GOVERNMENT COLLEGE OF TECHNOLOGY

(An Autonomous Institution Affiliated to Anna University, Chennai)

Coimbatore - 641 013

VISION AND MISSION OF THE INSTITUTION

VISION

To emerge as a centre of excellence and eminence by imparting futuristic technical education in keeping with global standards, making our students technologically competent and ethically strong so that they can readily contribute to the rapid advancement of society and mankind.

MISSION

- To achieve Academic excellence through innovative teaching and learning practices.
- To enhance employability and entrepreneurship.
- To improve the research competence to address societal needs.
- To inculcate a culture that supports and reinforces ethical, and professional behaviours for a harmonious and prosperous society.

DEPARTMENT OF CIVIL ENGINEERING

GOVERNMENT COLLEGE OF TECHNOLOGY

VISION AND MISSION OF THE DEPARTMENT

VISION

Marching towards the centre of excellence in Engineering and Technology with sustainable development to bring out professionals with futuristic vision.

MISSION

- To mould the students to be good planners, designers, executers and ethical Engineers to serve the society and strive for the development of the nation.
- To make Civil Engineering department a renowned high-tech consultancy centre for various Civil Engineering activities.
- To create a nodal centre for providing consulting services during natural calamities.
- To make this department a centre for research and development activities with field interaction.

2012 Regulations

DEPARTMENT OF CIVIL ENGINEERING

GOVERNMENT COLLEGE OF TECHNOLOGY

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The following Programme Educational Objectives are designed based on the department mission

PEO 1: Graduates will achieve a high level of technical expertise in the subjects related to Civil Engineering and also good in communication skills that help them to achieve and succeed in various positions.

PEO 2: Graduates will have a strong understanding in Mathematics and Sciences which are needed for the application of Civil Engineering principles to do Post Graduate programmes and competitive examinations.

PEO 3: Graduates will get interest on the learning processes and inculcate in them professional ethics, moral values and social concern.

DEPARTMENT OF CIVIL ENGINEERING

GOVERNMENT COLLEGE OF TECHNOLOGY

PROGRAMME OUTCOMES (POs)

Students in the Civil Engineering Programme should at the time of their graduation be in possession of the following

PO 1 : An ability to apply knowledge of Mathematics, Science, and Engineering.

PO 2 : An ability to design and conduct experiments as well as to analyze and interpret data.

PO 3 : An ability to function on multidisciplinary teams.

PO 4 : An ability to identify, formulate and solve Civil Engineering problem.

PO 5 : An ability to understand the professional and ethical responsibility.

PO 6 : An ability to communicate effectively.

PO 7 : An ability to understand the impact of Engineering solutions in a global, economic, environmental and societal context.

PO 8 : An ability to apply the Civil Engineering principles and techniques in project management and finance.

PO 9 : An ability to use the techniques, skills and modern Civil Engineering tools necessary for Engineering practice.

PO 10: To gain the knowledge of complex Civil Engineering problems.

PO 11: An ability to analyze the problems effectively and efficiently.

PO 12: An ability to deal with sustainability issues in construction.

Curriculum

BACHELOR OF ENGINEERING

CIVIL ENGINEERING

(Full Time Candidates admitted during 2012 - 2013 and onwards)

FIRST SEMESTER

Sl. No.	Subject Code	Course Title	Sessional Marks	Final Exam marks	Total Marks	Credits			
						L	T	P	C
		THEORY							
1	12C1Z1	Communication Skills in English-I	25	75	100	3	1	0	4
2	12C1Z2	Engineering Mathematics-I	25	75	100	3	1	0	4
3	12C103	Applied Physics	25	75	100	3	0	0	3
4	12C104	Materials in Construction	25	75	100	3	0	0	3
5	12C105	Engineering Mechanics	25	75	100	3	1	0	4
6	12C106	Programming in C	25	75	100	3	0	0	3
		PRACTICAL							
7	12C107	Physics Laboratory	25	75	100	0	0	3	2
8	12C108	Engineering Graphics	25	75	100	2	0	3	4
9	12C109	C Programming Laboratory	25	75	100	0	0	3	2
		TOTAL			**900**				**29**

SECOND SEMESTER

Sl. No.	Subject Code	Course Title	Sessional Marks	Final Exam marks	Total Marks	Credits			
						L	T	P	C
		THEORY							
1	12C2Z1	Communication Skills in English-II	25	75	100	3	1	0	4
2	12C2Z2	Engineering Mathematics-II	25	75	100	3	1	0	4
3	12C203	Programming in C++	25	75	100	3	0	0	3
4	12C204	Materials Technology	25	75	100	3	0	0	3
5	12C205	Engineering Chemistry	25	75	100	3	0	0	3
6	12C206	Engineering Geology	25	75	100	3	0	0	3
		PRACTICAL							
7	12C207	Workshop	25	75	100	0	0	3	2
8	12C208	Chemistry Laboratory	25	75	100	0	0	3	2
9	12C209	C++ Programming Laboratory	25	75	100	0	0	3	2
		TOTAL			**900**				**26**

THIRD SEMESTER

Sl. No.	Subject Code	Course Title	Sessional Marks	Final Exam marks	Total Marks	Credits			
						L	T	P	C
		THEORY							
1	12C3Z1	Engineering Mathematics-III	25	75	100	3	1	0	4
2	12C302	Environmental Science and Engineering	25	75	100	3	0	0	3
3	12C303	Mechanics of Solids I	25	75	100	3	1	0	4
4	12C304	Mechanics of Fluids	25	75	100	3	1	0	4
5	12C305	Surveying – I	25	75	100	3	0	0	3
6	12C306	Water Supply Engineering	25	75	100	3	0	0	3
		PRACTICAL							
7	12C307	Survey Practical – I	25	75	100	0	0	3	2
8	12C308	Strength of Materials Laboratory	25	75	100	0	0	3	2
		TOTAL			**800**				**25**

FOURTH SEMESTER

Sl. No.	Subject Code	Course Title	Sessional Marks	Final Exam marks	Total Marks	Credits			
						L	T	P	C
		THEORY							
1	12C401	Numerical Methods	25	75	100	3	1	0	4
2	12C402	Mechanics of Solids II	25	75	100	3	1	0	4
3	12C403	Applied Hydraulics and Fluid Machines	25	75	100	3	1	0	4
4	12C404	Construction Technology	25	75	100	3	0	0	3
5	12C405	Surveying – II	25	75	100	3	0	0	3
6	12C406	Waste Water Engineering	25	75	100	3	0	0	3
		PRACTICAL							
7	12C407	Survey Practical – II	25	75	100	0	0	3	2
8	12C408	Fluid Mechanics and Machinery Laboratory	25	75	100	0	0	3	2
		TOTAL			**800**				**25**

FIFTH SEMESTER

Sl. No.	Subject Code	Course Title	Sessional Marks	Final Exam marks	Total Marks	Credits			
						L	T	P	C
		THEORY							
1	12C501	Structural Analysis I	25	75	100	3	1	0	4
2	12C502	Basic Structural Design I (Masonry, Timber and Steel)	25	75	100	3	1	0	4
3	12C503	Water Resources Engineering	25	75	100	3	0	0	3
4	12C504	Concrete Technology	25	75	100	3	0	0	3
5	12C505	Mechanics of Soils	25	75	100	3	0	1	4
6	12C506	Highway Engineering	25	75	100	3	0	0	3
		PRACTICAL							
7	12C507	Environmental Engineering Laboratory	25	75	100	0	0	3	2
8	12C508	Soil Mechanics Laboratory	25	75	100	0	0	3	2
		TOTAL			**800**				**25**

SIXTH SEMESTER

Sl. No.	Subject Code	Course Title	Sessional Marks	Final Exam marks	Total Marks	Credits			
						L	T	P	C
		THEORY							
1	12C601	Structural Analysis II	25	75	100	3	1	0	4
2	12C602	Basic Structural Design II (Concrete)	25	75	100	3	1	0	4
3	12C603	Irrigation Engineering and Hydraulic Structures	25	75	100	3	0	0	3
4	12C604	Foundation Engineering	25	75	100	3	0	0	3
5	12C605	Design and Drawing –I (Irrigation and Environmental Engineering)	25	75	100	2	0	3	4
6		Elective – I	25	75	100	3	0	0	3
		PRACTICAL							
7	12C607	Computer Aided Building Drawing	25	75	100	0	0	3	2
8	12C608	Concrete and Highway Laboratory	25	75	100	0	0	3	2
		TOTAL			**800**				**25**

SEVENTH SEMESTER

Sl. No.	Subject Code	Course Title	Sessional Marks	Final Exam marks	Total Marks	Credits			
						L	T	P	C
		THEORY							
1	12C701	Prestressed Concrete Structures	25	75	100	3	1	0	4
2	12C702	Steel Structures	25	75	100	3	1	0	4
3	12C703	Concrete Structures	25	75	100	3	1	0	4
4	12C704	Design and Drawing –II (Concrete and Steel)	25	75	100	2	0	3	4
5		Elective – II	25	75	100	3	0	0	3
6		Elective – III	25	75	100	3	0	0	3
		PRACTICAL							
7	12C707	Estimation and Costing	25	75	100	0	0	3	2
8	12C708	Computer Application Laboratory	25	75	100	0	0	3	2
		TOTAL			**800**				**25**

EIGHTH SEMESTER

Sl. No.	Subject Code	Course Title	Sessional Marks	Final Exam marks	Total Marks	Credits			
						L	T	P	C
		THEORY							
1		Elective – IV	25	75	100	3	0	0	3
2		Elective – V	25	75	100	3	0	0	3
		PRACTICAL							
3	12C801	PROJECT WORK AND VIVA –VOCE	50	150	200	0	0	12	6
		TOTAL			**400**				**12**

LIST OF ELECTIVES FOR

B.E. CIVIL ENGINEERING

(SIXTH SEMESTER)

Sl. No.	Subject Code	Course Title	Sessional Marks	Final Exam marks	Total Marks	Credits			
						L	T	P	C
1	12C6E0	Construction Management	25	75	100	3	0	0	3
2	12C6E1	Railway Engineering	25	75	100	3	0	0	3
3	12C6E2	Smart Materials and Smart Structures	25	75	100	3	0	0	3
4	12C6E3	Maintenance and Rehabilitation of Structures	25	75	100	3	0	0	3
5	12C6E4	Safety in Civil Engineering Practices	25	75	100	3	0	0	3

(SEVENTH SEMESTER)

Sl. No.	Subject Code	Course Title	Sessional Marks	Final Exam marks	Total Marks	Credits			
						L	T	P	C
1	12C7E0	Finite Element Method	25	75	100	3	0	0	3
2	12C7E1	Advance concrete Design	25	75	100	3	0	0	3
3	12C7E2	Basics of Dynamics and Aseismic Design of Structures	25	75	100	3	0	0	3
4	12C7E3	Pavement Engineering	25	75	100	3	0	0	3
5	12C7E4	Town Planning and Architecture	25	75	100	3	0	0	3
6	12C7E5	Industrial Wastewater Management	25	75	100	3	0	0	3
7	12C7E6	Operations Research	25	75	100	3	0	0	3
8	12C7E7	Professional Ethics	25	75	100	3	0	0	3
9	12C7E8	Airport, Docks and Harbour Engineering	25	75	100	3	0	0	3
10	12C7E9	Hydrology	25	75	100	3	0	0	3

(EIGHTH SEMESTER)

Sl. No.	Subject Code	Course Title	Sessional Marks	Final Exam marks	Total Marks	Credits			
						L	T	P	C
1	12C8E0	Experimental Stress Analysis	25	75	100	3	0	0	3
2	12C8E1	Fundamentals Of Remote Sensing And GIS Applications	25	75	100	3	0	0	3
3	12C8E2	Non conventional Energy Sources	25	75	100	3	0	0	3
4	12C8E3	Machine Foundation	25	75	100	3	0	0	3
5	12C8E4	Geotechnical Earthquake Engineering	25	75	100	3	0	0	3
6	12C8E5	Bridge Engineering	25	75	100	3	0	0	3
7	12C8E6	Environmental Management	25	75	100	3	0	0	3
8	12C8E7	Traffic Engineering And Management	25	75	100	3	0	0	3
9	12C8E8	Ground Improvement Techniques	25	75	100	3	0	0	3
10	12C8E9	Prefabricated Structures	25	75	100	3	0	0	3

INDUSTRIAL BASED ELECTIVE SUBJECTS

Sl. No.	Subject Code	Course Title	Sessional Marks	Final Exam marks	Total Marks	Credits			
						L	T	P	C
1	12CEI1	Highways – State of the Art	25	75	100	3	0	0	3
2	12CEI2	Role of Environmental Legislations in Industries	25	75	100	3	0	0	3

12C1Z1 - COMMUNICATION SKILLS IN ENGLISH – I

(*Common to all branches of Engineering and Technology*)

L	T	P	C
3	1	0	4

Prerequisites: NIL

COURSE OBJECTIVES:

- *To help students develop listening skills for academic and professional purposes.*
- *To help students acquire the ability to speak effectively in English in real-life situations.*
- *To inculcate reading habit and to develop effective reading skills.*
- *To familiarize students with different rhetorical functions of scientific English.*

COURSE OUTCOMES:

CO1: *To provide language training to the engineering students which will enable them to understand and acquire knowledge in technical subjects.*

CO2: *To improve students' vocabulary and communication skills so that they employ the words appropriately in different academic and professional contexts.*

CO3: *To enable students to develop suitable reading strategies that could be adopted while reading science related articles.*

UNIT-I **(09)**

Tenses - Word formation- Vocabulary (Synonyms & Antonyms)- Listening and transfer of information- Pronunciation Practice-Word Stress-Sentence Stress-Intonation-Introducing oneself-Role play activities based on real life situations-Non-Verbal Communication -Reading Comprehension (Skimming and Scanning)- An introduction to Letter Writing – E-Tender Notices

UNIT-II **(09)**

Technical Vocabulary-Abbreviations & Acronyms- Commonly Confused Words- Active Voice to Passive Voice-Impersonal Passive- Listening at Specific Contexts such as Airport, Railway Station, Bus Stand, Sea Port/Shipboard etc., - Debates on Chosen Topics -Reading For Identifying Stylistic Features-Recommendations-Letter to the Editor of a News Paper

UNIT-III **(09)**

Subject-Verb Agreement (Concord) - Preposition-Listening to News in English- Mini Oral Presentation on the assumption of a historian, celebrity, famous Personality etc.- Reading and Note-making- - Notice-Agenda-Memo-Advertisement and Slogan Writing

UNIT-IV **(09)**

Common Errors in English-Conditional Statements -Use of Modal Auxiliaries- Definition-Listening to a Discussion at a Business Meeting- Group Discussion on chosen topics-Reading for interpreting tables, charts etc. - Writing E-mails-Graphic Description

UNIT-V **(09)**

Extensive Reading- APJ Abdul Kalam's "Wings of Fire"- An Abridged Special Edition for Students

LECTURE: 45 TUTORIAL: 15 TOTAL: 60hrs

REFERENCE BOOKS:

1. Meenakshi Raman, Sangeetha Sharma, "Technical Communication: English Skills for Engineers" Oxford University Press: New Delhi, 2008
2. Rizvi Ashrav.M, "Effective Technical Communication" Tata McGraw Hill, New Delhi, 2005
3. Herbert, A.J, "Structure of Technical English" the English Language Society. Authentic NET Resources.

