factors, increase in permissible stresses for eccentric vertical and lateral loads, permissible tensile and shear stresses, Effective height of walls and columns, opening in walls, effective length, effective thickness, slenderness ratio, eccentricity, load dispersion, arching action, lintels. Wall carrying axial load, eccentric load with different eccentricity ratios, wall with openings, freestanding wall. Design of load bearing masonry for buildings up to 3 to 8 storeys using BIS codal provisions.

Introduction to reinforced masonry: Concepts for vertical and horizontal reinforcement schemes for masonry, construction process, BIS codal provisions

Masonry arches, domes and vaults: Components and classification of masonry arches, domes and vaults, historical buildings, construction procedure.

Text Books:

Brick and Reinforced Brick Structures, Dayaratnam P., Oxford & IBH, 1987

Reference Books:

1. Structural masonry, Hendry A.W., Macmillan Education Ltd.,
2. Design of Masonry structures, Sinha B.P & Davis S.R., E & FN Spon
3. Design of Reinforced and Prestressed Masonry, Curtin, Thomas Telford
4. Structural Masonry, Sven Sahlin, Prentice Hall
5. Alternative Building, Jagadish.K.S, New Age International,
Materials & Technologies, Venkatarama Reddy B V & Nanjunda Rao K S, New Delhi & Bangalore
6. IS 1905 (1993 and revised ed.), BIS, New Delhi.
7. SP 20 (S & T), BIS, New Delhi.

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VI SEM CIVIL ENGINEERING
GROUND IMPROVEMENT TECHNIQUES

Sub Code	10CV6DEGIT	Total Hrs	50 Hours	SEE Duration
Credits	4	L-T-P	4:0:0	3hrs

Ground Improvement: Definition, Objectives of soil improvement, Classification of ground improvement techniques, Factors to be considered in the selection of the best soil improvement technique.

Mechanical Modification: Type of mechanical modification, Aim of modification, compaction, Principle of modification for various types of soils.

Compaction: Effect of grain size distribution on compaction for various soil types like BC soil, lateritic soil, coarse-grained soil, micaceous soil. Effect of compaction on engineering behavior like compressibility, swelling and shrinkage, permeability, relative density, liquefaction potential. Field compaction – static, dynamic, impact and vibratory type.. Specification of compaction. Tolerance of compaction. Shallow and deep compaction.

Hydraulic Modification: Definition, aim, principle, techniques. gravity drain, lowering of water table, multistage well point, spacing of well points, vacuum dewatering.

Drainage & Preloading: Drainage of slopes., preloading, vertical drains, sand drains. Assessment of ground condition for preloading, Electro kinetic dewatering.

Chemical Modification: Definition, aim, special effects, and methods. Admixtures, cement stabilization. Hydration – effect of cement stabilization on permeability, Swelling and shrinkage. Criteria for cement stabilization. Stabilization using Fly ash. Lime stabilization – suitability, process, special effects, criteria for lime stabilization Other chemicals, chlorides, hydroxides, lignin, hydrofluoric acid. Properties of chemical components, reactions and effects. Bitumen, tar or asphalt in stabilization.

Grouting: Introduction, Effect of grouting. . Chemicals and materials used. Types of grouting. Grouting procedure. Applications of grouting.

Miscellaneous methods: Only concepts of thermal methods, crib walls, gabions, Mattresses.

Text Books:

1. Ground Improvement Techniques- Purushothama Raj P. (1999) Laxmi Publications, New Delhi.
2. Construction and Geotechnical Method in Foundation Engineering- Koerner R.M. (1985) - Mc Graw Hill Pub. Co., New York.

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VI SEM CIVIL ENGINEERING
STRUCTURAL DYNAMICS

Sub Code	10CV6DESDY	Total Hrs	91Hours	SEE Duration
Credits	4	L-T-P	3:2:0	3hrs

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

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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**: 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.
4. **Dynamics of Continuous systems:** Free longitudinal vibration of bars, flexural vibration of beams with different end conditions, concept of orthogonality for continuous systems, introduction to matrix methods in structural dynamics.

Text Books:

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

Reference Books:

1. Dynamics of Structures, Anil K. Chopra, Prentice Hall of India
2. Dynamics of Structures, R.W. Clough & J.Penzien, McGraw Hill
3. Introduction to Structural Dynamics, John M Biggs, McGraw Hill pub
4. Schaum's outline series - Machanical vibrations, S Graham Kelly, McGraw Hill, India
5. Structural Dynamics, M Mukhopadhyay, CRC Press, India

VI SEM CIVIL ENGINEERING
PAVEMENT MATERIALS & CONSTRUCTION

Sub Code	10CV6DEPMC	Total Hrs	52 Hours	SEE Duration
Credits	4	L-T-P	4:0:0	3hrs

PAVEMENT MATERIALS

Aggregates: Origin, classification, requirements, properties and tests on road aggregates, concepts of size and gradation-design gradation, maximum aggregate size, aggregate blending to meet specification

04 Hours

Binders and Modified Binders : types-Origin, preparation, properties and constitution of bituminous road binders; requirements –tests- uses

04 Hours

Bituminous Emulsions and Cutbacks: Preparation, characteristics, uses and tests

Adhesion of Bituminous Binders to Road Aggregates: Adhesion failure, mechanism of stripping, tests and methods of improving adhesion

06 Hours

Bituminous Mixes: Introduction- - Mechanical properties, dense and open textured mixes, flexibility and brittleness, (No Hveem Stabilometer & Hubbard-Field Tests) bituminous mix, design methods using Rothfuch's Method only and specification using

different criteria - Marshall Mix Design- voids in mineral aggregates, voids in total mix, density, flow, stability, percentage voids filled with bitumen Problems on above. Superpave Mix – necessity-Applications.

10 Hours

PAVEMENT CONSTRUCTION

Equipment in Highway Construction: Various types of equipment for excavation, grading and compaction - their working principle, advantages and limitations. Special equipment for bituminous and cement concrete pavement and stabilized soil road construction

08 Hours

Subgrade: Earthwork grading and construction of embankments and cuts for roads. Preparation of subgrade, quality control tests

06 Hours

Flexible Pavements: Specifications of materials, construction method and field control checks for various types of flexible pavement layers

06 Hours

Cement Concrete Pavements: Specifications and method of cement concrete pavement construction; Quality control tests; Construction of various types of joints.

06 Hours

Text Book:

1. Khanna, S.K., and Justo, C.E.G., 'Highway Engineering', Nem Chand and Bros. Roorkee
2. Sharma, S.C., 'Construction Equipment and its Management', Khanna Publishers

Reference Books:

1. Engineering principles of ground modification- Manfred Haussmann (1990) - Mc Graw Hill Pub. Co., New York.
2. Methods of treatment of unstable ground- Bell, F.G. (1975) Butterworths, London.
3. Expansive soils- Nelson J.D. and Miller D.J. (1992) -, John Wiley and Sons.
4. Soil Stabilization; Principles and Practice- Ingles. C.G. and Metcalf J.B. (1972) - Butterworths, London.