12C1Z2 - ENGINEERING MATHEMATICS – I

L	T	P	C
3	1	0	4

Prerequisites: NIL

COURSE OBJECTIVES: Upon completion of this course the student will be familiar with

- *To wider applications in engineering problems using Matrix theory and its properties*
- *The area of hyperbolic functions and solid geometry leading to solve solve sphere, cone and cylinder problems.*
- *The applications of differential equations and integral calculus leading to bending of beams, electric circuits and transmission lines.*
- *Functions of two variables including extremum problems and Leibnitz rule of integration*
- *Performing double and triple integration.*

COURSE OUTCOMES: At the end of the course, students will be able to

CO1: *Find eigen values and eigen vectors of a real matrix, Reduce quadratic form to canonical form. (Usage)*
CO2: *Identify and solve problems using hyperbolic functions and apply solid geometry for solving problems. (Usage)*
CO3: Apply differential calculus to solve problems on curvature, evolute and envelopes. (Usage)
CO4: *Apply Taylor's theorem, Lagrangian multiplier method, Jacobians - differentiation under integral sign for two independent variables. (Usage)*
CO5: *Calculate the area using double integral and the volume using triple integral. (Usage)*

UNIT-I MATRICES (09)

Characteristic equation – Eigen values and Eigen vectors of a real matrix - Properties of Eigen values - Cayley-Hamilton Theorem (statement only) and applications- Diagonalisation by similarity transformation - Reduction of quadratic form to canonical form.

UNIT-II HYPERBOLIC FUNCTIONS AND SOLID GEOMETRY (09)

Hyperbolic functions and Inverse Hyperbolic functions -Identities-Real and imaginary parts- solving problems using hyperbolic functions. Sphere – tangent plane – Orthogonal spheres - Cone- right circular cone – Cylinder – right circular cylinder**.**

UNIT-III APPLICATIONS OF DIFFERENTIAL CALCULUS (09)

Curvature - cartesian and polar coordinates – centre and radius of curvature - circle of curvature -Evolutes - Envelopes- Evolutes as envelope of normal**.**

UNIT-IV FUNCTION OF SEVERAL VARIABLES (09)

Function of two variables - Taylor's theorem (statement only) and expansions - maxima and minima – constrained maxima and minima by Lagrangian multiplier method - Jacobians - differentiation under integral sign.

UNIT-V INTEGRAL CALCULUS (09)

Gamma and Beta functions - Double integration - Cartesian and Polar Coordinates – change of order of integration -Area as double integral – Triple integration –Volume as a triple integral - Transformation to Cylindrical and Spherical co-ordinates.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60hrs

TEXT BOOKS:

1. Veerarajan.T., “Engineering Mathematics” for Semesters I and II, Tata McGraw Hill Publishing Co., New Delhi., 2010.
2. Dr.Kandasamy.P., Dr.Thilagavathy.K and Dr.Gunavathy.K., “Engineering Mathematics” for First Year B.E/B.Tech, S. Chand & Co., Ram Nagar, New Delhi, 2010

REFERENCE BOOKS:

1. N.P.Bali., Dr. Manish Goyal., “A text book of Engineering Mathematics” vol. I , University science Press, New Delhi, 2010.
2. H.C.Taneja., “Advanced Engineering Mathematics” vol. I, I.K.International Pub.House Pvt.Ltd., New Delhi, 2007.
3. Baburam., “Engineering Mathematics” vol. I, Pearson, New Delhi, 2010.
4. B.V.Ramana., “Higher Engineering Mathematics” Tata McGraw Hill Publishing Co., New Delhi,2007.
5. Grewal B.S., “Higher Engineering Mathematics” (40th Edition) Khanna Publishers, New Delhi, 2007.

12C103 - APPLIED PHYSICS

Prerequisites: NIL

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.*

COURSE OUTCOMES: *The students are able to*

CO1: *Understand lasers, fiber optics, and their applications.*
CO2: *Acquire knowledge about quantum physics.*
CO3: *Gain knowledge about ultrasonic and vacuum science.*

UNIT-I LASERS (09)

Introduction- Principle of laser action - characteristics of laser - Spontaneous emission and Stimulated emission –Einstein's coefficients - population inversion – methods of achieving population inversion -Types of pumping –Optical Resonator -Types of Lasers – Principle, construction and working of different types of laser- CO_2, Nd-YAG, Semiconductor laser and Dye laser- applications of laser -Lasers in microelectronics, welding, heat treatment, cutting – holography – construction and reconstruction of a hologram – applications of holography.

UNIT-II FIBER OPTICS AND APPLICATIONS (09)

Introduction – Basics Principles involved in fiber optics- Total internal reflection – Structure of optical fiber – Propagation of light through optical fiber –Derivation for Numerical Aperture and acceptance angle - fractional index change - Preparation of optical fiber- Crucible and Crucible technique - Classification of optical fiber based on materials, refractive index profile and Modes - Splicing-fusion and multiple splices - Light sources for fiber optics.- LED- Detectors- Principle of photo detection - PIN Photodiode, - Fiber optical communication links-Fiber optic sensors-Temperature, displacement.

UNIT-III QUANTUM PHYSICS AND APPLICATIONS (09)

Limitations of classical Physics - Introduction to Quantum theory - Dual nature of matter and radiation- de-Broglie wavelength in terms of voltage, energy, and temperature –Heisenberg's Uncertainty principle – verification - Schrödinger's Time independent and Time dependent wave equations – physical significance of a wave function - Particle in a one dimensional deep potential well– microscope – basic definitions of microscope - Electron microscope-Scanning Electron Microscope (SEM)-Transmission Electron Microscope (TEM).

UNIT-IV ULTRASONICS (09)

Introduction – properties of ultrasonic waves – production of ultrasonic waves Magnetostriction effect-Magnetostriction generator- Piezoelectric crystals - Piezoelectric effect- Piezoelectric generator- Detection of ultrasonic wave – kundt's tube method – sensitive flame method – thermal detector method – piezo electric detector method- cavitation – industrial applications- ultrasonic drilling- ultrasonic welding- ultrasonic soldering and ultrasonic cleaning-Non- destructive Testing- Pulse echo system, through transmission and resonance system.

UNIT-V VACUUM SCIENCE (09)

Introduction - Importance of vacuum in industries - Properties of Design procedure of a vacuum Pump – Schematic diagram of a vacuum system - Pumping speed and throughput - Types of pumps-Rotary vane type Vacuum pump(oil sealed), Diffusion Pump and Turbo Molecular Pump - Measurement of High Vacuum-McLeod Gauge-Pirani Gauge-Penning Gauge.

LECTURE: 45 TOTAL: 45hrs

TEXT BOOKS

1. Ganesan S. Iyandurai N, “Applied Physics”, KKS Publishers, Chennai, 2007.

REFERENCE BOOKS

1. Gaur R K and Gupta S L-”Engineering Physics”, Dhanpat Rai and sons, 2002.
2. Avadhanulu M N and Kshirsagar P G,”A textbook of Engineering Physics”S.Chand and Company Ltd, New Delhi, 2005.
3. Arumugam M- “Engineering Physics”, Anuadha Publishers, 2002.
4. Jayakumar S, “Engineering Physics”, RK Publishers, Coimbatore, 2003.

12C104 - MATERIALS IN CONSTRUCTION

Prerequisites: NIL

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *To learn the manufacturing process, types, applications and testing procedures for materials used for construction*
- *To impart knowledge about basis of recent paradigms, and new materials*

COURSE OUTCOMES:

CO1: *The students should be able to understand the types, basic properties, uses of basic building materials.*
CO2: *The students will understand the various BIS tests adopted for testing common building materials used in construction.*
CO3: *The students are also exposed to modern building materials.*

UNIT I - STONES, TILES, BRICKS, BUILDING BLOCKS (08)

Stones – Types – characteristics – uses - BIS tests - Tiles-types-selection -suitability – uses - maintenance – Bricks –composition – manufacture – types - BIS tests. Hollow concrete blocks, Burnt clay hollow Blocks, Stabilized mud blocks– Selection of Building Blocks.

UNIT II – MORTAR (09)

Cement - Different types - hydration-setting and hardening – Initial & Final Setting Time-Cement mortar – Preparation and uses – curing - BIS Tests - Lime mortar – uses – Surki - BIS tests- Water, Sand, M-Sand Properties.

UNIT III - CEMENT CONCRETE (09)

Selection of materials for concrete - bulking of sand - water cement ratio -workability of concrete and Testing Methods - Proportioning and mixing- grades of concrete – uses - permissible strength-volume changes - Ready mix concrete.

UNIT IV - TIMBER, BOARDS AND PAINTS (10)

Timber- defects-causes of decay - seasoning – preservation - fire proofing -Laminated wood products - types – properties – uses of fiber boards, particle boards, hard boards and A.C boards - Paints – types – wall paints – wood paints – metal paints.

UNIT V - MODERN BUILDING MATERIALS (09)

Steel Properties – types- Aluminium products- UPVC – crack fillers – Asbestos –GI Sheets– Glass – water proofing compounds – Neo-prene – thermocole – fiber reinforced plastic – smart concrete and smart bricks

LECTURE: 45 TOTAL: 45hrs

TEXT BOOKS

1. S.C. Rangawala, “Engineering materials”, Charotar Publishing House, New Delhi.2000.
2. Surendra Singh, “Engineering materials”, Vikas Publishing Company, New Delhi.
3. R.K.Rajput,”Engineering Materials”, Revised Edition, S.Chand &Company LTD, New Delhi, 2008.

REFERENCE BOOKS

1. P.C.Smith, “Materials of Construction”, Mc Graw Hill Publications, 1973.
2. Janardhana Jha, Engineering materials, Khanna Publishers, New Delhi, 1981.
3. Allan Everett, Materials, John Willey & Sons 1978.
4. K.S.Jagadish, B.V. Venkataraman Reddy and K.S. Nanjunda Rao “Alternative Building
5. Materials and Technologies”, New Age International (P) Ltd. Publishers, New Delhi –110002. 1st Edition,2007.

12C105 - ENGINEERING MECHANICS

Prerequisites: NIL

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- *To familiarize various system of forces and theorems.*
- *To throw light on friction and frictional force.*
- *To know the concepts of centre of gravity and moment of inertia.*
- *To study the basics of velocity, acceleration, displacement and the energy principles.*
- *To understand about the momentum and impact of elastic bodies.*

COURSE OUTCOMES:

CO1: Able to resolve forces in plane and space structures.
CO2: Describe the different types of frictional force and its practical applications.
CO3: Able to work out the centre of gravity and moment of inertia of various plane areas
CO4: *Able to solve problems in dynamics using the various principles like Newton's second law, Work- energy, Impulse momentum and equations of motions.*

UNIT-I INTRODUCTION TO MECHANICS AND FORCE CONCEPTS (10)

Definition of mechanics – characteristics – system of forces -– parallelogram, triangle and polygon law of forces –resultant of a force system – resultant of a concurrent, coplanar and parallel force system – resolution and Composition of forces – Lami's theorem – moment of a force – physical significance of moment- Varignon's theorem – resolution of a force into force and couple – forces in space –addition of concurrent forces in space – equilibrium of a particle in space.

UNIT-II FRICTION (08)

Frictional resistance – classification of friction- laws of friction –coefficient of friction-angle of friction – angle of repose – cone of friction – free body diagram-advantages-equilibrium of a body on a rough horizontal and inclined plane –ladder friction – rope friction – wedge friction. Simple machines-concept of lifting machines-law of lifting machine – efficiency– mechanical advantages – velocity ratio and their relationship.

UNIT-III GEOMETRICAL PROPERTIES OF SECTION (08)

Introduction – concept of first moment – definition of centroid – centroid of an area – centroid of simple figures -composite sections – bodies with cutparts-moment of inertia – theorem of moment of inertia – moment of inertia of composite sections – principal moment of inertia of plane areas- radius of gyration.

UNIT-IV BASICS OF DYNAMICS (10)

Definition – kinematics and kinetics – displacements, velocity and acceleration- Equations of motion -Types of motion –Rectilinear motion of a particle with uniform velocity, uniform acceleration, varying acceleration – motion curves –motion under gravity – relative motion – curvilinear motion of a particle – projectiles – angle of projection – range – time of flight and maximum height. Newton's second law of motion – linear momentum – D'Alembert's principle, Dynamic equilibrium - work energy equation of particles– law of conservation of energy – principle of work and energy

UNIT-V IMPULSE MOMENTUM AND IMPACT OF ELASTIC BODIES (09)

Impulsive force – Impulse – linear impulse and momentum – Equations of momentum – principle impulse and momentum – impulsive motion – conservation of momentum

Definition – Time of compression, restitution, collision – law of conservation of momentum – Co-efficient of restitution –types of impact – collision of elastic bodies by direct central impact and oblique impact – collision of small body with a massive body – loss of kinetic energy.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60hrs

TEXT BOOKS

1. S.S. Bhavikatti and K.G. Rajasekarappa, Engineering Mechanics, New Age International (P) Ltd. 1999.
2. S.C. Natesan, Engineering Mechanics, Umesh Publications, Delhi, 2002.

REFERENCE BOOKS

1. F.B. Beer and E.R. Johnson, Mechanics for Engineers, Tata Mc.Graw Hill publishing Ltd, 1996.
2. S. Timoshenko and Young, Engineering Mechanics, Mc.Graw Hill, 4th Edition, 1995.
3. Irving shames, Engineering Mechanics, Prentice Hall of India Ltd, Delhi, 1980.
4. Domkundwar V.M and Anand V. Domkundwar, Engineering Mechanics (Statics and Dynamics), Dhanpat Rai& Co. Ltd, 1st Edition, 2006.
5. Suhas Nitsure, Engineering Mechanics, Technical Publications, Pune, 1st edition, 2006.

12C106 - PROGRAMMING IN C

Prerequisites: NIL

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *To enable the student to learn the major components of a computer system*
- *To know the correct and efficient ways of solving problems*
- *To learn to use office automation tools*
- *To learn to program in C*

COURSE OUTCOMES: *The students are able to*

CO1 : Acquire fundamental knowledge of basic hardware and software components and problem solving techniques.

CO2 : Gain knowledge and usage of basic programming elements, control structures and arrays in C.

CO3 : Understand different user defined data types, functions and pointers and effectively use in development of efficient C programs.

UNIT I BASICS OF COMPUTER, PROGRAMMING AND INFORMATION TECHNOLOGY (09)

Digital Computer Fundamentals- Block diagram of a computer-Components of a Computer system-Applications of Computers-Hardware and Software definitions-Categories of Software-Booting-Installing and Uninstalling Software-Software privacy-Software terminologies-Information Technology Basics-History of Internet-Internet Tools. Problem solving Techniques-Program-Program development cycle-Algorithm-Flow Chart-Pseudo Code-Program control structures-Types and generation of programming languages-Development of algorithms for simple problems.

UNIT II BASIC ELEMENTS OF C (09)

Introduction to C-C Declaration- Operators and Expressions-Input and output Functions- Decision statements: If-If else-Nested If else-If else If ladder-break-continue-goto-switch-nested switch case-Switch case and nested ifs-Loop control:for, nested for, while, do-while- do while statement with while loop-Arrays: initialization, characteristics, types and operations.

UNIT III POINTERS AND FUNCTIONS (09)

Strings and Standard functions: Declaration and initialization, formats, standard, conversion and memory functions, applications; Pointers-pointers and address- declaration-void ,wild, constant pointers –arithmetic operations with pointers and arrays- pointers to pointers-pointers to pointers- pointers and strings; Functions-return statement-types-call by value and reference-returning more values, function as an argument, function with operators, decision statements, loop statements, arrays and pointers, recursion-Tower of Hanoi.

UNIT IV STORAGE CLASSES, STRUCTURE AND UNION (09)

Storage classes: auto-extern-static-register; Preprocessor directives; Structures: Declaration and initialization, structure within structure-Array of Structures-pointer to structure-structure and functions-typedef-bit fields-enumerated data types; union: calling BIOS and DOS services-union of structures.

UNIT V FILES, GRAPHICS AND DYNAMIC MEMORY ALLOCATION (09)

Files: streams and file types-operations-File I/O-read and write-other –creating, processing and updating files-simple file handling programs-low level programming-command line arguments- Environment variables; Graphics: initialization functions-library functions-text-patterns and styles-mouse programming-drawing non common figures; Dynamic memory allocation.

LECTURE: 45 TOTAL: 45 hrs

TEXT BOOKS

1. ITL Education Solutions Limited, "**Introduction to Information Technology**", Pearson Education (India),2005. (Unit I) (Chapters: 1, 7, 9, 10, 15, 16)
2. Ashok N. Kamthane, **"Programming in C"**, Pearson Education, Second edition, 2012.

REFERENECE BOOKS

1. Byron Gottfried, **"Programming with C"**, II Edition, (Indian Adapted Edition), TMH publications, 2006.
2. Brain W.kernighan and Dennis M.Ritchie, "**The C programming language"** , Pearson Education Inc.(2005).
3. E. Balagurusamy, **"Programming in ANSI C"**, 5E, Tata McGraw-Hill Education, 2011.

12C107 - PHYSICS LABORATORY

Prerequisites: *Applied Physics*

L	T	P	C
0	0	3	2

COURSE OBJECTIVES:

- *To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter*

COURSE OUTCOMES: *The Students are able*

CO1: To provide hands-on experience on laser and fiber optics.

CO2: To give students a background in perimental techniques and to reinforce instruction in physical principles.

CO3: To learn the various mechanism in quantum physics.

List of Experiments:

1. SPECTROMETER - DIFFRACTION GRATING NORMAL INCIDENCE METHOD
2. AIR WEDGE
3. YOUNGS MODULUS – CANTILEVER BENDING KOENING'S METHOD
4. PARTICLE SIZE DETERMINATION
5. THERMAL CONDUCTIVITY OF THE BAD CONDUCTOR LEE'S DISC METHOD
6. AMMETER AND VOLTMETER CALIBRATION – LOW RANGE
7. RESISTANCE OF THE GIVEN COIL OF WIRE – CAREY FOSTER'S BRIDGE
8. TORSIONAL PENDULUM
9. YOUNG'S MODULUS - NON UNIFORM BENDING
10. TRANSISTOR CHARACTERISTICS

TOTAL: 45hrs

12C108 - ENGINEERING GRAPHICS

Prerequisites: NIL

L	T	P	C
2	0	3	4

COURSE OBJECTIVES:

- *To develop in students graphic skill for communication of concepts, ideas and design of engineering products.*
- *To expose them to existing national standards related to technical drawings.*

COURSE OUTCOMES: *The students are able*

CO1: To develop graphic skill for communicating concepts, ideas and design of engineering products.

CO2: To gain knowledge about the technical drawing and construction of various curves like ellipse, parabola, and cycloid.

CO3: To gain knowledge of orthographic projections, section of solids and pictorial views.

UNIT-I GEOMETRICAL CONSTRUCTIONS (15)

Dimensioning-Lettering-Types of Lines-Scaling conventions-Dividing a given straight line in to any number of equal parts- Bisecting a given angle- Drawing a regular polygon given one side-Special methods of constructing a pentagon and hexagon

UNIT-II ORTHOGRAPHIC PROJECTIONS (15)

Introduction to Orthographic Projection-Projection of points-Projection of straight lines with traces- Conversion of pictorial views to orthographic views-Projection of solids - Auxiliary projections

UNIT-III SECTION OF SOLIDS AND DEVELOPMENT (15)

Section of solids- Development of surfaces

UNIT-IV INTERPENETRATION OF SOLIDS (10)

Cylinder and cylinder, cone and cylinder only

UNIT-V PICTORIAL VIEWS (10)

Isometric projections - Conversion of orthographic views to pictorial views (simple objects).

LECTURE: 25 TUTORIAL: 40 TOTAL : 65hrs

REFERENCE BOOKS

1. K.Vengopal,"Engineering Graphics", New Age International (P) Limited, 2007
2. Dhananjay.A.Jolhe, "Engineering Drawing", Tata McGraw Hill Publishing Co.,2007 K.V.Nataraajan 'A textbook of Engineering Graphics", Dhanalakashmi Publishers, Chennai, 2006
3. M.B.Shah and B.C. Rana,"Engineering Drawing", Pearson Education,2005 Luzadder and Duff,"Fundamentals of Engineering Drawing" Prentice Hall of India Pvt Ltd, XI Edition – 20014.

12C109 - C PROGRAMMING LABORATORY

L	T	P	C
0	0	3	2

Prerequisites: *Programming in C*

COURSE OBJECTIVES:

The student should be made to:

- *Be familiar with the use of Office software.*
- *Be exposed to presentation and visualization tools.*
- *Be exposed to problem solving techniques and flow charts.*
- *Be familiar with programming in C.*
- *Learn to use Arrays, strings, functions, structures and unions.*

COURSE OUTCOMES:

CO1: *The students are able to know the basic concepts of C program.*
CO2: *Ability to solve mathematical problems using C program.*
CO3: *Able to use all types of operators in C progam.*

Exercises illustrating the following concepts:

1. Operators , Expressions and IO formatting
2. Decision Making and Looping
3. Arrays and Strings
4. Functions and Recursion
5. Pointers
6. Dynamic Memory Allocation
7. Structures
8. Unions
9. Files
10. Command line arguments
11. Graphics.
12. Mini Project

TOTAL: 45hrs

12C2Z1 - COMMUNICATION SKILLS IN ENGLISH – II

L	T	P	C
3	1	0	4

Prerequisites: *Communication Skills in English-I*

COURSE OBJECTIVES:

- *To make learners acquire listening and speaking skills in both formal and informal contexts.*
- *To help them develop their reading skills by familiarizing them with different types of reading strategies.*
- *To equip them with writing skills needed for academic as well as workplace contexts.*
- *To make them acquire language skills at their own pace by using e-materials and language lab Components*

COURSE OUTCOMES:

CO1: *Acquire strategic competence to use both spoken and written language to use in a wide range of communication strategies.*

CO2: *Use language effectively to face interviews, group discussions, public speaking.*

CO3: *Understand the discourse competence, to prepare the learner to be able to produce contextualize written text and speech.*

UNIT-I **(09)**

Use of Relative Clauses-Noun Phrases- Listening to Conversations- Telephonic Conversational Skills Paralinguistic Communication (Articulation, Stress and Pause) – Cloze Reading-Reading to practice stress, pause etc. –Process -Description- Transcoding.

UNIT-II **(09)**

Cause and Effect Expressions-Time and Contracted Time Statements- Listening to Narration/Speech – Extemporaneous -Instructions with Imperatives- Reading for inferring meaning: Lexical and Contextual - Understanding the organization of the Texts -Writing Articles (Technical & General)

UNIT-III **(09)**

Phrasal Verbs -American and British Vocabulary- Video Listening: Listening to Authentic Clippings in English (Movie/Play)-Making Speeches (Introducing a Chief Guest, Delivering Welcome Address, Proposing Vote of Thanks)-Reading for understanding discourse cohesion-Logical Connectives- Minutes of the Meeting

UNIT-IV **(09)**

Idiomatic Expressions -Numerical Expressions- Listening to authentic songs in English-Mock Interviews-Reading for identifying the topic sentence in each paragraph-An Introduction to Different kinds of Report-Report on an Industrial Visit-Report on an accident

UNIT-V **(09)**

Abstract – foot notes-bibliography-plagiarism- Technical Style- Presentation of a **Mini Project Report** of 25 to 30pages on one of the topics from the First Year B.E Syllabus or similar topics.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60hrs

REFERENCE BOOKS

1. Meenakshi Raman, Sangeetha Sharma, “Technical Communication: English Skills for Engineers” Oxford University Press: New Delhi, 2008
2. Rizvi Ashrav.M, “Effective Technical Communication” Tata McGraw Hill:New Delhi, 2005
3. Herbert, A.J, “Structure of Technical English”: the English Language Society
4. Authentic NET Resources.

12C2Z2 - ENGINEERING MATHEMATICS – II

Prerequisites: *Engineering Mathematics-I*

L	T	P	C
3	1	0	4

COURSE OBJECTIVES: Upon completion of this course the student will be familiar with:

- *Understand vector calculus operations and identities to solve physical problems.*
- *Develop the ability of mathematical modeling of systems using differentials equations..*
- *Understand the concept of complex differentiation leading to analytic function, conformal mapping and bilinear mapping.*
- *Gain knowledge on complex integration around unit circle and semi-circle.*
- *Understand the concepts of Laplace Transforms including applications.*

COURSE OUTCOMES: At the end of the course the students should be able to

CO1: *Apply Green's Gauss Divergence & Stoke's theorem to verify application.(Usage)*
CO2: *Apply first, second and higher order differential equations to solve real world applications.(Usage)*
CO3: *Obtain the images corresponding to conformal and bilinear mappings.(Usage)*
CO4: Evaluate contour integration using Cauchy-Residue theorem. (Usage)
CO5: *Perform Laplace transformations to solve linear and second order differential equations with constant coefficients.(Usage)*

UNIT I: VECTOR CALCULUS (09)

Gradient , Divergence , Curl – Directional derivative – Irrotational and Solenoidal fields-Vector identities - Line, Surface and Volume Integrals – Green's Theorem in a Plane , Gauss Divergence and Stoke's Theorems (Statements only) – Verifications and Applications.

UNIT II: ORDINARY DIFFERENTIAL EQUATIONS (09)

Linear equations of Second and Higher order with constant coefficients-Simultaneous first order Linear equations with constant coefficients - Linear equations of Second and Higher order with variable coefficients - Legendre type - Method of variation of parameters-method of reduction of order.

UNIT III: COMPLEX DIFFERENTIATION (09)

Functions of a Complex variable-Analytic functions- Cauchy Riemann equations and sufficient conditions(excluding proof)–Harmonic and orthogonal properties of analytic functions –Construction of analytic functions-Conformal mappings: w = z + a , az ,1/z , z2, ez ,cosz, sinz and Bilinear Transformation.

UNIT IV : COMPLEX INTEGRATION (09)

Cauchy's integral theorem, Cauchy's integral formula -Taylor's and Laurent's theorems (Statements only) and expansions – Poles and Residues – Cauchy's Residue theorem – Contour integration – Circular and semicircular contours.

UNIT V: LAPLACE TRANSFORMATIONS (09)

Laplace transforms - Properties and standard transforms-Transforms of unit step, unit impulse and error functions –Transforms of periodic functions - Inverse Laplace transforms - Initial and Final value theorems – Convolution theorem(statement only) and applications- Applications to Solution of Linear y differential equations of second order with constant coefficients.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 hrs

TEXT BOOKS

1. Veerarajan.T., “Engineering Mathematics” for Semesters I and II , Tata McGraw Hill Publishing Co., New Delhi., 2010.
2. Dr.Kandasamy.P., Dr.Thilagavathy.K and Dr.Gunavathy.K., “Engineering Mathematics” for First Year B.E/B.Tech, S. Chand & Co., Ram Nagar, New Delhi, 2010.

REFERENCE BOOKS

1. N.P.Bali., Dr. Manish Goyal., “A text book of Engineering Mathematics” vol. II , University science Press, New Delhi, 2010.
2. H.C.Taneja., “Advanced Engineering Mathematics” vol.II, I.K.International Pub. House Pvt.Ltd., New Delhi, 2007.
3. Baburam., “Engineering Mathematics”, Pearson, New Delhi, 2010.
4. B.V.Ramana., “Higher Engineering Mathematics” Tata McGraw Hill Publishing Co., New Delhi, 2007.
5. Grewal B.S., “Higher Engineering Mathematics”(40th Edition) Khanna Publishers, New Delhi., 2007.

12C203 - PROGRAMMING IN C++

L	T	P	C
3	0	0	3

Prerequisites: *Programming in C*

COURSE OBJECTIVES:

- *To learn to program in C++*
- *To learn to solve problem using C++ Programming.*

COURSE OUTCOMES:

The student should be able to
CO1: Acquire fundamental knowledge of C++ programming.
CO2: Gain knowledge and usage of basic programming elements, functions and file handling in C++.

BASICS OF C++ PROGRAMMING (09)

An overview of C++, Classes and objects: Friend Functions, Friend classes, Inline functions, Parameterized constructors, Static class members, Nested and local classes- Arrays, Pointers, References, Dynamic allocation operators.

FUNCTION AND OPERATOR OVERLOADING (09)

Function overloading, Copy constructors and default arguments-Operator overloading: Overloading with operator function, Overloading new, delete, special operators and comma operators.

INHERITANCE, VIRTUAL FUNCTIONS AND POLYMORPHISM (09)

Inheritance: Access control, Constructor, destructor, single, multiple, multilevel and hybrid inheritance, virtual base class;Virtual functions, Pure virtual functions, Early Vs Late binding.

TEMPLATES AND EXCEPTION HANDLING (09)

Templates: Generic functions, Applying generic functions, Generic Classes; Exception handling: Fundamentals, derived class exceptions, options, terminate() and unexpected(), uncaught exception(), The exception and bad exception classes.

SYSTEM I/O AND FILE I/O (09)

I/O System Basics: C++ Stream Classes, Formatted I/O, Overloading << and >> operators-File I/O: Opening, Closing, Reading and Writing files, Unformatted Binary I/O, Random access, I/O status, Customized I/O and files.

LECTURE: 45 TUTORIAL: 15TOTAL: 60hrs

TEXT BOOKS

1. Herbert Schildt, "The Complete Reference **C++**" , Tata Mc Graw-Hill Pub.Co.Ltd., Fourth edition, 2003.

REFERENCE BOOKS

1. Stanley B.Lippman Josee Lajoie, Barbara E.Moo, " C++ Primer", 4th Edition, Addison Wesley, 2005.
2. Ira Pohl, "Object Oriented Programming using C++", Second Edition, Pearson Education, 2008.
3. VenuGopal K.R., Rajkumar, RaviShankar. T, "Mastering C++ "Tata McGraw Hill Publishing Company Ltd.,1999.