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VI SEM CIVIL ENGINEERING
ADVANCED CONCRETE TECHNOLOGY

Sub Code	10CV6DEACT	Total Hrs	52 Hours	SEE Duration
Credits	4	L-T-P	3:0:2	3hrs

Brief Review of Conventional Concrete and Constituent Materials: Different types of blended cement & their salient properties, including cement binding materials (fly ash, condensed silica fumes, GGBS and other fine fillers), concrete aggregates-classification, Salient features of concrete mix design.

Chemical Admixtures: Classification, effect on fresh and hardened concrete, retention time, Dosage ant their effects, Influence on properties of paste, mortar, and concrete.

Ferrocement: Materials, mechanical properties, strength, cracking and durability of normal Ferrocement. Strength and behavior of light weight Ferrocement, and Prestressed Ferrocement. Mix design procedure.

Fiber Reinforced Concrete: Fibers, types, characterstics, 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

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.

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

Text Books:

1. **Properties of Concrete**, A.M.Neville, Pearson Education (Singapore) Pte. Ltd.,
2. Concrete Microstructure, Properties, and Materials, by P.Kumar Mehta and Paulo J.M.Monteiro.

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

VI SEM CIVIL ENGINEERING
EARTH AND EARTH RETAINING STRUCTURES

Sub Code	10CV6DEERS	Total Hrs	52 Hours	SEE Duration
Credits	4	L-T-P	4:0:0	3hrs

EARTH STRUCTURES: Introduction about earthen dams and embankments- different types of earthen dams with sketches and their suitability. Hydraulic fill and rolled fill methods of construction – causes of failure of earth dam – Design criteria of earth dams – Stability analysis of earthen dams – Seepage control in earthen dams. Role of Filters in Earth Dam Design. **8 Hours**

RETAINING WALLS: Introduction, types failure of retaining walls by sliding overturning and bearing. Stability analysis and Principles of the design of retaining walls – Gravity retaining walls, cantilever retaining walls, counterfort retaining walls (no structural design) – Other modes of failure of retaining walls – Drainage from the backfill. **7 Hours**

BULK HEADS: Cantilever sheet pile walls Introduction - Types of sheet pile walls – Free cantilever sheet pile - cantilever sheet pile in cohesion-less soils – cantilever sheet pile penetrating in clay. **7 Hours**

BULK HEADS: Anchored Sheet Pile Walls: Anchored sheet pile with free earth support in cohesion-less and cohesive soil. bulkheads with fixed earth support method – Types, locations, problems-stability check. **7 Hours**

BRACED CUTS: Introduction, Lateral earth pressure on sheeting's. Different types of sheeting and bracing systems – design principles of various components of bracings. **7 Hours**

ROCK FILL DAMS: Introduction, Origin and usage of rock fill dams, types of rock fill dams, design principles of rock fill dams and construction of rock fill dams. **8 Hours**

COFFER DAMS & CELLULAR COFFER DAMS I: Introduction – types of coffer dams - Design method of cellular coffer dams on rock by Tennesse Valey Authority (TVA) method – safety against sliding, slipping, overturning, vertical shear and stability against bursting.(no problems) **8 Hours**

TEXT BOOKS:

1. **Soil Mechanics and Foundation Engineering** : Dr. K.R. Arora : Pub : Standard Publishers & Distributors.
2. **Soil Mechanics and Foundation Engineering,** : S.K. Garg : Pub : Khanna Publishers.

REFERENCE BOOKS:

1. **Soil Mechanics and Foundation Engineering,**: Dr. B.C. Punmia : Pub : Laxmi Publications Ltd.,
2. **Foundation Engineering.**: Dr. B.J. Kasmalkar
3. **Numericals in Geotechnical Engineering** : A.V. Narasimha Rao & C. Venkataramaiah :Pub : University Press.
4. **Hydraulic Structures**: S.K. Garg : Pub : Khanna Publishers.
5. **Soil Mechanics and Foundation Engineering,** : Dr. V.N.S. Murthy : Pub : Sai Tech.
6. **Geotechnical Engineering,** : Dr. C. Venkataramaiah : Pub : New age publications.
7. **Geotechnical Engineering** : Purushotam Raj .
8. **Theory and Practice of Soil Engineering** : Alum Singh .

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VI SEM CIVIL ENGINEERING
SOLID WASTE MANAGEMENT

Sub Code	10CV6DESWM	Total Hrs	52 Hours	SEE Duration
Credits	4	L-T-P	3:0:2	3hrs

INTRODUCTION: Definition, land pollution-scope and importance of solid waste management, functional elements of solid waste management. Sources, Classification and characteristics- Municipal, Commercial & Industrial. Methods of quantification.

COLLECTION AND TRANSPORTATION: System of collection, Collection equipment, garbage chutes, transfer stations-bailing and compacting, route optimization techniques and problems.

TREATMENT/PROCESSING TECHNIQUES: Components of separation, volume reduction, size reduction, chemical reduction and biological processing problems.

INCINERATION: process-3T's, factors affecting incineration process, incinerators – types, prevention of air pollution, pyrolysis, design criteria for incineration

COMPOSTING: Aerobic and Anaerobic composting, factors affecting composting, Indore and Bangalore processes, mechanical and semi mechanical composting processes, vermin composting

SANITARY LAND FILLING: Different types, Trench method area method, Ramp and pit method, site selection, basic steps involved, cell design, prevention of site pollution, leachate & gas control methods, geosynthetic fabrics in sanitary landfills

DISPOSAL METHODS: Open dumping-selection of site, ocean disposal, feeding to hogs, incineration, pyrolysis, composting, sanitary land filling, merits and demerits, biomedical wastes and disposal

RECYCLING AND REUSE: Material and energy recovery operations refuse in other industries, plastic wastes, environmental significance and reuse.

TEXT BOOKS: 1 Integrated solid waste management: Tchobanoglous:M/c Graw Hill.

2. Solid waste management in developing countries .Bhide and sundearashan

REFERENCE BOOKS:

1. Hand Book on solid waste disposal: pavoni j.L
2. Environmental engineering; peavey and Techobanoglou.3. Biomedical waste handling rules -2000

SOLID WASTE TREATMENT LABORATORY

1. Quantification of Municipal solid waste (MSW)
2. Determination of Specific Gravity and Moisture content of MSW
3. Determination of combustible component of MSW
4. Determination of Energy component of MSW
5. Determination of Biodegradability of MSW
6. Determination of Material Balance for MSW
7. Pyrolysis of MSW
8. Determination of Leachate Characteristics of MSW

VII SEMESTER CIVIL ENGINEERING
IRRIGATION AND HYDRAULIC STRUCTURES

Sub. Code	11CV7DCIHS	TOTAL HRS	52	SEE Du ration
Credit	04	L-T-P	4:0:0	3hrs

INTRODUCTION:

Definition, Need, Purpose, benefits, ill effects and scope of irrigation, Sources of water for irrigation – surface and ground water, Systems of flow irrigation and lift irrigation, Methods of application of irrigation water.