12C204 - MATERIALS TECHNOLOGY

L	T	P	C
3	0	0	3

Prerequisites: *Applied Physics*

COURSE OBJECTIVES: To understand the properties of basic and advanced materials.

COURSE OUTCOMES:

CO1: *To make students familiar in the properties of conducting, semiconducting, magnetic and dielectric materials.*

CO2: *To acquire knowledge in thermal properties of materials used in construction and non-destructive techniques.*

CO3: *Knowledge of shape memory alloys and their applications*.

UNIT-I CONDUCTING MATERIALS (09)

Introduction to Conductors – classical free electron theory of metals – Draw backs of classical theory – quantum theory- Electrical and Thermal conductivity of Metals – Derivation for Wiedemann – Franz law – Lorentz number — Fermi distribution function - effect of temperature – density of energy states – calculation of Fermi energy- carrier concentration in metals

UNIT-II SEMICONDUCTING MATERIALS (09)

Introduction – Properties – elemental and compound semiconductors - Intrinsic and extrinsic semiconductors – properties - Carrier concentration in intrinsic Semiconductor - variation of Fermi level with temperature and carrier concentration - Electrical Conductivity – band gap determination - extrinsic semiconductors - Carrier concentration in P- type and Ntype semiconductors – variation of Fermi level with temperature and impurity concentration.

UNIT-III SUPERCONDUCTING MATERIALS (09)

Introduction – Superconducting state – magnetic properties of superconductors – Current flow and magnetic fields in superconductors – High current, High field superconductors - Types of superconductors - BCS theory of superconductivity (qualitative) – characteristics of superconductors - Applications of superconductors- High $T_C$superconductors - SQUID, Cryotron, Magnetic

UNIT-IV DIELECTRIC MATERIALS (09)

Introduction to dielectric materials – polar and nonpolar molecules-Various polarization mechanisms in dielectrics -electronic, ionic, orientational and space charge polarization – frequency and temperature dependent of polarization –internal field – Claussius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – Applications of dielectric materials – Ferro electricity and applications.

UNIT-V MODERN ENGINEERING MATERIALS (09)

Metallic glasses- preparation of metallic glasses- properties – applications of the metallic glasses - Shape Memory Alloys (SMA) - Characteristics, properties of NiTi alloy - applications of the Shape memory alloys - advantages and disadvantages of SMA – Nanomaterials-synthesis –chemical vapour deposition – Sol Gels – ball Milling – properties of nanoparticles and applications of nanoparticles - Carbon Nanotubes(CNT)– structure–properties-applications of the CNTs

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 hrs

TEXT BOOKS

1. Ganesan S. Iyandurai N, “Engineering Physics II”, Gems Publishers, Coimbatore 2009.

REFERENCE BOOKS

1. Jayakumar S, “Materials Science”, RK Publishers, Coimbatore, 2004
2. William D Callister Jr, “Materials Science and Engineering – An Introduction”, John Wiley and Sons Inc.,6th edition, New York, 2003
3. James F Shackelford, S “Introduction to materials Science for Engineers”, 6th Macmillan Publishing Company,New York, 2004

12C206 - ENGINEERING GEOLOGY

L	T	P	C
3	0	0	3

Prerequisites: Nil

COURSE OBJECTIVES:

- *At the end of this course the students will be able to understand the importance of geological knowledge such as earth, earthquake, volcanism and to apply this knowledge in projects such as dams, tunnels, bridges, roads, airport and harbor as well as to choose types of foundations*

COURSE OUTCOMES:

CO1: *The student shall be able to understand about geological formations, classification and morphology of rocks.*

CO2: *The importance of the study of geology for Civil Engineers with regard to founding structures like dams, bridges, buildings, etc.*

CO3: *The student shall also be able to appreciate the importance of geological formation in causing earthquakes and landslides.*

UNIT-I GENERAL GEOLOGY (09)

Interrelationship between Geology and civil engineering – Branches of Geology – Earth Structure and composition –Geological processes – Weathering – work of rivers, sea, wind and their Engineering significance- Earthquakes –Earthquake Zones in India - Volcanoes – Ground water – Origin, Occurrence, Properties of rock – Geological work of ground water – Importance in Civil Engineering.

UNIT-II MINERALOGY (09)

Elementary knowledge on symmetry elements of important Crystallographic systems – Physical properties of minerals – Study of the following rock forming minerals – Quartz family, Felspar family, Augite, Hornblende, Biotite , Muscovite, Calcite, Garnet. Ore minerals - Haematite, Magnetite, Bauxite, Graphite, Magnesite – Clay minerals – Properties and Engineering significance.

UNIT-III PETROLOGY (09)

Formation and Classification of rocks and their distinctive properties – Description, Occurrence, Engineering properties and Distribution of the following rocks – Igneous rocks – Granite, Syenite, Diorite, Gabbro, Pegmatite, Dolerite and Basalt. Sedimentary rocks- Sandstone, Limestone, shale, Conglomerate, and Breccia – Metamorphic rocks – Quartzite, Marble, Slate, phyllite, Gneiss and schist.

UNIT-IV STRUCTURAL GEOLOGY (09)

Attitude of beds Dip and Strike - Uses of Clinometer compass – Outcrops – Geological maps – their uses – Structural features – Folds, Faults, Unconformities and Joints – their significance on engineering constructions.

UNIT-V INTRODUCTION TO GEOLOGICAL INVESTIGATIONS (09)

Geophysical investigations – Seismic and electrical resistivity methods – Aerial Photo and satellite imageries- Interpretation of remote sensing data-Exploration for ground water – Geological investigations pertaining to Dam and Reservoir, Tunnels and Road cuttings – Landslides – causes and prevention – Sea erosion and coastal protection

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 hrs

TEXT BOOKS

1. Parbin Singh, Engineering and General Geology, Katson Publication House. 2004
2. Bangar.K.M, Principles of Engineering Geology, Standard Publishers& Distributors, 1705-B,Naisarak, Delhi-1995.

REFERENCE BOOKS

1. Legget, “Geology and Engineering”, McGraw Hill Book company, 1998 Blyth, “Geology for Engineers”,ELBS 1995.

12C207 - WORKSHOP

L	T	P	C
0	0	3	2

Prerequisites: Nil

COURSE OBJECTIVES:

- *To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.*

COURSE OUTCOMES:

CO1: *Get knowledge on safety aspects of electrical wiring and electrical devices.*
CO2: *Understands the importance of plumbing, carpentry and sheet metal.*
CO3: *Understands the welding procedure for suitable applications*

List of Experiments:

1. Introduction to use of tools and equipment's in Carpentry, Welding, Foundry and Sheet metal

2. Safety aspects in Welding, Carpentry and Foundry

3. Half lap Joint and Dovetail Joint in Carpentry

4. Welding of Lap joint, Butt joint and T-joint

5. Preparation of Sand mould for cube, conical bush, pipes and V pulley

6. Fabrication of parts like tray, frustum of cone and square box in sheet metal.

TOTAL: 45hrs

12C208 - CHEMISTRY LABORATORY

L	T	P	C
0	0	3	2

Prerequisites: Engineering Chemistry

COURSE OBJECTIVES:

- *To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis*

COURSE OUTCOMES:

CO1: *Gain knowledge on basic concepts and its applications of chemical analysis.*
CO2: *Understand chemical and instrumental methods.*
CO3: *Develop skills in estimation of a given sample by chemical and instrumental methods.*

List of Experiments:

1. Estimation of hardness by EDTA method

2. Estimation of chloride by argentometric method

3. Determination Dissolved oxygen by Winkler's method

4. Estimation of available chlorine in bleaching powder

5. Estimation of copper and zinc in brass sample

6. Estimation of manganese in steel sample.

7. Surface area of activated carbon by adsorption technique using acetic acid

8. Estimation of calcium and magnesium in magnesite ore

9. Estimation of manganese in pyrolusite ore

10. Conduct metric titration of mixture of strong and weak acids using strong base

11. Potentiometric titration (Ferrous iron versus potassium dichromate)

12. Estimation of sodium or potassium using flame photometer

13. Estimation nickel using spectrophotometer

14. Estimation of iron by spectrophotometer. (Any twelve experiments only)

TOTAL: 45hrs

REFERENCE BOOKS

1. A.O.Thomas, **Practical Chemistry**, 6th Edn, Scientific book centre, Kannanore (1995)
2. Arthur I. Vogel, **Quantitative Inorganic Analysis**, 3rd Edn, ELBS (1970)

12C209 - C++ PROGRAMMING LABORATORY

L	T	P	C
0	0	3	2

Prerequisites: Programming in C, C Program Lab

COURSE OBJECTIVES:

The student should be made to:

- *Be familiar with programming in C++.*
- *Learn to use Arrays, strings, functions, structures, pointers and graphics.*

COURSE OUTCOMES:

CO1: *To know the basic concepts of C++ program.*
CO2: *Solving mathematical problems using C++ program.*

LIST OF EXPERIMENTS

1. Classes and Objects
2. Arrays and Structures
3. Functions
4. Inheritance
5. Operator Overloading
6. Virtual Functions
7. Pointers
8. Templates
9. Files and Streams
10. Exception Handling
11. Graphics
12. Mini Project

TOTAL: 45hrs

12C3Z1 - ENGINEERING MATHEMATICS – III

L	T	P	C
3	1	0	4

Prerequisites: *Engineering Mathematics-I, Engineering Mathematics-II*

COURSE OBJECTIVES: *Upon completion of this course the student will be familiar with:*

- *Understand the partial differential equation concepts.*
- *Form the Fourier series and perform Harmonic Analysis.*
- *Understand the concepts of finite and infinite Fourier transformations.*
- *Understand the method of separating variables and introduce Fourier series analysis to solve the boundary value problems.*
- *Gain the knowledge to find solutions for difference equation using z-transformation.*

COURSE OUTCOMES: *At the end of the course, students will be able to*

CO1: Form and solve first & higher order partial differential equation, Lagrange's equations.(Usage)

CO2: Determine the behavior of the Fourier series at points of discontinuity using Dirichlet's boundary condition, use half range sine and cosine series, Parseval's Identity and perform harmonic Analysis of a discrete function.(Usage)

CO3: *Solve problems using Fourier integral theorem and convolution theorem.(Usage)*

CO4: *Solve one dimensional wave and heat equation separation of variables method and Fourier series.(Usage)*

CO5: Develop Z-transform techniques for discrete time systems.(Usage)

UNIT I: PARTIAL DIFFERENTIAL EQUATIONS (09)

Formation of PDE by elimination arbitrary constants and functions – Solutions of standard first order partial differential equations – Lagrange's equation – Linear partial differential equations of second and higher order with constant coefficients-homogeneous and non homogeneous types.

UNIT II: FOURIER SERIES (09)

Dirichlet's Conditions – General Fourier Series –Odd and even functions- Half range Sine and Cosine series – Parseval's Identity – Harmonic Analysis

UNIT III: FOURIER TRANSFORMS (09)

Statement of Fourier integral Theorem – Fourier transform pair– Fourier Sine and Cosine Transforms – Properties– Transforms of Simple functions- Convolution Theorem –Parseval's Identity-Finite Fourier transforms

UNIT IV: BOUNDARY VALUE PROBLEMS (09)

Method of separation of variables – One dimensional wave equation – One dimensional heat equation – Unsteady and Steady state conditions –Fourier series solution

UNIT V: Z TRANSFORMS **(09)**

Z-transforms - Elementary properties-Inverse Z-transform - Initial and Final value theorems - Convolution theorem -Formation of difference equations - Solution to difference equations of second order with constant coefficients using Z -transform.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60hrs

TEXT BOOK

1. Veerarajan.T., "Transforms and partial Differential equations", Tata McGraw Hill Publishing Co., New Delhi.2010.

REFERENCE BOOKS

1. N.P.Bali., Dr. Manish Goyal., "Transforms and partial Differential equations", University science Press, New Delhi, 2010.
2. Dr.Kandasamy.P., Dr.Thilagavathy.K and Dr.Gunavathy.K., "Engineering Mathematics" for Third Semester B.E/B.Tech, S. Chand & Co., Ram Nagar, New Delhi, 2010.
3. B.V.Ramana., "Higher Engineering Mathematics" Tata McGraw Hill Publishing Co., New Delhi, 2007.
4. Grewal B.S., "Higher Engineering Mathematics" (40th Edition) Khanna Publishers, New Delhi., 2007.
5. Glyn James, "Advanced Modern Engineering Mathematics" (8th Edition) Wiley India, New Delhi., 2007.

12C302 - ENVIRONMENTAL SCIENCE AND ENGINEERING

L	T	P	C
3	0	0	3

Prerequisites: Nil

COURSE OBJECTIVES:

- *To gain knowledge on the importance of environmental education andecosystem.*
- *To acquire knowledge about environmental pollution- sources, effects and control measures of environmental pollution.*
- *To acquire knowledge with respect to biodiversity, its threats and its conservation and appreciate the concept of interdependence.*
- *To be aware of the national and international concern for environment for protecting the environment*

COURSE OUTCOMES:

CO1: The student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these Resources.

CO2: The role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity.

CO3: The role of government and non-government organization in environment managements.

UNIT-1 ENVIRONMENTAL RESOURCES (09)

Earth structure, Internal and external earth processes, plate tectonics, erosion, weathering, deforestation, anomalous properties of water, hydrological cycle, effect of modern agriculture, fertilizers, pesticides, eutrophication, biomagnifications, land degradation, minerals, rocks, rock cycle, mining, types of mining, desertification, soil erosion, methods of conservation of soil erosion, renewable energy resources, wind, solar, geothermal, tidal, OTEC.

UNIT-2 ECO SYSTEM AND BIODIVERSITY (09)

Weather and climate, ocean current, upwelling, EL Nino, Ecology, ecosystem, biomes, physical and chemical components of ecosystem, biological components of ecosystem, forest ecosystem, desert ecosystem and pond ecosystem, Energy flow in ecosystem, nitrogen cycle, carbon dioxide cycle, phosphorous cycle, food pyramid, Ecological succession, types, biodiversity, need for biodiversity, values of biodiversity, hot spots of biodiversity, endangered and endemic species, conservation of biodiversity insitu-exitu conservation.

UNIT-3 ENVIRONMENTAL POLLUTION (09)

Air pollution, classification of air pollutants gaseous particulars, sources effects and control of gaseous pollutants SO2,NO2, H2S, CO, CO2 and particulates, control methods, cyclone separator, electrostatic precipitator, catalytic combustion water pollution-classification of water pollutants, inorganic pollutants, sources, effects and control of heavy metals, organic pollutants, oxygen demanding wastes, aerobic and anaerobic decomposition, soil pollution, Noise pollution, sources, effects, decibel scale.

UNIT-4 ENVIRONMENTAL THREATS (09)

Acid rain, greenhouse effect, global warming, disaster management, flood, drought, earthquake, tsunami, threats to biodiversity, destruction of habitat, habit fragmentation- hunting, over exploitation – man- wildlife conflicts, The IUCN red list categories, status of threatened species.

UNIT-5 SOCIAL ISSUES AND ENVIRONMENT (09)

Sustainable development- sustainable technologies, need for energy and water conservation, rain water harvesting, water shed management, waste land reclamation, Air act, Wild life protection act, forest conservation act, population growth, exponential and logistic growth, variation in population among nations,

population policy, women and child welfare programs, Role of information technology in human and health, HIV/AIDS, effects and preventive measures.

LECTURE: 45TOTAL: 45hrs

TEXT BOOKS

1. Sharma J.P**., 'Environmental Studies'**, 3rd Edn, University Science Press, New Delhi (2009)
2. Anubha Kaushik and C.P.Kaushik, **'Environmental Science and Engineering'**, 3rd Edn New age InternationalPublishers, New Delhi (2008)

REFERENCE BOOKS

1. R.K.Trivedi, **'Hand book of Environmental laws**, Rules, Guidelines, Compliances and Standards', Vol.I &II,Environ Media.(2006)
2. G.Tyler Miller,JR**, 'Environmental Science'**, Tenth Edition, Thomson BROOKS/COLE (2004)
3. Gilbert M.Masters**, 'Introduction to Environmental Engineering and Science'**, 2nd Edition Pearson Education(2004).

12C303 - MECHANICS OF SOLIDS – I

L	T	P	C
3	1	0	4

Prerequisites: *Engineering Mechanics*

COURSE OBJECTIVES:

- *To understand the behaviour and mechanical properties of materials.*
- *To determine the shear force, bending moment in a beam.*
- *To determine the stresses, strains and its distribution in a material.*
- *To analyze trusses for member forces and to solve complex stress problems.*

COURSE OUTCOMES:

CO1: *The student will understand the concept of bending and shear stresses and its distribution*
CO2: *The student will be able to determine the shear force and bending moment in a beam subjected to various types of loading.*
CO3: *The student will be able to solve problems involving torsion and complex stresses*
CO4: *The student will be able to ascertain the dimensions and the suitability of material to resist the forces.*

UNIT I - STRESS AND STRAIN (09)

Stress and Strain at a point – Tension, Compression, Shear Stresses – Hooke's law –Relationship among Elastic constants – Stress Strain Diagram for Mild Steel, TOR Steel, Concrete – Ultimate Stress – Yield Stress – Factor of Safety - Thermal Stresses – Thin Cylinders - Strain Energy due to Axial Force – Resilience – Stresses due to Impact and Suddenly Applied Load - Compound Bars.

UNIT II - SHEAR FORCE AND BENDING MOMENT DIAGRAMS (09)

Beams and Bending – Types of loads, supports - Shear Force and Bending Moment Diagrams for Cantilever, Simply Supported and Overhanging Beams with Concentrated, Uniformly Distributed and Uniformly Varying Loads –Relationship between Rate of Loading, Shear Force, Bending Moment – Point of Contra Flexure.

UNIT III - SHEAR AND BENDING STRESSES (09)

Theory of Simple Bending – Analysis of Beams for Stresses - Stress Distribution at a Cross Section due to Bending Moment and Shear Force for Cantilever, Simply Supported and Overhanging Beams with different loading conditions - Flitched Beams – Combined Direct and Bending Stresses – Condition for No Tension in a section – Strain Energy due to Flexure, Transverse Shear – Shear Stress Distribution

UNIT IV – TORSION (09)

Torsion of Circular and Hollow Shafts –Elastic Theory of Torsion - Stresses and Deflection in Circular Solid and Hollow Shafts – Stepped Composite Shafts - Combined Bending Moment and Torsion on Shafts – Strain Energy due to Torsion –Modulus of Rupture - Power Transmitted to a Shaft – Shafts in Series and Parallel - Closed and Open Coiled helical Springs – Leaf Springs – Springs in Series and Parallel – Design of Buffer Springs.

UNIT V - COMPLEX STRESSES (09)

2 D State of Stress -2D Normal and Shear Stresses on any plane – 2D Strain – Principal Stresses and Principal Planes– Principal Strains and Direction - Graphical Method.

PLANE TRUSSES: Analysis of Plane Trusses – Method of Joints – Method of Sections.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60hrs

TEXT BOOKS

1. Sadhu Singh, “Strength of Materials”, Khanna publishers, New Delhi, 2000
2. Vaidyanathan.R, Perumal.P and Lingeswari.S, “Mechanics of Solidsand Structures”Volume I, ScitechPublications Pvt Ltd, Chennai, 2006.
3. Rajput.R.K, “Strength of Materials”, S. Chand & Co., New Delhi, 2007.

REFERENCE BOOKS

1. Prasad.I.B, “Strength of Materials”, Khanna Publishers, New Delhi, 1998.
2. James .M. Gere “Mechanics of Materials”, Thomson India, Brooks/Cole, 2006.
3. Robert L.Mott,”Applied Strength of Materials”, PHI Learning Pvt Ltd.,” New Delhi,2009
4. Timoshenko.S.B and Gere.J.M, “Mechanics of Materials”, Van Nos Reinbhold, New Delhi 1995.
5. Jhunarkar.S.B. and Shah.H.J, “Mechanics of Structures”, Vol. I, Charotar Publishing House,New Delhi,1997.
6. Kazimi, “Solid Mechanics”, Tata McGraw Hill, New Delhi, 1998.
7. Punmia B C, Jain Ashok and Jain Arun. “Strength of Materials and Theory of structures” – Vol.1, LaxmiPublications Pvt. Ltd., New Delhi,2000
8. Bansal R K “Strength of Materials’, Laxmi Publications, New Delhi, 2007.

12C304 - MECHANICS OF FLUIDS

Prerequisites: *Engineering Mechanics*

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- *The student will be able to define the properties of fluid and behaviour of fluid at rest and motion and boundary layer*

COURSE OUTCOMES:

CO1: *The student is able to define properties of fluid, fluid statics and Dynamics*
CO2: *The student is able to solve problems using various principles of fluid statics and dynamics*
CO3: *The student is able to apply laminar flow and boundary layer concept in real situations of fluid flow.*

UNIT - I BASIC CONCEPTS AND FLUID STATICS (10)

Dimensions and Units - Fluid properties - Density, Specific gravity, viscosity, surface tension, capillarity and elasticity, compressibility, vapour pressure -Continuum Concept - Control Volume Fluid statics - Pascal's Law - pressure measurement piezometer and manometers. – Hydrostatic forces on plane and curved surfaces- Stability of Floating Bodies- Buoyancy – metacentre and metacentric height - simple problems.

UNIT II –PRINCIPLES OF MASS (08)

Basic principles of fluid flow - Types of flow - types flow line – continuity equation - one dimensional and three dimensional - velocity potential and stream function - Free and Forced vortex flow

UNIT-III – PRINCIPLE OF ENERGY (08)

Energy and its forms, Energy equation – Euler's and Bernoulli's equation – Applications venturimeter - orifice meter - pitot tube- Flow over notches and weirs – Other Flow measuring devices

UNIT IV - FLOW THROUGH CONDUITS (09)

Laminar flow through circular pipes and between parallel plates - Hagen Poisullie equation - turbulent flow – Darcy Weisbach formula - Moody diagram – Impulse Momentum principle.

UNIT V - BOUNDARY LAYER AND FLOW AROUND IMMERSED BODIES (10)

Boundary layer - Definition - Boundary layer on a flat plate - Thickness and classification - Displacement, energy and momentum thickness - Boundary layer separation and control – Flow around submerged objects - Drag and lift coefficients – Lift on cylinders - Streamlined and bluff bodies.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 hrs

TEXT BOOKS

1. R.K.Rajput., "A text book of Fluid Mechanics", S.Chand and Company, NewDelhi, 2007.
2. Modi P.N and Seth S.M, "Hydraulics and Fluid Mechanics", Including Hydraulic Machines, Standard BookHouse, Newdelhi, 2002.
3. S.Ramamurtham and R.Narayanan , "Hydraulics and Fluid Mechanics and Fluid Mechines" Dhanpat Rai Publishing Co (P) Ltd, NewDelhi, 2000.

REFERENCE BOOKS

1. Streeter, Victor L., Wylie, E.Benjamin , "Fluid Mechanics", McGraw - Hill., 1998.
2. Kumar.K.L., "Engineering FluidMechanics", Eurasia Publishing Houses (P) Ltd., NewDelhi, 2000.
3. Natarajan M.K, "Principles of Fluid Mechanics", Anuradha Agencies, Vidayal Karuppur, Kumbakonam, 1995.

12C305 - SURVEYING – I

Prerequisites: Nil

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *To understand basic principle and concepts of different surveying methods.*
- *To study the different surveying equipments in the field of civil engineering.*
- *To enhance the ability to calculate surveying quantities.*
- *To enable the suitability of surveying instruments and method to a given problem.*

COURSE OUTCOMES:

CO1: *The student will be able to make plan and maps of a given site.*
CO2: The students will be able to calculate various surveying quantities.
CO3: The students will be able to apply the suitable surveying methods to various problems

UNIT I - INTRODUCTION AND CHAIN SURVEYING (09)

Definition and Principles of Surveying – Classification – Field and Office work – Scales – Conventional Signs. Chain Survey Instruments – Ranging and Chaining – Reciprocal Ranging – Obstacles in Chaining – Setting out Perpendiculars – Well conditioned Triangles – Traversing – Plotting – Enlarging and reducing Maps

UNIT II - COMPASS SURVEYING (09)

Prismatic Compass – Surveyor's Compass – Bearing – Systems and Conversions – Local Attraction. Magnetic Declination – Dip – Traversing - Plotting – Adjustment of Error

UNIT III - PLANE TABLE SURVEYING (09)

Instruments and Accessories – Merits and Demerits – Methods – Radiation Intersection, Resection, Three point problem – Tracing Paper Method – Bessel's Method – Trial and Error Method – Two Point Problem – Traversing

UNIT IV - LEVELLING AND APPLICATIONS (09)

Levelling Instruments – Spirit Level – Sensitiveness – Bench Marks – Temporary and Permanent Adjustments – Differential , Fly ,Check ,Profile and Block Levelling – Booking – Reduction – Curvature and Refraction – Reciprocal Levelling –Longitudinal and Cross Sections – Plotting – Calculation of Areas and Volumes – Contouring – Methods – Characteristics and Uses of Contours – Plotting – Earthwork volume – Capacity of Reservoir.

UNIT - V THEODOLITE (09)

Theodolite – Vernier – Micrometer –Microptic , Total Station and LASER Description and Uses – Temporary and Permanent Adjustment of Vernier Transit – Measurement of Horizontal Angles by Repetition and Reiteration – Vertical Angles – Heights and Distances – Traversing – Closing Error and Distribution – Omitted Measurements

LECTURE : 45 TOTAL : 45 hrs

TEXT BOOKS

1. Kanetkar .T.P, and Kulkarni .S.V, "Surveying and Levelling", Vol. I & II, Pune Vidyarthi Griha Prakashan ,2004.
2. Duggal S.K , "Surveying" ,Vol. I &II , Tata McGraw-Hill, Publishing Company, 2004.

REFERENCE BOOKS

1. Punmia B.C, "Surveying", Vol. I &II , Laxmi Publication , 2007
2. Bannister. A &Reynolds.S , "Surveying" , ELBS , 1992

12C306 - WATER SUPPLY ENGINEERING

Prerequisites: Nil

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *To make the students conversant with sources and its demand of water*
- *To understand the basic characteristics of water and its determination*
- *To expose the students to understand the design of water supply lines*
- *To provide adequate knowledge about the water treatment processes and its design*
- *To have adequate knowledge on operation and maintenance of water supply*

COURSE OUTCOMES:

CO1: *To make the students conversant with principles of water supply and characteristics of water.*
CO2: *The Students will get idea on the various treatment processes.*
CO3: *The student shall be able to understand the water distribution system.*

UNIT I - PUBLIC WATER SUPPLY SCHEMES AND QUANTITY OF WATER (09)

Necessity and objectives of public water supply schemes – planning and financing – treatment of water. Quantity of water – water requirements – continuous and intermittent supply– rate of demand – variations in rate of demand –effect on design – design periods and capacities of different components – population growth and forecast –estimating the quantity of water required.

UNIT II - HYDROLOGICAL CONCEPTS AND SOURCES OF WATER (09)

Hydrological concepts – hydrological cycle – precipitation – types of precipitation – rain fall measurements – rainfall indices - estimation of surface runoff. Sources of water – Types of sources - lakes, ponds, rivers – infiltration galleries - storage reservoirs - storage capacity by analytical and mass curve methods - dam height and cost -types of wells - tests for yield of a well - sanitary protection of wells.

UNIT III - QUALITY OF WATER AND TRANSPORTATION OF WATER (09)

Quality of water - portable water, pure water, mineral water, etc. - Impurities in water - sampling - analysis of water - water borne diseases - quality standards of water. Transportation of water - types of conduits - Hydraulics of pipe flow - design - materials of pressure pipes - pipe corrosion - Theories, effect and prevention- Laying and testing of pipe lines. Pumps - Types of pumps - selection of pumps - pumping stations.

UNIT IV - PURIFICATION OF WATER (09)

Treatment of water - working principles, Purpose and Design of all the unit process of water treatment - Screening - plain Sedimentation - coagulation Sedimentation - filtration - Disinfection - Water softening - Removal of colour, Odour and Tastes - Removal of Iron and manganese - Fluoridation and Defluoridation.

UNIT V - DISTRIBUTION OF WATER AND IMPACT OF WATER SUPPLY SCHEMES (09)

Intakes - types - intake tower - Distribution of water - requirements of good distribution system - method of distribution system - layouts of distribution system - pressure in the distribution system - Pipes in series and pipes in parallel - Equivalent pipe method - Distribution Reservoirs – purpose - types - locations and height - design aspects - preventive methods to reduce wastage of water - Impact of water supply schemes.

LECTURE: 45 TOTAL: 60 hrs

TEXT BOOKS

1. Garg. S. K., "Water Supply Engineering", Khannah Publishers, Delhi, September 2001.
2. Mark J. Hammer, Mark J. Hammer Jr, "Water and Waste Water Technology", Prentice hall of India 2008.