4 hours

AGRICULTURE: Dry and wet crops, Crops of India (Karnataka in Particular), Seasons across the country**.**

2 hours

IRRIGATION DEVELOPMENT: Potential, Practices in India, Karnataka, Major Medium & Minor projects, GW irrigation**.**

2 hours

IRRIGATION AND WATER REQUIREMENT OF CROPS:

Definition of consumptive use, duty, delta and base period, KOR depth, Factor affecting duty of water, Definition of gross command area, culturable command area, intensity of irrigation, time factor, crop factor, Irrigation efficiencies, irrigation required. 4.4. Frequency of irrigation. **8 hours**

RESERVOIRS:

Definitions, Investigation for reservoir site, Storage zones, Determination of storage capacity and yield of reservoirs using analytical and graphical methods, Economical height of dam, flownets & their relevance. **6 hours**

DIVERSION WORKS:

Definition, Differences in North & South Indian conditions, Layout, components and their functions, Design of impermeable floors – Bligh's Methods and Khosla's theory, Slit control works – silt ejectors and silt excluder. **6 hours**

GRAVITY DAMS:

Definitions, Forces acting on a gravity dam, Elementary and practical profiles, Low and high gravity dams stresses, Stability analysis-example, Drainage galleries**.**
8 hours

EARTHEN DAMS:

Types of earthen dams, Failures of earthen dams, Preliminary design, Drainage arrangements, Phreatic line. **4 hours**

SPILLWAYS:

Definition, Types of spillways, Types of Energy dissipaters**.** **4 hours**

CANAL:

Types of canals, Alignment of canals, Definition of gross command area, cultural command area, intensity of irrigation, time factor, Unlined canals, Standard sections, Design of canals by Lacey's and Kennedy's methods, Designs in hard rock areas.
5 hours

CANAL WORKS: Classification and suitability of canal regulators, Canal escape, Cross drainage works – types. **3 hours**

TEXT BOOKS:

1. "Irrigation, Water Resources and Water Power Engg"- Modi P.N. Standard book house New Delhi

REFERENCE BOOKS:

1. "Irrigation Engg. and Hydraulic. Structures" - S.K. Garg, Khanna publications, New Delhi
2. "Irrigation and Water power Engg." – Punmia and Pandey Lal Lakshmi Publications, New Delhi.
3. "Text book of Irrigation Engineering and Hydraulics" – R.K. Sharma, Oxford & IBH Publishing Co., New Delhi.
4. "Irrigation theory and practice" – Michael A.M., Vikas Publications House, New Delhi.
5. "Irrigation theory and practice" – Hansen and Isreal sen.
6. C.W.C. India.(Website)
7. Kar.nic.in (Website)

VII SEMESTER CIVIL ENGINEERING

Subject	MAJOR PROJECT (Phase-1)	Sub. Code	11CV7DCMAP
Credits	04	contact hrs	4
Total Hrs	52	SEE Duration	3hrs

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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VII SEMESTER CIVIL ENGINEERING

Subject	QUANTITY SURVEYING AND COSTING	Sub. Code	11CV7DCQSC
Credits	05	L-T-P	4:2:0
Total Hrs	54	SEE Duration	3hrs

INTRODUCTION:

Different types of estimates, approximate methods of estimating buildings, cost of materials. **4 Hours**

ESTIMATION:

Introduction, important terms, units of measurement, abstract. Methods of taking out quantities and cost – center line method, long and short wall method or crossing method. Preparation of detailed and abstract of estimates for the following Civil Engineering works – masonry buildings, RCC framed structures with flat RCC roofs with all building components. **14 Hours**

ESTIMATES:

Steel trusses (Fink and Howe truss), RCC slab culvert, manhole and septic tanks. **8 Hours**

SPECIFICATIONS:

Definition of specifications, objective of writing specifications, essentials in specifications, general and detailed specifications of common item of works in buildings. **8 Hours**

ANALYSIS OF RATES:

Definition and purpose. Working out quantities and rates for the following standard items of works – Earth work in different types of soils, cement concrete of different mixes, bricks and stone masonry, flooring, plastering, RCC works, centering and form work for different RCC items. **12 Hours**

EARTHWORK FOR ROADS:

Methods for computation of earthwork- mid sectional area method, mean sectional area method, trapezoidal and prismoidal formula methods with and without cross slopes **8 Hours**

TEXT BOOK

1. Estimating and Costing in Civil Engineering by 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, Dhanpath Rai and sons : New Delhi.
4. A text book on Estimating, Costing and Accounts- D.D. Kohli and R.C. Kohli S. Chand : New Delhi.

VII SEMESTER CIVIL ENGINEERING

Subject	BRIDGE ENGINEERING	Sub. Code	11CV7DCBRI
Credits	03	L-T-P	3:0:0
Total Hrs	42	SEE Duration	3hrs

INTRODUCTION-

Development of Bridges, Component parts of a bridge, Classification of bridges on various considerations. **5 Hours**

INVESTIGATION FOR BRIDGES –

Factors influencing choice of ideal site for a bridge, Techno economic feasibility, Methods of determination of design flood- Empirical method ,Statistical method, Rational method, Unit Hydrograph method, Linear waterway, Economical span, Scour and depth of flow, Afflux, Calculation of waterway. **7 Hours**

BRIDGE LOADING STANDARDS-

Loading requirements, Need for loading standards, Railway and road bridge loadings **5 Hours**

SUBSTRUCTURE-

Piers and Abutments, Wing walls, location of piers and abutments, material of construction for piers and abutments. **5 Hours**

BRIDGE FOUNDATIONS-

Types of foundations, Open foundation, pile foundation, well foundation **5 Hours**

CULVERTS-

Pipe Culverts, RCC Slab culverts, Box culverts, Design of RCC Slab and pipe culverts **6 Hours**

DESIGN OF SUPERSTRUCTURE-

RCC Tee Beam bridges, Design of deck slab and girders using IRC Loadings **6 Hours**

BRIDGE BEARINGS-

Need for bearings, Types of bearings **3 Hours**

REFERENCES:

1. Bridge Engineering – S. Ponnuswamy, Tata Mcgraw Hill Publications
2. Essentials of Bridge Engineering- D. Johnson Victor, Oxford & IBH Publishing Co
3. Design of Concrete Bridges- MG.Aswani, V.N. Vazirani , MM Ratwani, - Khanna Publications.

VII SEMESTER CIVIL ENGINEERING

Subject	REMOTE SENSING & GEOGRAPHICAL INFORMATION SYSTEM	Sub. Code	11CV7IERSG	SEE+CEE=50+50
Credit		04	L-T-P	4:0:0
Total Hrs	52	SEE Duration	3hrs	

GEODATABASE:

Types of geodatabase, Advantages of geodatabase, Basic geodatabase structure, Topology, relational classes, geometric networks, raster data - Creating geodatabase, organizing data, defining database structure - Understanding spatial reference in geodatabase – Modifying spatial domain, Simple feature creation in geodatabase, Creating and editing map topology Types of geodatabase annotation - Adding behavior to a geodatabase

SURFACE ANALYSIS:

Slope and aspect - Hydrologic functions - Viewsheds - Shaded relief maps Spatial analysis - Surface analysis - 3-D analysis - Map algebra - Cell statistics DEM, DTM and TIN

MODEL BUILDING AND SPATIAL MODELING:

Why build models - Anatomy of a model - Model elements -Introduction to scripting. The object model in GIS. Vector and raster data extraction for modeling, Land use classification, Temporal land use analysis, Spatial modeling procedure, Cellular automata modeling, Methods of spatial interpolation. Data Accuracy, Error Assessment and Propagation: Spatial data standards, Positional accuracy, Methods of measuring data accuracy, Accuracy measurement, Error in linear and area feature, Land use classification accuracy, Attribute accuracy, Error propagation in spatial attribute.

ADVANCED CARTOGRAPHY:

Annotations, labels, and metadata; Map making with advance tricks Working with labels and annotations - Managing (organizing and modifying) labels and annotations - Metadata file creation and management with new tools

MULTI-CRITERIA DECISION ANALYSIS AND SDSS :

Elements of multi-criteria decision analysis, classification of decision problems, evaluation criteria, hierarchical decision alternatives and constraints, alternatives and decision variables, deterministic variables, criteria weighting , estimation weights, ranking

methods, decision rules, multi-attribute decision rules, sensitivity analysis, multi-criteria spatial decision support systems (SDSS). SDSS for location planning, application-specific capabilities; requirements of a SDSS.

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 web pages, internet mapping sites, internet softwares, Mobile GIS –positioning, location based services, personal and vehicle navigation, LBS for mass market, telematics. –Applications

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.

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.

REFERENCE BOOKS:

GIS and Multi-criteria decision analysis by Jacek Malczewski, John Wiley and sons. Expert Systems by Peter Jackson, third edition,1999, Pearson Education.

Concepts and Techniques of Geographic Information Systems CP Lo Albert K W Yeung, 2005 Prantice Hall of India.

Geographic Information Systems – An introduction by Tor Bernhardsen, John Wiley and Sons, Inc, New York, 2002.

Remote sensing and Image interpretation by Thomas M. Lillesand and Ralph W. Kiefer, John Wiley and Sons Inc.,New York, 1994.

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 1991.

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 1991.

Subject	BASIC FRACTURE MECHANICS	Sub. Code	11CV7IEBFM
Credit	04	L-T-P	4+0+0
Total Hrs	52	SEE Duration	3hrs

Definition of stress intensity factor, fracture toughness, energy release rate, critical energy release rate, crack mouth opening displacement and R-curve.

Elasto-plastic fracture mechanics and J-integral.

Mixed-mode crack propagation, fatigue crack propagation,

Computational fracture mechanics.

Introduction to fracture of quasi-brittle materials like concrete.

Non-linear fracture models with softening, size effect in fracture of concrete.

REFERENCES

Fundamentals of fracture mechanics, Prashanth Kumar

Broek, D., Elementary Engineering Fracture Mechanics, Sijthoff and Noordhaff, Alphen Aan Den Rijn, The Netherlands.

Anderson, T.L., Fracture Mechanics: Fundamentals and Applications, CRC Press, USA, Second Edn.

Shah, S.P., Swartz, S.E., and Ouyang, C., Fracture Mechanics of Cocrete: Applications of Fracture Mechanics to Concrete, Rock and Other Quasi-Brittle Materials, John Wiley and Sons, USA.

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VII SEMESTER CIVIL ENGINEERING

Subject	PAVEMENT DESIGN	Sub. Code	11CV7DEPAD
Credit	04	L-T-P	4:0:0
Total Hrs	52	SEE Duration	3hrs

INTRODUCTION:-

Types- Desirable characteristics of pavement, types and components, Difference between Highway pavement and Air field pavement –– Functions of sub-grade, sub base – Base course – surface course – comparison between Rigid and flexible pavement. **8 Hours**

FUNDAMENTALS OF DESIGN OF PAVEMENTS:

Design life – Traffic factors – climatic factors –– Evaluation of Subgrade soil strength – Plate load Test-CBR Test- Stresses and deflections, Boussinesqs theory – principle, Assumptions – Limitations - problems using vertical stress charts and deflection charts - **8 Hours**

DESIGN FACTORS:

Design wheel load – contact pressure – ESWL concept – Determination of ESWL by equivalent deflection criteria – Stress criteria – EWL concept. **8 Hours**

FLEXIBLE PAVEMENT DESIGN:

Assumptions – McLeod Method – Kansas method – Tri-axial method - CBR method – CSA Method using IRC 37-2001- Busmister theory – Assumptions – Description-problems on above. **8 Hours**

STRESSES IN RIGID PAVEMENT:

Principle – Factors – General properties of concrete affecting design- External conditions – joints – Reinforcement – Analysis of stresses – Assumptions – Westergaard's Analysis –– Critical stress Locations – Wheel load stresses, Warping stress – Frictional stress – combined stresses (using chart / equations) - problems on above. **8 Hours**

DESIGN OF RIGID PAVEMENT:

Design of C.C. Pavement by IRC: 38 – 2002 for dual and Tandem axle load – Reinforcement in slabs – Requirements of joints – Types of joints – Expansion joint – contraction joint – warping joint – construction joint – longitudinal joint, Design of joints, Design of Dowel bars, Design of Tie bars – problems of the above **10 Hours**

TEXT BOOKS:

1. **Highway Engineering**- Khanna & Justo
2. Relavent IRC codes

REFERENCE BOOKS:

1. **Principles of Pavement Design**- Yoder and Witzack - 2nd edition, John Wileys and Sons

Subject	ADVANCED FOUNDATION DESIGN	Sub. Code	11CV7DEAFD
Credit	04	L-T-P	4:0:0
Total Hrs	52	SEE Duration	3HRS

SHALLOW FOUNDATIONS

Introduction, Types of shallow foundations, Factors influencing selection of depth of foundation, Factors affecting Bearing capacity, Settlement of shallow foundation, types-immediate , consolidation and differential settlements, , plate load test, its application, merits, demerits, Principles of design of footing, proportioning of isolated, combined , strip, strap, raft footings (proportioning only) **15hours**

PILE FOUNDATIONS

Introduction, Necessity of pile foundation, classification, Static and dynamic formula with numerical problems, Pile load test, Negative skin friction, pile groups, group action of piles in sand and clay, group efficiency, introduction to under reamed piles **15hours**

WELL FOUNDATIONS

Introduction, Different shapes and characteristics of wells, forces acting on well foundation, sinking of wells, causes and remedies of tilts and shifts (no numerical problems) **7hours**

DRILLED PIERS AND CAISSONS

Introduction, Advantages and disadvantages of drilled piers, Types of Caissons-open, pneumatic and floating caissons, sketches, Advantages and disadvantages of floating caissons. **7hours**

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 **8hours**

TEXT BOOKS

1. **Soil mechanics and Foundation Engineering-** Dr.K.R.Arora, Standard publishers distributors

2. **Foundation Engineering** - Braja.M.Das- Thomson Publication
3. **Soil mechanics and Foundation Engineering –** Dr.B.C. Punmia- Laxmi publication pvt Ltd
4. **Advanced Foundation Engineering –** VNS Murthy –Sai Tech publication

REFERENCE BOOKS

1. **Geotechnical Engineering-** P.Purushotham raj
2. **Geotechnical Engineering-**Dr.C.Venkatramaiah- New age publication
3. **Foundation Engineering –**Dr.P.C.Varghese- Prentice hall of India

VII SEMESTER CIVIL ENGINEERING

Subject	INDUSTRIAL WASTE WATER TREATMENT	Sub. Code	11CV7DEIWW
Credit	04	L-T-P	4:0:0
Total Hrs	52	SEE Duration	3hrs

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.