REFERENCE BOOKS

1. Birdie.G.S., "Water Supply and Sanitary Engineering", Dhanpat Rai and sons, 1985.
2. Fair. G. M.., Geyer. J. C., "Water Supply and Waste Water disposal", John Wiley & Sons,1954.
3. Babbit. H. E., and Donald. J. J., "Water Supply Engineering", McGraw Hill book Co, 1984
4. Steel E. W. et.al, "Water Supply Engineering", McGraw Hill International Book Co,1984
5 .Duggal. K.N., " Elememts of public Health Engineering", S.Chand and Co,1985. Jain Publishers, CPHEECO MANUAL

12C307 - SURVEY PRACTICAL - I

L	T	P	C
0	0	3	2

Prerequisites: *Surveying – I*

COURSE OBJECTIVES:

- *To enhance the ability to measure different surveying measurements.*
- *To enable the handling of various surveying equipments.*
- *To apply suitable surveying methods and instruments for a given problem.*

COURSE OUTCOMES:

CO1: *The student will be able to handle the surveying instruments like chain, compass, plane table and Dumpy level.*
CO2: *The Student will be able to do measurements precisely using surveying instruments.*
CO3: *The student will be able to conduct field survey and collect data.*

LIST OF EXPERIMENTS

1. Chain Surveying (Ranging and Chaining)
2. Compass Traversing
3. Distance between two inaccessible points using Compass
4. Plane table surveying - Intersection method
5. Plane table surveying - Three point and Two Point Problem
6. Levelling –Height of Collimation, Rise and Fall Method
7. Fly Levelling
8. Contouring
9. Setting out Building and Foundation Marking

TOTAL: 45hrs

12C308 - STRENGTH OF MATERIALS LABORATORY

L	T	P	C
0	0	3	2

Prerequisites : *Engineering Mechanics, Mechanics of Solids – I*

COURSE OBJECTIVES:

- *To find the strength properties of different construction materials like steel, concrete, brick and timber*
- *To evaluate stiffness properties of springs and to find the hardness properties of various metals.*

COURSE OUTCOMES:

CO1: *The experimental works involved in this laboratory make the student to determine the properties of different structural elements.*

CO2: *The student should be able to obtain the strength of the material and stiffness properties of structural elements.*

LIST OF EXPERIMENTS

1. Tension test on Mild steel rod
2. Tension test on tor steel rod
3. Torsion test on MS bar
4. Tension and compression test on springs
5. Compression test on bricks and concrete cubes
6. Water absorption test on bricks
7. Brinell and Rockwell Hardness test
8. Compression and bending test on wood specimens
9. Deflection test on aluminium simply supported beams
10. Deflection test on MS cantilever beams
11. Bending test on rolled steel joist
12. Test on miniature specimens
13. Flexure test on tiles
14. Bend test
15. Charpy and Izod Impact Test
16. Double shear test

TOTAL: 45hrs

12C401 - NUMERICAL METHODS

	L	T	P	C
Prerequisites : *Engineering Mathematics-I, & Engineering Mathematics - III*	**3**	**1**	**0**	**4**

COURSE OBJECTIVES: Upon completion of this course the student will be familiar with:

- *Understand the solutions of algebraic, transcendental, exponential and logarithmic equations.*
- *Gain the knowledge of interpolation with equal and unequal intervals.*
- *Evaluation of numerical derivatives and numerical integration.*
- *Acquire the knowledge of solving the ordinary differential equations numerically.*
- *Acquire the knowledge of solving the partial differential equations numerically.*

COURSE OUTCOMES: At the end of the course, students will be able to

CO1: *Solve a set of algebraic equations representing steady state models formed in Engineering Problems.(Usage)*

CO2: *Fit smooth curves for the discrete data connected to each other or to use interpolation methods over these data tables. (Usage)*

CO3: *Find the trend information from discrete data set through numerical differentiation and summary information through numerical integration. (Usage)*

CO4: *Predict the system dynamic behavior through solution of ODEs modeling the system. (Usage)*

CO5: *Solve PDE models representing spatial and temporal variations in physical systems through numerical methods. (Usage)*

UNIT I - SOLUTIONS OF EQUATIONS AND EIGEN VALUE PROBLEMS (09)

Iterative method – Newton – Raphson Method for single variable and for simultaneous equations with two variables – Solutions of Linear system by Gauss elimination, Gauss – Jordan, Crout's and Gauss Seidel Methods –Relaxation Method – Eigen value of a Matrix by Power Method**.**

UNIT II -INTERPOLATION (09)

Operators – Relation between the operators – Newton's divided difference formula – Lagrange's and Hermite'sPolynomials – Newton Forward and Backward difference formulae – Stirlings and Bessel's Central differenceformulae**.**

UNIT III -NUMERICAL DIFFERENTIATION AND INTEGRATION (09)

Numerical differentiation with Interpolation Polynomials – Numerical Integration by Trapezoidal and Simpson's(Both 1/3rdand 3/8th) rules – two and three point Gaussian quadrature formula – Double integrals using Trapezoidal and Simpson's Rules – Difference equation.

UNIT IV -INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS (09)

Single step methods – Taylor series , Euler and Modified Euler, Runge – Kutta method of order four for first order differential equations – Multistep methods – Milne and Adam – Bashforth predictor and Corrector methods.

UNIT V -BOUNDARY VALUE PROBLEMS FOR ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS (09)

Finite difference solutions for the second order ordinary differential equations – Finite difference solutions for one dimensional Heat equation (Both Implicit and Explicit) – One dimensional Wave equation -Two dimensional Laplace and Poisson equations.

LECTURE : 45 TUTORIAL : 15 TOTAL : 60 hrs

TEXT BOOKS

1. Dr.Kandasamy. P, Dr.Thilagavathy . K, Dr. Gunavathy .K., “Numerical methods”, S. Chand and Co., NewDelhi, 2010.

REFERENCE BOOKS

1. Veerarajan. T and Ramachandran.T., “Numerical Methods with Programming in C”, Tata Mc.Graw HillPublishers, New Delhi, 2007.
2. Balagurusamy .E. “Numerical Methods”, Tata McGraw Hill Publishers, New Delhi, 1999, reprint 2007.
3. Grewal. B. S. and Grewal. J.S., “Numerical Methods in Engineering and Science”, (Sixth Edition), KhannaPublishers, New Delhi, 2004.
4. Gerald.C.F. and Wheatley. P.O., “Applied Numerical Analysis”, (Sixth Edition), Pearson Education,Asia,New Delhi, 2006.
5. Sankar Rao K, “Numerical Methods for Scientists and Engineers”, (Third edition), Prentice Hall of India,New Delhi , 2007.
6. Dr.Manish Goyal , “Statistics and Numerical methods”, University Science Press, New Delhi, 2010.
7. Dr.J.S.Chitode, “Numerical Methods “, Technical Publications, Pune, 2010.

12C402 - MECHANICS OF SOLIDS – II

Prerequisites: *Engineering Mechanics, Mechanics of Solids - I*

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- *To study the different methods of finding deflection of beam*
- *To analyse the Indeterminate beams and beam subject to unsymmetrical bending*
- *To understand the theory of elastic failures*
- *To analyze the column with different end conditions and stress in thick cylinders*

COURSE OUTCOMES:

CO1:*To impart knowledge on behaviour of structural elements subjected to transverse load.*
CO2: *The students will be able to analyse the complex problems on bending and twisting.*
CO3: *To learn about theories of failure so that the students will be able to design/modify a system or component*

UNIT I – DEFLECTION OF BEAMS (09)

Deflection Curve – Differential Equation – Double Integration Method – Macaulay's Method – Area Moment Method (Stepped Beams)– Conjugate Beam Method – Strain Energy and Dummy Unit Load Approaches – Castigliano's First and Second Theorems .

UNIT II – STATICALLY INDETERMINATE BEAMS (09)

Propped Cantilever Beams – Fixed Beams – Continuous Beams – Theorem of Three Moments – Calculation of reactions, Bending Moments and Shear Force – Shear Force and Bending Moment Diagrams (for all Types of Loadings,Couple).

UNIT III – THEORY OF COLUMNS (09)

Members Subjected to Axial Load – eccentric load – Slenderness Ratio – End Conditions – Buckling Load for Columns- Euler's Theory – Assumptions and Limitations – Rankine-Gordon Formula – Empirical Formula – Straight Line Formula – Columns Subjected to Eccentric Loading .

UNIT IV – UNSYMMETRICAL BENDING AND SHEAR CENTRE (09)

Stresses due to Unsymmetrical Bending of Beams for Symmetrical Sections – Shear Centre - Definition – Shear Centre for Sections Symmetrical about One Axis – Moment of Inertia – Product of Inertia – Principal Area and Principal Moment of Inertia – Deflection of Beams due to Unsymmetrical Bending.

UNIT V – THICK CYLINDERS (09)

Lame's Equation – Hoop Stress and Radial Stress Distribution – Compound Cylinders – Wire Wound Cylinders – Shrink Fit.

THEORIES OF ELASTIC FAILURE: Theories of Elastic Failure – Factor of Safety – Graphical Representation of Theories for Two Dimensional Stress System.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60hrs

TEXT BOOKS

1. Sadhu Singh, "Strength of Materials", Khanna publishers, New Delhi, 2000
2. Vaidyanathan.R, Perumal.P and Lingeswari.S "Mechanics of Solids and Structures"Volume I, Scitech Publications Pvt Ltd, Chennai, 2006.
3. Rajput.R.K, "Strength of Materials", S. Chand & Co., New Delhi, 2007.

REFERENCE BOOKS

1. Prasad.I.B, “Strength of Materials”, Khanna Publishers, New Delhi, 1998.
2. James .M. Gere “Mechanics of Materials”, Thomson India, Brooks/Cole, 2006.
3. Robert L.Mott,”Applied Strength of Materials”, PHI Learning Pvt Ltd.,” New Delhi,2009
4. Timoshenko.S.B and Gere.J.M, “Mechanics of Materials”, Van Nos Reinbhold, New Delhi, 1995.
5. Kazimi, “Solid Mechanics”, Tata McGraw Hill, 1998.
6. Punmia B C, Jain Ashok and Jain Arun. “Strength of Materials and Theory of Structures” – Vol.1, Laxmi Publications Pvt. Ltd., New Delhi, 2000.
7. Bansal R K “Strength of materials”, Laxmi Publications, New Delhi, 2007.
8. Khurmi, R.S, “Strength of Materials”, 23rd Edition,S.Chand& Co, 2008

12C403 - APPLIED HYDRAULICS AND FLUID MACHINES

L	T	P	C
3	1	0	4

Prerequisites: *Mechanics of Fluids*

COURSE OBJECTIVES:

- *To enhance knowledge on flows in open channel, dimensional analysis, momentum principle and its applications.*

COURSE OUTCOMES:

CO1: *Student will get knowledge about open channel flow characteristics including hydraulic jump and surges.*
CO2: *Hydraulic machines viz. flow through turbines and pumps including their performance characteristics and design aspects are taught.*
CO3: *Student, at the end of the semester will have the ability to analyse flow characteristics in open channel and design hydraulic machines.*

UNIT I – OPEN CHANNEL FLOW **(10)**

Uniform flow – Velocity measurement – Manning's and Chezy's formula – Roughness coefficients – Normal depth and velocity – Most economical sections –Wide open channel – Specific energy – Critical flow and its computation-Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and backwater curves –Hydraulic jump – Types – Energy dissipation

UNIT-II-DIMENSIONALANALYSIS **(06)**

Dimensional Homogeneity-Rayleigh's and Buckingham methods- Model study and similitude – scale effects and distorted model

UNIT III – MOMENTUM PRINCIPLE **(10)**

Impulse momentum Principle- impact of Jet – force exerted by a jet on normal, inclined and curved surfaces for stationary and moving vanes- Angular momentum principle- Inlet and outlet flow diagrams

UNIT IV – TURBINES **(10)**

Turbines – classification – radial flow turbines – axial flow turbines – Impulse and Reaction Turbines – work done and efficiency – draft tube theory- types – Similarity laws – specific speed- operating characteristic curves of turbines – Governing and Selection of Turbines

UNIT-VPUMPS **(09)**

Centrifugal pump- Work done and Efficiency – minimum speed to start the pump – multistage Pumps – Jet and submersible pumps - Positive displacement pumps - reciprocating pump - Work done and Efficiency- negative slip- flow separation conditions – air vessels –indicator diagram and its variation – savings in work done

LECTURE: 45 TUTORIAL: 15 TOTAL: 60hrs

TEXT BOOKS

1. R.K.Rajput., "A text Book of Fluid Mechanics", S.Chand and Company,New Delhi,2007
2. Modi P.N and Seth S.M, "Hydraulics and Fluid Mechanics", Including Hydraulic Machines, Standard BookHouse, Newdelhi, 2002
3. R.K.Bansal, "Fluid Mechanics and Hydraulic Machines",Lakshmi Publications, NewDelhi, 2002.

REFERENCE BOOKS

1. Natarajan M.K, “Principles of Fluid Mechanics”, Anuradha Agencies, Vidayal Karuppur, Kumbakonam,1995.
2. Subramanya K.,”Flow in Open channels”,Tata McGraw-Hill Publishing Company, 1994.
3. S.Ramamurtham and R.Narayanan, “Hydraulics Fluid Mechanics and Fluid Machines” Dhanpat Rai Publishing Co. (P) Ltd, NewDelhi, 2000.

12C404 - CONSTRUCTION TECHNOLOGY

Prerequisites: *Materials in Construction*

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *To study the different types of masonry works, flooring, roofing and foundations*
- *To understand the various types of doors, windows, plastering and paintings*

COURSE OUTCOMES:

CO1: *The main objective of this course is to study the various types of foundations, masonry works and Flooring works.*

CO2: *The student shall have a reasonable knowledge about the various construction procedures for tunnel, cooling tower and fly-over.*

UNIT – I FOUNDATION (09)

Functions of foundation – shallow foundations – strip footing – column foundations – achieving different end conditions in field – Grillage foundation – Raft foundation – Deep foundation. Introduction to Piles - precast piles – cast in situ piles – under reamed piles – caissons. Setting out foundation – excavation and timbering – Dewatering Techniques- Causes of failures and remedial measures.

UNIT – II MASONRY (09)

Stone masonry – classification – materials used – dressing of stones – supervision of stone masonry – brick masonry– Bond in brickwork – types of bricks, Supervision of brick masonry – comparison of brick and stone masonry – Defects in brick masonry – Hollow block masonry – Concrete block masonry – Load bearing wall – partition wall – cavity wall construction – Arches and Lintels.

UNIT – III FLOORING AND DAMP PROOF COURSE (09)

Base for floors, requirements of good floor – floor finishing – brick flooring – Flag stone flooring – cement concrete flooring – Granolithic flooring – Terrazzo flooring – Marble flooring – Timber flooring – Asphalt flooring – Rubber flooring – suitability of floors for various applications – damp proof course – cause of dampness – effect of dampness – methods of damp proofing – materials used for damp proofing – Anti-termite treatment.

UNIT – IV STAIRS AND ROOFING (09)

Stairs – requirements – dimensions – Classifications of stairs - stairs made up of different materials – Ramps and Escalators. Roofs – requirements – Pitched roof – Lean to roof – Gable roof – Hip roof – Flat roof – R.C.C roof – flat slab – ribbed slab.

UNIT – V DOORS, WINDOWS, PLASTERING AND PAINTING (09)

Doors: Location – size – door frames – types of doors – paneled door – Flush door – Louvered door, grill door –UPVC doors – Eco-friendly door – fixing of doors – various types based on mode of opening, material and structural form.

Windows: Location – size – types of windows, based on mode of opening, material and Structural form.

Plastering: Methods of plastering – materials used – types of plaster – special plastering materials –Defects in plastering – pointing.