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.

PRETREATMENT OF WASTE WATER:

Volume reduction, Strength reduction, Neutralization, Equalization and Proportioning.

TREATMENT METHODS:

Removal of Inorganic. Removal of Organic solids, Removal of suspended solids and colloids, Treatment and disposal of sludge Solids.

COMBINED TREATMENTMETHODS:

Feasibility of combined treatment of industrial raw waste with Domestic Waste, Discharge of raw, partially treated and completely treated wastes to streams.

TREATMENT OF SELECTED WASTE WATER:

Origin/sources of waste water, characteristics of waste, alternative treatment methods, disposal, reuse and recovery along with flow sheet, Effects of waste disposal on water bodies.

INDUSTRIES TO BE COVERED:

Paper and pulp, Cotton textile industry; Tanning Industry, cane sugar industry & distillery industry; Dairy industry; Steel and cement Industry. Pharmaceutical,

TEXT BOOKS:

1. Nemerow N.N., (1971) – Industrial Wastewater Treatment"
2. M.N.RAO AND A.K.DATTA (2007) - Wastewater Treatment"

REFERENCE BOOKS:

1. Mahajan (1984) –" Pollution control in Process industries". TMH, New Delhi.
2. Ross R.D. (1968)– "Industrial Waste Disposal", Reinhold Environmental Series – New York.
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.

Subject	ALTERNATE BUILDING MATERIAL AND TECHNOLOGY	Sub. Code	11CV7DEABM
Credit	04	L-T-P	4:0:0
Total Hrs	52	SEE Duration	3Hrs

COURSE OBJECTIVES

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

INTRODUCTION:

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:

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

LIME-POZZOLANA CEMENTS

Raw materials, Manufacturing process, Properties and uses

FIBRE REINFORCED CONCRETE

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

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

FERROCEMENT AND FERROCONCRETE

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

ALTERNATIVE ROOFING SYSTEMS

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

STRUCTURAL MASONRY

Compressive strength of masonry elements, Factors affecting compressive strength, Strength of units, prisms / wallettes and walls, Effect of brick work bond on strength, Bond strength of masonry : Flexure and shear, Elastic properties of masonry materials and masonry, IS Code provisions, Design of masonry compression elements, Concepts in lateral load resistance

COST EFFECTIVE BUILDING DESIGN

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

EQUIPMENT FOR PRODUCTION OF ALTERNATIVE MATERIALS

Machines for manufacture of concrete, Equipments for production of stabilized blocks, Moulds and methods of production of precast elements

TEXT BOOK:

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

REFERENCE BOOKS:

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

Subject	FINITE ELEMENT ANALYSIS	Sub. Code	11CV7DEFEA
Credit	04	L-T-P	4+0+0
Total Hrs	52	SEE Duration	3hrs

BASIC CONCEPT OF ELASTICITY & FINITE ELEMENT METHOD

Kinematic and Static variables for various types of structural problems, approximate method of structural analysis – Rayleigh – Ritz method, Finite difference method. Role of finite element analysis in computer-aided design. Principles of finite element method, advantages & disadvantages, Finite element procedure.

ANALYSIS OF 1D CONTINUUM PROBLEMS:

Displacement models, Relation between the nodal degrees of freedom and generalized coordinates, Convergence criterion, Compatibility requirements, Geometric invariance, construction of displacement functions for 2 D truss and beam elements.

Applications of FEM for the analysis of fine truss, continuous beam and simple plane frame problems.

ANALYSIS OF 2D CONTINUUM PROBLEMS:

Elements and shape functions, Triangular, rectangular and quadrilateral elements, different types of elements, their characteristics and suitability for application.

ISOPARAMETRIC ELEMENTS:

Internal nodes and higher order elements, Serendipity and Lagrangian family of Finite Elements – Sub parametric and Super parametric elements, Condensation of internal nodes, Jacobian transformation Matrix. Development of strain – displacement matrix and stiffness matrix, consistent load vector, numerical integration, application to plane -stress and plane-strain problems.

FINITE ELEMENT PROGRAMMING:

Pre and Post Processors, software packages, current trends in finite element analysis software.

REFERENCES:

1. Krishnamoorthy C.S, "Finite Element Analysis", Tata-McGraw-Hill Publishing Company
2. Zienkiewicz.O.C, "The Finite Element Method", Tata-McGraw-Hill Publishing Company
3. Desai.C.S and Abel.J.F. , "Introduction of Finite Element Method", East–West press
4. Reddy.J.N., "Finite Element Method", -McGraw Hill International edition.
5. Rajashekaran.S, "Finite Element Analysis in Engineering Design", –Wheeler Publishing.
6. Bathe.K.J., "Finite Element Procedures in Engineering Analysis", -Prentice Hall of India.
7. Chandrupatla and Belegundu, "Introduction to Finite Elements in Engineering", Prentice Hall of India. 2nd edition, 1999

VII SEMESTER CIVIL ENGINEERING

Subject	ADVANCED PSC STRUCTURES	Sub. Code	11CV7DEAPS
Credit	04	L-T-P	4:0:0
Total Hrs	52	SEE Duration	3hrs

ANCHORAGE ZONE STRESSES IN POST-TENSIONED MEMBERS:

Introduction, stress distribution in end block, investigations on Anchorage zone stresses, Magnel and Guyon's Methods, Comparative Analysis, Anchorage zone reinforcement. **6 Hours**

SHEAR AND TORSIONAL RESISTANCE:

Shear and principal stresses, ultimate shear resistance, design of shear reinforcement, Torsion, Design of reinforcement for torsion, shear & bending. **7 Hours**

COMPOSITE BEAMS:

Introduction, Composite structural members, types of composite construction, analysis of stresses, differential shrinkage, deflection, serviceability limit state, flexural strength, shear strength design. **9 Hours**

STATICALLY INDETERMINATE STRUCTURES:

Introduction, Advantages of continuous members, effect of prestressing indeterminate structures, methods of analysis of secondary moments, concordant cable profile, Guyon's theorem, Ultimate load analysis, Determination of concordant tendon profile, Design of continuous beams. **9 Hours**

FLOOR AND FLAT SLABS:

Types of floor slabs, Design of one way and two way slabs. Flat slabs-Indian code and distributions of prestressing tendons **8 Hours**

PRECAST ELEMENTS:

Introduction, prestressed concrete poles-manufacturing techniques, shapes and cross sectional properties, design loads, design principles, Railway sleepers-classification and manufacturing techniques, design loads, analysis and design Principles. **6 Hours**

APPLICATION OF PRESTRESSING IN OTHER STRUCTURES:

Introduction, Circular prestressing (water tanks), Prestressing in dams, piles. **7 Hours**

TEXT BOOKS:

1. **Design of Prestressed concrete structures** - Lin T.Y. and H. Burns - John Wiley & Sons, 1982.
2. **Prestressed Concrete**- N. Krishna Raju - Tata Megrahill, 3rd edition, 1995.