Painting: Paints and painting – painting on new and old surfaces of steel, timber and masonry wall – defects in painting – classification of paints.

LECTURE: 45 TUTORIAL: 15TOTAL : 60 hrs

TEXT BOOKS

1. Punmia.B.C, Ashok Kumar Jain and Arun Kumar Jain, “Building construction”, Laxmi Publications Pvt. Ltd, 2008.
2. Varghese P.C,”Building Construction”, Prentice Hall of India, 2007.

Reference Book

1. Bindra.S.P and Arora.S.P, “Building construction”, Dhanpat Rai Publication Pvt, Ltd, 2005.

12C405 - SURVEYING – II

Prerequisites: *Surveying- I*

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *To learn about the advanced methods of surveying to solve complex civil engineering problems.*
- *To understand the principles and concepts of advanced surveying instruments.*
- *To learn about errors in field measurements and their adjustments.*
- *To understand the setting out of horizontal and vertical curve.*

COURSE OUTCOMES:

CO1: *The students will possess knowledge about Tachometric surveying and Control surveying.*
CO2: *The students will be able to do Survey adjustments in the field measurements.*
CO3: *The student will be able to do setting out curves and to conduct hydrographic surveying.*
CO4: *The student will be able to interpret survey data and calculate surveying quantities.*

UNIT I - TACHEOMETRIC SURVEYING (09)

Tacheometric systems-Tangential**,** Stadia and Subtence methods-Stadia systems-Horizontal and inclined sights-Vertical and normal staffing-Fixed and Movable hairs-Stadia constants-Anallactic lens –Subtence bar.

UNIT II - CONTROL SURVEYING (09)

Vertical and horizontal control-Triangulation-Different-Networks, Orders and Accuracies.Signals and Towers Trilateration, Base line-Instruments and Accessories-Corrections-Satellite stations- Reduction to centre-Trignometric leveling-Single and reciprocal observations.

UNIT III - SURVEY ADJUSTMENTS (09)

Errors-Sources, Precautions and corrections-Classification of errors-true and most probable values- Weighted observations- Method of equal shifts-Principle of least squares-Level nets-Normal equations-Correlates.

UNIT IV- CURVES (09)

Simple curves-Setting out-Linear and angular methods –Rankines tangential angles-Double Theodolite method-Difficulties in setting out-Compound and Reverse curves-parallel tangents in railway sidings- Setting out of Vertical Curves.

UNIT V- GIS , GPS AND HYDROGRAPHIC SURVEYING

Introduction to GPS and GIS - Operating Principle. Tides-types, gauges-Shore line theory-Soundings-Methods-Reduction-Plotting Engineering surveys- Route survey

LECTURE : 45 TOTAL : 60 hrs

TEXT BOOKS

1. Kanetkar.T.P.,and Kulkarni.S.V., “Surveying and leveling”, Vol I & II,Pune Vidyarthi Griha Prakashan,2004.
2. Duggal S.K , “Surveying” ,Vol. I &II , Tata McGraw-Hill, Publishing Company, 2004.

REFERENCE BOOKS

1. Punmia B.C , “Surveying” , Vol. I &II , Laxmi Publication , 2007.
2. Bannister . A &Reynolds .S , “Surveying” , ELBS , 1992.

12C406 - WASTEWATER ENGINEERING

Prerequisites: Water Supply Engineering

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *To learn the basics of sewage composition and its characteristics*
- *To depict the information about various sewage treatment processes*
- *To provide the adequate information on various disposal standards for industrial effluents*
- *To understand the knowledge about solid waste generation and disposal methods*

COURSE OUTCOMES:

CO1: *To educate the students on the principles and design of Sewage Collection and Conveyance.*
CO2: *To study the primary and biological treatment of sewage.*
CO3: *To understand the objectives of sludge treatment and disposal.*

UNIT I - QUANTITY, COLLECTIONS AND CONVEYANCE (09)

Necessity and objectives of sanitary engineering projects - Definitions - systems of sewerage - quantity of sewage -Fluctuations in flow pattern - Estimation of storm runoff - DWF and WWF - Design flow for separate and combined systems - House drainage - Sanitary fixtures / fittings - one pipe system, two pipe system, etc. - General layout of house drainage - street connections.

UNIT II – SEWER AND SEWER APPURTENANCES (09)

Hydraulics of sewers - Self cleansing velocities - full flow / partial flow conditions - sewer sections – sewer appurtenances - Design principles and procedures - materials for sewers - sewer joints - sewer laying – sewer cleaning and maintenance - sewage pumping - types of pumps.

UNIT III - QUALITY OF SEWAGE AND PRIMARY TREATMENT (09)

Characteristics and composition of sewage - physical and chemical analysis - DO, BOD,COD and their Significance - cycles of decomposition - Objectives and basic principles of sewage treatment - primary treatment- screens - Grit chamber - settling tank - principles of sedimentations - Design of settling tanks.

UNIT IV - BIOLOGICAL TREATMENT OF SEWAGE (09)

Basic principles of biological treatment - Filtration - contact beds - Sand Filters - trickling filters - Description and principles of operation of standards / high rate filters - recirculation - activated sludge process - diffuser /Mechanical aeration - Conventional, high rate and extended aeration process - oxidation pond - stabilization ponds - aerated lagoons - Septic tanks and effluent disposal system.

UNIT V - SEWAGE DISPOSAL AND SLUDGE MANAGEMENT (09)

Objectives of sludge treatment - properties and characteristics of sludge - Thickening - sludge digestion - drying beds - conditioning and dewatering - sludge disposal - Eutrophication - recycle & reuse of waste effluents – elutriation - Methods - dilution method – self-purification of streams - oxygen sag curve - land disposal – sewage farming.

LECTURE: 45 TOTAL: 45 hrs

TEXT BOOKS

1. Garg. S. K., "Environmental Engineering", Vol I & Vol II, Khannah Publishers, New Delhi, 1994.
2. Mark J. Hammer, Mark J. Hammer Jr, "Water and Waste Water Technology", Prentice hall of India 2008
3. Hussain. S. K., "Text Book of Water Supply and Sanitary Engineering", Oxford and IBH Publishing.
4. Duggal. K.N., "Elements of public Health Engineering", S.Chand and Company Ltd, New Delhi. 1998.

REFERENCE BOOKS

1. Manual on wastewater and treatment CPHEEC, Ministry of Urban Affairs and Employment, Govt. of India, New Delhi, 1990.
2. Shah.C. S., "Water supply and Sanitation", Galgotia publishing company, New Delhi, 1994.

12C407 - SURVEY PRACTICAL - II

L	T	P	C
0	0	3	2

Prerequisites: Surveying - I

COURSE OBJECTIVES:

- *To understand the advanced surveying techniques.*
- *To enable the handling of advanced surveying equipments.*
- *To apply suitable surveying methods and instruments for a given problem.*

COURSE OUTCOMES:

CO1: *The student will be able to handle the advanced surveying instruments like tacheometer, subtence bar and total station.*
CO2: *The Student will be able to do measurements precisely using advanced surveying instruments.*
CO3: *The student will be able to solve complex surveying problems.*

LIST OF EXPERIMENTS

1. Measurement of horizontal angles by Repetition and Reiteration methods.
2. Theodolite Traversing.
3. Measurement of vertical angles
4. Heights and Distances – Inaccessible stations – Single Plane and Double plane methods.
5. Trignometrical leveling – Single and Reciprocal observations.
6. Stadia Tacheometry
7. Tangential Tacheometry
8. Subtense Bar method.
9. Setting out Simple Curve.
10. Study of Special Instruments-Micrometer, Microptic Theodolite and Total Station

TOTAL: 45hrs

12C408 - FLUID MECHANICS AND MACHINERY LABORATORY

L	T	P	C
0	0	3	2

Prerequisites: Mechanics of fluids

COURSE OBJECTIVES:

- *Students should be able to verify the principles studied in theory by performing the experiments in lab*

COURSE OUTCOMES:

CO1: *Student will be able to verify the principles studied in theory by conducting the experiments.*
CO2: *Students are able to do practical work on fluid flow problems in pipe and open channel.*
CO3: *Students are able to do performance study on fluid machinery.*

LIST OF EXPERIMENTS

1. Determination of Major and Minor losses in pipes
2. Verification of Bernoulli's Theorem
3. Calibration of Venturimeter and Orificemeter
4. Flow over Rectangular and V- Notches
5. Flow through Mouthpiece / Orifice
6. Determination of velocity through Pitot tube
7. Calibration of pressure gauges
8. Determination of Meta centric height
9. Demonstration of Reynold's Apparatus
10. Performance study of Rotodynamic pumps: Centrifugal pump, Submersible pump , Vertical Turbine Pump and Jet pump
11. Performance study of positive displacement pumps: Reciprocating pump, Gear oil pump and Single screw pump
12. Load test on Pelton wheel and Francis turbine

TOTAL: 45hrs

12C501 - STRUCTURAL ANALYSIS – I

L	T	P	C
3	1	0	4

Prerequisites: |Mechanics of solids I & Mechanics of solids II

COURSE OBJECTIVES:

- *To impart knowledge on basic theory and concepts to analyse different kind of structures*

COURSE OUTCOMES:

CO1: S*tudents are able to solve problems (on beams, trusses and frames) using energy methods and also able to analyse the beams with rolling loads.*

CO2: S*tudents are able to analyse arches, cables and suspension bridges.*

CO3: *Students are able to construct the influence lines for beams, frames, arches and cables and suspension bridges for solving the problems.*

UNIT I - FUNDAMENTAL CONCEPTS AND ENERGY METHODS (09)

Definition and Determination of Static and Kinematic Indeterminacy – Beams, Trusses and Frames – Degree of Freedom– Equilibrium and Kinematic Stability – Principle of Superposition – Basic Methods of Structural Analysis. Work – Energy principles – Principle of Stationary Potential Energy – Principle of Virtual Displacements – Complementary Energy – Principle of virtual Forces – Castigliano's First and Second Theorem –Theorem of least work – Clark Maxwell's theorem of reciprocal deflection – Betti's theorem – Application to simple problems of Statically determinate beams, trusses and frames.

UNIT – II ARCHES (09)

Three hinged arch – Two hinged arch – parabolic and semi circular arches – Concentrated loads – Uniform loads –Temperature effects – Determination of Reaction, Normal Thrust, Radial shear and Bending Moment – Unsymmetrical arches

UNIT – III CABLES AND SUSPENSION BRIDGES (09)

Components and their Functions - Analysis of cable under concentrated loads and UDL – Shape of cable under self weight – Anchorage of suspension cables – Bending Moment and Shear Force in three hinged stiffened girders – Max Bending Moment due to single concentrated load and UDL - Influence lines for Bending Moment and Shear Force – Two hinged stiffened girders.

UNIT – IV ROLLING LOADS AND INFLUENCE LINES ON DETERMINATE BEAMS (09)

Determinate Beams: Single concentrated load moving on the span – UDL longer than the span – UDL shorter than the span– Two concentrated loads – Series of concentrated loads – Equivalent UDL

Influence lines for reactions, shear force, bending moment – Load Position – Absolute maximum Bending Moment and Shear Force - UDL smaller than the span – Concentrated loads – Absolute maximum Bending Moment and Shear Force

Indeterminate beams: Muller Breslau's principle and its applications to determine the influence lines for continuous beams.

UNIT – V INFLUENCE LINES FOR FORCES IN PLANE FRAMES ARCHES (09)

N type truss – Pratt truss with parallel chords – Pratt truss with inclined chords - Warren truss with inclined chords. Symmetrical arches - Influence lines for horizontal thrust - Influence lines for B.M - Influence lines for S.F – Influence lines for normal thrust - Influence lines for B.M at any section for a parabolic arch– Single rolling load - Uniformly distributed load – Unsymmetrical arches - Influence lines for horizontal thrust.

TOTAL: 45 hrs

TEXT BOOKS

1. Reddy C.S., “Basic Structural Analysis”, Tata McGraw Hill Publishing Co., 2011.
2. Punmia B.C.,”Strength of Materials and Mechanics of Structures”, Vol. II, Standard publishers, 2008.
3. Vaidayanathan.R and Perumal.P, “Comprehensive Structural Analysis”, Vol.I and II, Laxmi publications, 2008.

REFERENCE BOOKS

1 .Timoshenko S.P and Young D.H., “Theory of Structures”, McGraw – Hill Book Company, New Delhi 1965.
2. Sterling Kinney. J “Indeterminate Structural Analysis”, Narasa Publishing House, Delhi,1987.
3. Negi L.S and Jangid R.S., “Structural Analysis”, Tata McGraw - Hill Publishing Company, New Delhi, 2003.
4. Ramamurtham. S “Theory of structures”, Dhanpat Rai & Sons, New Delhi, 2004.

12C502 - BASIC STRUCTURAL DESIGN – I

(Masonry, Timber and Steel) **L T P C**

Prerequisites: *Engineering Mechanics, Mechanics of Solids I and II* **3 1 0 4**

COURSE OBJECTIVES:

- To study the behavior and design of various structural elements made of masonry and timber.
- To design the tension and compression steel elements and their connections.
- To understand the behavior of flexural members and to design laterally restrained and unrestrained beams.

COURSE OUTCOMES:

CO1. *The students are able to apply the basic requirements of Indian Standards for design of masonry and timber structures.*

CO2. *They will be able to identify the different failure modes of bolted and welded connections and design connections subjected to both axial and eccentric load.*

CO3. *They will be able to compute the design strength of tension, compression members and beams.*

CO4. *They will be able to design the tension, compression members and beams according to the specific design criteria.*

CO5. *They will be able to apply relevant IS codal provisions to ensure safety and serviceability of structural elements.*

UNIT I – MASONRY **(09)**

Mix proportions – compressive strength of mortars – basic compressive stress – design of masonry walls – eccentrically loaded walls – shape factor for masonry units – stability of piers and walls – design as per IS Codes.

UNIT II - TIMBER **(09)**

Allowable stresses in compression, tension and flexure – types of joints with nails and bolts – Design of simple compression members – design of beams for strength and stiffness as per BIS code

UNIT III - STRUCTURAL STEEL CONNECTIONS **(09)**

Steel standard sections – properties – permissible stresses as per BIS codes

Bolted connections

Types of bolts – permissible stresses for black bolt, HSFG bolts as per BIS code – Resistance of a bolt in single shear and double shear and bearing – Design for eccentric loading - Field examples.

Welded connections

Principle of welding – methods of welding – weld symbols – edge preparation – welding electrodes – types of welded joints – strength of fillet and butt weld – design of welded connections for lap and butt joint and detailing - Design for eccentric loading - Field examples.

UNIT IV - BEAMS (Bolted and welded connections only) **(09)**

Beams – permissible bending stress as per BIS code - section classification– Design of laterally supported and unsupported simply supported beams – Design of built – up beams – curtailment of flange plate – connection between flange plate and beam – need for lateral support of compression flange and their design – strength of beams in shear.