REFERENCE BOOKS:

1. **Prestressed Concrete Structures**- P. Dayaratnam - Oxford & IBH, 5th Edition, 1991.
2. **Prestressed Concrete**- G.S. Pandit and S.P. Gupta - CBS Publishers, 1993.
3. IS : 1343 : 1980.
4. **Pre stressed concrete** by Y. Guyon , Jphn Wiley and sons Publishers.
5. Pre stressed concrete by V.N.Vazirani & S.P.chandola Khanna Publishers , New Delhi

VIII SEMESTER CIVIL ENGINEERING

Subject	ENGINEERING MANAGEMENT	Sub. Code	11CV8HSEMG
Credit	04	L-T-P	4:0:0
Total Hrs	52	SEE Duration	3hrs

COURSE OBJECTIVE:

To provide an insight in to the requirements of engineering management skills with a specific objective of introducing students to Construction Management of projects.

[**Engineering management** is a specialized form of management concerned with the application in engineering, as a result of the unique personalities and technical nature of engineering. Engineering Management courses typically include instruction in management, organizations, economics, and project management. Example areas of engineering are product development, manufacturing, construction, design engineering, industrial engineering]

MANAGEMENT

Introduction – Meaning – nature and characteristics of Management, Scope and functional areas of management – Management as a science, art or profession – Management & Administration – Roles of Management, Levels of Management, Development of Management Thought – early management approaches – Modern management approaches. **6 hours**

PLANNING

Nature, importance and purpose of planning process – objectives – Types of plans (Meaning only) – Decision making – Importance of planning – steps in planning & planning premises – Hierarchy of plans. **4 hours**

ORGANISING AND STAFFING

Nature and purpose of organization – principles of organization – Types of organization – Departmentation – Committees – Centralization Vs Decentralisation of authority and responsibility – Span of control – MBO and MBE (Meaning only) Nature and importance of Staffing – Process of Selection & Recruitment (in brief). **6 hours**

DIRECTING & CONTROLLING

Meaning and nature of Directing – Leadership styles, Motivation Theories, Communication – Meaning and importance – Coordination, meaning and importance and Techniques of Co-ordination. **4 hours**

ENGINEERING ECONOMICS

Interest, equivalent worth, comparing alternatives, rate of return methods, depreciation and taxes, inflation, benefit-cost analysis. **8 hours**

PROJECT/CONSTRUCTION MANAGEMENT.

Project definition, planning, scheduling (CPM and PERT), resource allocation, time-cost tradeoff **8 hours**

CONSTRUCTION EQUIPMENT

Types, Selection of equipment, Productivity, Cost of owning and maintaining. **6 hours**

OPERATION MANAGEMENT

System Design for civil engineering, Linear Programming, Transportation Model, **6 hours**

TEXT BOOKS:

1. Principles of Management – P.C. Tripathi, P.N. Reddy, Tata McGraw Hill.
2. **Construction** Planning, Equipment and Methods- R. L. **Peurifoy** and W. B. Ledbetter,

REFERENCES:

1. Principles of Management: An Analysis of Managerial Functions - Harold Koontz and Cyril O'Donnell,, 4th Ed., McGraw-Hill, New York, 1968.
2. **Engineering Economics and Cost Analysis-** Courtland A. Collier and William B. Ledbetter Harper & Row.
3. Construction Management and Planning - Sengupta B and Guha H, Tata McGraw-Hill Publishing, 1995.

VIII SEMESTER CIVIL ENGINEERING

Subject	PROFESSIONAL PRACTICE	Sub. Code	11CV8DCPPR
Credit	03	L-T-P	3:0:0
Total Hrs	42	SEE Duration	3hrs

Introduction : Basic Concepts : Proposal, Acceptance, Promise, Promisor and Promisee, Consideration, agreement and contract. The Communication of Proposal, Acceptance and Revocation. Competency of parties to a contract. Valid contract.

The Tender : Invitation to Tender and modes of invitation, Types of tender documents, Pre-qualification of Tenders, Submission of Tenders, Irregularities in submission of tenders, Withdrawal of Tender, Acceptance of Tender, Modes of Communication of acceptance, Revocation of acceptance, Rejection of Tender

The Contract : Introduction, Provision of the act, Essentials of a valid contract, Void and voidable Contracts, Collateral contracts, Implied Contract, Contract Documents, Types of Contract.

Beach of Contract: Introduction, Refusal to perform contract, breach by the contractor, breach by the owner, Excuses for non-performance, Doctrine of Frustration, Consequences of breach of contract, common breaches of contract and remedies for breach of contract.

Arbitration : Introduction, essentials of Arbitration, Selection and appointment of arbitrator, Qualification of an Arbitrator, Powers of Arbitrator, Removal of Arbitrator by court, ground for setting aside an award, misconduct of arbitrator, Arbitration in construction contracts.

Reference Books:

Law Relating to Building and Engineering Contracts in India - K. Gajria, Fourth Edition, Butterworths India, New Delhi

Professional Practice - Dr. Roshan H. Namavati, Lakshmi Book Depot, Mumbai

Legal aspects of Building and Engineering contracts - B.S. Patil, Mrs. S.B. Patil Publications, Pune.

Building and Engineering Contracts - B.V. Subba Rao, Imprint, Bangalore.

Hand Book of Construction Management - P.K. Joy. MACMILLAN INDIA Limited, New Delhi.

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VIII SEMESTER CIVIL ENGINEERING

Subject	INDUSRIAL TRAINING /PAPER PRESENTATION	Sub. Code	11CV8DCITP	SEE Duration
Credit	03	Contact hours	2	3hrs
Total Hrs	42	SEE+CIE	50+50	

A paper presentation on a technical topic not related to project work

Identify industries and send students for atleast two days in a week or at a stretch

VIII SEMESTER CIVIL ENGINEERING

Subject	MAJOR PROJECT	Sub. Code (Phase-2)	11CV8DCMAP	SEE Duration
Credit	10	L-T-P	-	3hrs
contact Hrs	2	SEE+CIE	100+100	

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 carried out using in-house facilities or in industry

VIII SEMESTER CIVIL ENGINEERING

Subject	OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION	Sub. Code	11CV8IEOSH	SEE Duration
Credit	04	L-T-P	4:0:0	3hrs
Total Hrs	52	SEE+CIE	50+50	

INTRODUCTION

Occupational Safety and Health Act, Occupational Safety and Health Administration, Right to know Laws.

INDIAN ACTS

Labour Act, Factories Act, OSHA guidelines

ACCIDENT

Causation, investigation methods and different models.

ERGONOMICS –

Need, Task Analysis, Preventing Ergonomic Hazards, Ergonomics Programme.

OCCUPATIONAL HAZARD AND CONTROL

Hazard Analysis, Human Error and Fault Tree Analysis, Emergency Response. Hazards and their control in different manufacturing and processing industries.

FIRE PREVENTION AND PROTECTION

types of Fire, Fire Development and its Severity, Effect, Extinguishing Fire, Electrical Safety, Product Safety.

OCCUPATIONAL HEALTH

Health and Safety Considerations, Personal Protective Equipment.

HEALTH PROBLEMS IN DIFFERENT TYPES OF INDUSTRIES

construction, textile, steel and food processing, pharmaceutical, occupational Health and Safety considerations in Wastewater Treatment Plants.

REFERENCES:

1. Goetsch D.L., (1999), "**Occupational Safety and Health for Technologists**", Engineers and Managers", Prentice Hall.
2. Heinrich H.W.(1959), **"Industrial Accident Prevention",** McGraw Hill Publication, Newyork.
3. Colling D.A.(1990), "**Industrial Safety Management and Technology**", Prentice Hall, New Jersey.
4. Della D.E., and Giustina, (1996), "**Safety and Environmental Management**", Van Nostrand Reinhold
5. International Thomson Publishing Inc.
6. CPHEEO, (1999) **Manual on Sewerage and Sewage Treatment,** Ministry of Urban Development, GOI, New Delhi.
7. National Safety Council and Associate (Data) Publishers Pvt. Ltd., (1991), "**Industrial Safety and Pollution Control Handbook**" Manual of Loss Prevention Society of India

VIII SEMESTER CIVIL ENGINEERING

Subject	**EARTHQUAKE RESISTANT DESIGN OF STRUCTURES**	**Sub. Code**	**11CV8DEERD**
Credit	**04**	**L-T-P**	**4:0:0**
Total Hrs	**52**	**SEE Duration**	**3hrs**

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

SYLLABUS CONTENT

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

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 G Penelis 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 Masonry Buildings", John Wiley and Sons, 1992
5. S.K.Duggal, (2007), "Earthquake Resistant Design of Structures", Oxford University 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"- Mc Millan
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"-David Key, "EarthquakeDesign Practice for Buildings".

VIII SEMESTER CIVIL ENGINEERING

Subject	ENVIRONMENTAL IMPACT ASSESSMENT	Sub. Code	11CV8DEEIA
Credit	04	L-T-P	4:0:0
Total Hrs	52	SEE Duration	3hrs

INTRODUCTION:

Definition Evaluation of EIA in India, Rapid and Comprehensive, Development activity and Ecological factors, EIA, EIS, and FONSI. Need for EIA studies, Base line information.

FUNDAMENTAL APPRACH TO EIA/ EIAPROCEDURES:

Step- by- step procedure for conducting EIA, Limitations of EIA. Advantages and Limitations of EIA. Hierarchy in EIA. Statutory Requirements in EIA, MoEF Guidelines in Sitting Developmental Projects.

OBJECTIVES AND SCOPE OF EIA:

Contents of EIA. Methodologies and Evaluation Techniques of EIA, their selection for Specific Projects. Frame work of impact Assessment.

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.

PUBLIC PARTICIPATION IN EIA:

Elements of Effective Public Participation and Benefits and Procedures. Environmental and Disaster Management Plans.

IMPACT QUANTIFICATIONS FOR:

EIA for Water Resource Developmental Projects, Mass Transit Routes, Hazardous Waste disposal Sites, Sanitary Land filling, Mining Project (Coal, Aluminum, Iron Ore, Bauxite) Thermal Power Plant (Coal- based) Project, Pharmaceutical Industries

TEXT BOOKS:

1. Environmental Impact analysis-Jain R.K, Urban & Stacey—Van Nostrand Reinhold Co.
2. Environmental impact Assessment methodologies- Anjaneylu.Y.

REFERENCE BOOKS:

1. **Environmental Impact Assessment** –L.W.Canter (1996), McGraw Hill Inc.
2. **Guidelines for EIA of Developmental Projects**. Ministry of Environment and Forests, Government of India.

VIII SEMESTER CIVIL ENGINEERING

Subject	REINFORCED EARTH STRUCTURES	Sub. Code	11CV8DERES
Credit	04	L-T-P	4:0:0
Total Hrs	52	SEE Duration	3hrs

INTRODUCTION

Historical background, work of Henry Vidal, concept of reinforced soil, Mechanism of reinforced soil. Differences between reinforcement of soil and reinforcement of concrete. Economic advantage of reinforced earth structure over similar structures. **06 Hours**

BASIC COMPONENTS OF REINFORCED SOIL:

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 **06 Hours**

DESIGN OF REINFORCED EARTH STRUCTURE:

Introduction, Internal and overall stability, Design of retaining walls using metallic strips and geotextiles, Reinforced Earth foundation, Assessment of stability of reinforced earth slopes, Design of pavement using geogrids. **12 Hours**

SOIL NAILING TECHNIQUES:

Introduction, Advantages & limitations of soil nailing techniques, comparison of soil nailing with reinforced soil, methods of soil nailing, -construction sequence components of system, design aspects. Applications of soil nailing techniques **07 Hours**

GEOSYNTHETICS:

Introduction and overview. Historical developments, Recent developments. Classification based on materials, Methods of manufacturing process. Raw materials – polypropylene (polyolefin), Polyethylene (Polyoefin), Polyester, Polyvinyl chloride, Polyester, polyamide, polystyrene Elastomers etc, Geosynthetics – geotextiles, geogrids, geomembranes, geocomposites, geonets and other products, geomats, geomeshes, geowebs etc., **07 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, **08 Hours**

APPLICATION OF GEOSYNTHETICS:

Use of geosynthetics in civil engineering as filters and as separators, Material properties for design- Index tests (pore size opening, cross plane-permeability, strength and ultra violet resistance) and performance tests (piping and clogging behaviour, interface strength). Design criteria –soil retention, cross plane permeability and strength. Use of geosynthetics in civil engineering as a separator in highways and railways. **Future trends in geosynthetic applications-**Combined geosynthetics, smart geosynthetics, active geosynthetics. **06 Hours**

TEXT BOOKS:

1. **Design with geosynthetics**- Koerner. R.M. - Prince Hall Publication, 1994.
2. Reinforced soil and its Engineering Applications – Swami Saran.- I.K. International Pvt. Ltd.,
4. An Introduction to Soil Reinforcement and geosynthetics –Shiva Kumar Babu. Wide Publications, India.

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 by R.W. Sarsby, CRC Press, **Boca Raton Boston New York Washington, DC.**

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

VIII SEMESTER CIVIL ENGINEERING

Subject	URBAN TRANSPORT PLANNING	Sub. Code	11CV8DEUTP
Credit	04	L-T-P	4:0:0
Total Hrs	52	SEE Duration	3hrs

INTRODUCTION:

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

TRANSPORTATION PLANNING PROCESS:

Factors to be considered; land use transportation planning; Systems approach.

TRANSPORT SURVEYS:

Planning of different types of surveys and interpretation, travel demand; Traffic surveys for mass transit system planning.

TRIP GENERATION AND DISTRIBUTION:

Factors governing trip generation and attraction; Zonal models; Category analysis; Methods of trip distribution; Application of gravity model.

MODAL SPLIT AND ASSIGNMENT:

Factors affecting modal split; Modal split in transport planning; principles of traffic assignment; Assignment techniques

LAND USE TRANSPORT MODELS-INTRODUCTION-

Selection-Lowry Model-Garin-Lowry model- Advantages- Applications

MASS TRANSIT SYSTEMS: -

Types-characteristics-objective and Planning- Current developments

REFERENCES:

1. Kadiyali, L.R., 'Traffic Engineering and Transportation Planning' – Khanna Publication.
2. Institute of Traffic Engineers – 'An Introduction to highway Transportation Engineering'.
3. Related Publications.

BMS COLLEGE OF ENGINEERING, BANGALORE
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VIII SEMESTER CIVIL ENGINEERING

Subject	GEOMETRIC DESIGN OF ROADS	Sub. Code	11CV8DEGDR
Credit	04	L-T-P	4:0:0
Total Hrs	52	SEE Duration	3hrs

INTRODUCTION:

Geometric Control factors like Topography -design speed – design vehicle – Traffic – Capacity – volume – environment and other factors as per IRC and AASHTO standards and specifications- PCU concept – **4 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 – kerb – median – shoulder – foot path – parking lanes – service roads – cycle tracks – Driveways – Right of way – Factors influencing right of way – Design of Road humps as per latest IRC provisions. **8 Hours**

SIGHT DISTANCE:

Importance-Types-Stopping Sight Distance -Overtaking Sight Distance- Sight distance at uncontrolled intersection, derivation, factors affecting sight distance, IRC standards, problems on above. **6 Hours**

HORIZONTAL ALIGNMENT:

Definition, Checking the stability of vehicle, while moving on horizontal curve, Super elevation, Ruling minimum and maximum radius, Assumptions – problems – method of providing super elevation for different curves – Extra widening of pavement on curves – objectives – Mechanical widening – psychological widening – Transition curve – objectives – Ideal requirements – Types of transition curve – Method of evaluating length of transition curve – Setting the transition curve in the field, set back distance on horizontal curve and problems on above **10 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. **8 Hours**

INTERSECTION DESIGN:

Principle – Atgrade and Grade separated junctions – Types – channelization – Features of channelising Island – median opening – Gap in median at junction.

6 Hours

HIGHWAY DRAINAGE:

Importance – sub surface drainage –surface drainage – Design of cross sections – Hydrological – Hydraulic considerations and design of filter media, problems on above.

8 Hours

TEXT BOOKS:

1. Principle and practice of Highway Engineering- L R KADIYALI & N B LAL : Khanna publications
2. Highway Engineering – Khanna S K & Justo, Nemchand & Bros.
3. Relavent IRC Publications

VIII SEMESTER CIVIL ENGINEERING

Subject	FRACTURE MECHANICS OF CONCRETE STRUCTURES	Sub. Code	11CV8DEFCS
Credit	04	L-T-P	4:0:0
Total Hrs	52	SEE Duration	3hrs

1. Linear elastic fracture mechanics.
2. Importance of Fracture Mechanics of Concrete (FMC) in Designs.
3. Developments in Fracture Mechanics.
4. Fracture Mechanics models.
5. Fracture Process and Softening Models.
6. Size Effect in Concrete.
7. Experimental Techniques in FMC.
8. Applications of Fracture Mechanics

REFERENCES

Fundamentals of fracture mechanics, Prashanth Kumar

Broek, D., Elementary Engineering Fracture Mechanics, Sijthoff and Noordhaff, Alphen Aan Den Rijn, The Netherlands.

Anderson, T.L., Fracture Mechanics: Fundamentals and Applications, CRC Press, USA, Second Edn.

Shah, S.P., Swartz, S.E., and Ouyang, C., Fracture Mechanics of Cocrete: Applications of Fracture Mechanics to Concrete, Rock and Other Quasi-Brittle Materials, John Wiley and Sons, USA.

VIII SEMESTER CIVIL ENGINEERING

Subject	STABILITY ANALYSIS OF STRUCTURES	Sub. Code	11CV8DESTS
Credit	04	L-T-P	4:0:0
Total Hrs	52	SEE Duration	3hrs

BEAM COLUMN-

Differential equation. Beam column subjected to (i) lateral concentrated load, (ii) several concentrated loads, (iii) continuous lateral load. Application of trigonometric series. Euler's formulation using fourth order differential equation for pinned-pinned, fixed-fixed, fixed-free and fixed-pinned columns.

BUCKLING OF FRAMES AND CONTINUOUS BEAMS. ELASTICA. ENERGY METHOD-

Approximate calculation of critical loads for a cantilever. Exact critical load for hinged-hinged column using energy approach. Buckling of bar on elastic foundation. Buckling of cantilever column under distributed loads. Determination of critical loads by successive approximation. Bars with varying cross section. Effect of shear force on critical load. Columns subjected to non-conservative follower and pulsating forces.

STABILITY ANALYSIS BY FINITE ELEMENT APPROACH –

Derivation of shape functions for a two noded Bernoulli-Euler beam element (lateral and translational dof) –element stiffness and Element geometric stiffness matrices

– Assembled stiffness and geometric stiffness matrices for a discretised column with different boundary conditions – Evaluation of critical loads for a discretised (two elements) column (both ends built-in). Algorithm to generate geometric stiffness matrix for four noded and eight noded isoparametric plate elements. Buckling of pin jointed frames (maximum of two active dof)-symmetrical single bay Portal frame.

REFERENCE:

1. Stephen P. Timoshenko, James M. Gere, "Theory of Elastic Stability", 2nd Edition, McGraw-Hill, New Delhi.
2. Robert D Cook et al, "Concepts and Applications of Finite Element Analysis", 3rd Edition, John Wiley and Sons, New York
3. Rajashekaran.S, "Computational Structural Mechanics", Prentice-Hall, India
4. Ray W Clough and J Penzien, "Dynamics of Structures", 2nd Edition, McGraw-Hill, New Delhi.
5. Zeiglar.H,"Principles of Structural Stability", Blaisdall Publications