UNIT V - COMPRESSION AND TENSION MEMBER (Bolted and welded connections only) **(09)**

Axially loaded columns – effective length of compression members – slenderness ratio –strength of compression members – design of columns – built up columns – design of lattices and battens – design of their base – Gusseted base – design of simple and built up members subjected to tension – effective area of angle and Tee sections connected to Gussets –Tension splice – lug angle.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 hrs

TEXT BOOKS

1. Arya, " Structural Design in Steel, Masonry And Timber", Nemchand & Bros., Roorkee, 1993.
2. Subramanian.N "Design of Steel Structures", Oxford University Press, New Delhi, 2008.
3. Duggal.S.K., "Limit State Design of Steel Structures", Tata McGraw Hill ,New Delhi, 2010.

REFERENCE BOOKS

1. Ramachandra, " Design of Steel Structures", Vol. I & II, Standard publishing house, New Delhi, 2007.
2. B. C. Punmia, Ashok Kumar Jain and Arunkumar Jain, "Design of Steel Structures, Vol. I & II", Arhant Publications, Bombay, 2004
3. P. Dayaratnam, "Brick and reinforced brick structures", Oxford and IBH publishing house, 1997.
4. BIS: 1905 – 1980, Code of practice for structural safety in buildings reinforced masonry
5. IS: 800 – 2007, Code of practice for general construction in steel (Third revision)
6. BIS – SP 6(I) – Handbook for structural steel sections

12C503 - WATER RESOURCES ENGINEERING

L	T	P	C
3	0	0	3

Prerequisites: Water supply Engineering

COURSE OBJECTIVES:

- *The students are exposed to the know the hydrological cycle in earth system, components and its applications in civil engineering as well as design of canal system.*

COURSE OUTCOMES:

CO1: *The student will be able to explain the hydrological cycle and its components.*
CO2: *The students are able to plan the reservoir and design of well in different aquifers.*
CO3: *The students are able to design canal system and identify the causes and effects of water logging.*

UNIT – I SURFACE WATER HYDROLOGY (09)

Hydrological Cycle – Precipitation – forms and types – Rain gauges – average rainfall over a basin - Arithmetic mean, Thiessen polygon and Isohyetal method - missing precipitation – optimum number of rain gauge station – Runoff process– infiltration, evaporation, transpiration and depression storage. Estimation of Runoff - Empirical formula and Infiltration Indices. Storm Hydrograph and Unit Hydrograph – Flood estimation by Empirical formulae - recurrence interval – rational method.

UNIT – II RESERVOIR PLANNING (09)

Purpose of storage work – types of reservoirs – Investigation for reservoir planning – Selection of site for a reservoir –Yield of a reservoir – Safe, secondary and average yield – mass curve and demand curve - Calculation of safe yield from a reservoir of a given capacity - Calculation of reservoir capacity for a specified yield – Zones of storage in reservoirs – Single and multipurpose reservoir – Reservoir sedimentation and their control – trap efficiency - Basics of flood routing.

UNIT – III GROUND WATER HYDROLOGY (09)

Occurrence of ground water – types of aquifers – zones of underground water - storage coefficient – coefficient of transmissibility – Steady radial flow into a well located in unconfined and confined aquifers - Description of various types of open and tube wells – Yield from an open well by constant level pumping test and recuperation test – well loss -Site selection for a tube well – Problems.

UNIT – IV DISTRIBUTION SYSTEM (09)

Classification of canals – canal alignment – Design procedure for an unlined irrigation channel - Kennedy's theory –Wood table – Lacey's theory – Comparisons of the two theories – Use of Garret's diagram in channel design – Balancing depth of cutting – types of canal cross section – component parts of a cross section – Canal lining - Design of lined canals – Problems.

UNIT – V WATER LOGGING, DRAINAGE AND RIVER CONTROL (09)

Water logging – Causes and effects of water logging – Remedial measures – Land Drainage – Advantages – Types of drainage system – layout of tile drainage. Rivers – classifications – Meandering and cut-off – River training works - Objectives – Classification and Types of river training works

LECTURE: 45 TOTAL: 45hrs

TEXT BOOKS

1. Punmia .B.C. and Pande B.B.Lal, "Irrigation and Water Power Engineering", Laxmi Publications Pvt.Ltd,New Delhi, 2009.
2. Santosh Kumar Garg, "Irrigation Engineering and Hydraulics Structures", Khanna Publications Pvt.Ltd, New Delhi, 2009.

REFERENCE BOOKS

1. Duggal .K.N and Soni. J.P, "Elements of Water Resources Engineering", New Age International Pvt.Ltd, NewDelhi, 2005.
2. Gupta.B.L and Amit Gupta,"Water resources system and management", Standard Publishers Distributors,New Delhi, 2007.

12C504 - CONCRETE TECHNOLOGY

L	T	P	C
3	0	0	3

(Use of Mix Design Tables and Charts are permitted)

Prerequisites: *Materials in Construction.*

COURSE OBJECTIVES:

- *To learn the tests to be carried out on various concrete making materials as per IS codal provisions and to understand their properties.*
- *To study the properties of fresh and hardened concrete.*
- *To know about various methods of mix design for concrete.*
- *To have an exposure on various special concretes.*

COURSE OUTCOMES:

CO1*: Student are able to produce better quality concrete by understanding the properties of concrete and the role of ingredients like cement, aggregate, admixtures in concrete.*

CO2*: Students are able to apply mix design concepts to produce concrete with adequate workability, strength and durability and design the formwork.*

CO3*: Students are able to select appropriate type of concrete for specific requirements.*

UNIT I - INGREDIENTS OF CONCRETE (09)

Cement – constituents- Hydration – Tests on cement – Types of cement – Aggregates – properties and uses – Classification of aggregates – Properties and test on aggregates – gradation – Quality of water – Admixtures – Accelerators –Retarders – Water proofers – workability agents – air entraining agents – corrosion inhibitors – Curing compounds

UNIT II –FORMWORK AND PRODUCTION OF CONCRETE (09)

Requirements of formwork – Economy in formwork – Materials for forms – Arrangement of forms for slabs, beam, column, walls, culverts, stairs etc – Removal of forms – Design considerations.

Measurement of materials – batching – Mixing –Transportation – Placing of concrete in cold weather, hot weather and under water concreting – Compaction – Curing

UNIT III – PROPERTIES OF CONCRETE (09)

Properties of fresh concrete – Workability – Segregation – Bleeding – Properties of hardened concrete – Strength –Stress - Strain characteristics – Modulus of Elasticity – Shrinkage – Creep – Thermal properties – Permeability – Test for Tension, Compression and Flexure – Non-Destructive Test

UNIT IV – CONCRETE MIX DESIGN AND QUALITY CONTROL OF CONCRETE (09)

Quality Control - Frequency of sampling – Statistical analysis of test results – standard deviation – Coefficient of variation – Characteristic strength –Acceptance and rejection Criteria – Importance of water cement ratio – Importance of cover to concrete. Nominal mixes – Design Mixes – factors influencing the design mix – Mix Design by ACI method, IS method and DOE method

UNITV – SPECIAL CONCRETES (09)

High Strength- High Performance Concrete - reactive powder concrete - Light weight, heavy weight and mass concrete – Self Compacting Concrete – Self Curing Concrete – Polymer Concrete – Fibre Reinforced Concrete - Ready Mixed Concrete

LECTURE: 45 TOTAL: 45hrs

TEXT BOOKS

1. Shetty M.S., “Concrete Technology”, S.Chand & Company, New Delhi, 2008
2. Santhakumar. A.R, “Conrete Technology”, Oxford university press, 2007
3. M.L. Gambhir, “Concrete Technology”, Tata Mc-Graw Hill Company, Noida, 2011

REFERENCE BOOKS

1. Orchard D.F., “Concrete Technology”, Vol I &II ,1998
2. Neville A.M “Properties of Concrete”,Pearson Education,2008.
3. Povindar K. Mehta, Paulo J. M. Monteiro, “Concrete: Microstructure, Properties, and Materials”, Mc-GrawHill Company, 2011.

12C505 - MECHANICS OF SOILS

	L	T	P	C
Prerequisites: *Engineering Mathematics and Mechanics of fluids*	**3**	**1**	**0**	**4**

COURSE OBJECTIVES:

- *To impart knowledge on engineering behaviour and performance of soil. At the end of this course student attains adequate knowledge in assessing the physical, engineering, compaction and strength properties of soils.*

COURSE OUTCOMES:

CO1: *The student acquires the capacity to assess the physical, engineering properties of soil and Classify the soil.*

CO2: *The student gets an idea about the stress distribution and permeability in soil.*

CO3: The student acquires the knowledge on compaction and consolidation characteristics of soil.

UNIT-I BASIC PROPERTIES OF SOILS (09)

Soil formation – Soil problems in Engineering – Physical properties of soil – Phase relations – Index properties of soil –Grain size distribution – Atterberg limits – Soil classification-different methods- their significance – BIS classification system – Field identification – Simple tests.

UNIT-II STRESSES IN SOILS (09)

Soil water statics – Concept of effective and neutral stresses – Capillary phenomenon – Vertical stress distribution in soils – Boussinesq equation – Line load – Uniformly distributed loads – New marks chart – Construction and use –Approximate methods – Pressure bulb – Westerguards equation.

UNIT-III PERMEABILITY AND SEEPAGE (09)

One dimensional flow through soil – permeability – Darcy's law – field and laboratory permeability tests – Flow through stratified soil – Seepage pressure – Quick sand condition – Soil liquefaction – Two dimensional flow – Laplace equation – Electrical analogy – Flow net –Methods of construction – Properties – Applications – Sheet pile cut off and earth dam – Phreatic line.

UNIT-IV COMPACTION AND CONSOLIDATION (09)

Compaction – Laboratory test – Standard proctor's compaction – Modified proctors compaction – Moisture density relation – Factors affecting compaction – Field compaction methods – Compaction control. Consolidation – Consolidation settlement – Laboratory test – Determination of Cv by curve fitting methods – Terzaghi's one dimensional consolidation – Definition of terms – Normally consolidated clay – Over consolidated clay – Under consolidated clay – Field curve – Pre consolidation pressure – e vs p curve – Boundary condition – Time factor – Time rate of consolidation.

UNIT-V SHEAR STRENGTH (09)

Shear strength of soil – Importance and use – Mohr – Coulomb's theory – Factors affecting the shear strength – Laboratory test – Direct shear test – Triaxial compression test – Triaxial tests based on drainage conditions – Cyclic loading – Pore pressure parameters – UCC test – Vane shear test – Insitu vane shear test.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 hrs

TEXT BOOKS

1. Arora. K.R., “Soil Mechanics and Foundation Engineering”, Standard Publishers and Distributors, New Delhi, 2005.
2. GopalRajan and Rao, A.S.R., “Basic and Applied Soil Mechanics”, New Age International Publishers, Third Edition, New Delhi, 2006.

REFERENCE BOOKS

1. Punmia. B.C., “Soil Mechanics and Foundations”, Laxmi Publications Pvt. Ltd., New Delhi, 2005.
2. Venkataramaiah. C, “Geotechnical Engineering” Wiley Eastern Ltd., New Delhi, 2001.
3. Murthy. V.N.S., “Soil Mechanics and Foundation Engineering”, DhanapatRai Publication, 2000.
4. Teng. W.L., “Foundation Design” Prentice Hall of India Ltd.,New Delhi,1969.

12C506HIGHWAY ENGINEERING

L	T	P	C
3	0	0	3

Prerequisites: Nil

COURSE OBJECTIVES:

- *To give an overview about the highway engineering with respect to, planning, design, construction and maintenance of highways as per IRC standards, specifications and methods*

COURSE OUTCOMES:

CO1: The outcome of the course is to educate the students on the various components of Highway Engineering. It exposes the students to highway planning, engineering surveys for highway alignment, Design of Geometric Elements of Highways and Urban roads, Rigid and Flexible pavements design.

CO2: The students further learn the desirable properties of highway materials and various practices adopted for construction.

CO3: This course enables the students to develop skill on evaluation of the pavements and to decide appropriate types of maintenance.

UNIT–I HIGHWAY PLANNING & FINANCING (09)

Importance of Highway Transportation– Classification of Highways- Scope, advantages and important highway plans –Highway financings – Calculation of Annual cost – Economic analysis –methods- Highway location and surveys.

UNIT–II GEOMETRIC DESIGN OF HIGHWAYS (09)

Introduction –Design Parameters-PCU, Design Vehicle, speed, gradient, Camber, super elevation,- Typical cross sections, Sight distance- Types-Horizontal & Vertical alignment- Design of curves – curve widening- Intersections- problems

UNIT–III HIGHWAY MATERIALS AND CONSTRUCTION (09)

Testing of Highway materials – Tests on soils, aggregates and Bitumen – CBR Test - Equipments used in Highway construction – Stages of highway construction – Soil stabilization – Bituminous pavement construction – Water bound Macadam roads – Cement concrete pavement construction.

UNIT–IV FLEXIBLE & RIGID PAVEMENTS (09)

General principles – Factors affecting pavement stability – Flexible pavement design methods – Empirical methods –Using soil classification – using soil strength – Rigid pavement design methods – Stress in concrete pavement – Westerguard analysis – Types of rigid pavements – Design of pavement thickness – Design of joints.

UNIT– V PAVEMENT EVALUATION AND MAINTENANCE (09)

Structural evaluation – Lab and field test methods – Strengthening of pavements – Types of overlays – Highway drainage –Types – Maintenance of different road surfaces – Maintenance of shoulders, roadway drainage and other structures.

LECTURE: 45TOTAL: 45hrs

TEXT BOOKS

1. Khanna and Justo, “Highway Engineering”, Nemchand and Bros 2005.
2. Kadiyali, L.R., “Transport planning and traffic engineering”, Khanna Publication. 2003.

REFERENCE BOOKS

1. Sharma S.K, “Principles, Practice& Design of Highway Engineering” S.Chand & Co,2001.
2. IRC codes 15 -1981, 37 -4984, 38 – 1988, 52 1981, 58 – 1988, 66 – 1976, 73 -1980 and IRC SP 23 – 1983.

12C507 - ENVIRONMENTAL ENGINEERING LABORATORY

Prerequisites: Waste water Engineering, Water Supply Engineering

L	T	P	C
0	0	3	2

COURSE OBJECTIVES:

- *To understand the sampling and preservation methods and significance of characterization of wastewater*

COURSE OUTCOMES:

CO1: *The students are able to test the physical, chemical and biological properties of water and waste water.*

LIST OF EXPERIMENTS

1. Determination of pH & Electrical Conductivity
2. Determination of Turbidity
3. Determination of Chlorides
4. Determination of Total Hardness
5. Determination of Calcium Hardness
6. Determination of Alkalinity
7. Determination of Acidity
8. Determination of Sulphates
9. Determination of Iron & Fluoride
10. Estimation of Residual Chlorine
    a) Determination of Total Suspended solids
    b) Determination of Dissolved solids
    c) Determination of Fixed and Volatile solids
    d) Determination of Total solids
11. Determination of Optimum Coagulant Dosage
12. Determination of Dissolved Oxygen
13. Determination of BOD
14. Determination of COD
15. Standard Plate Count Test

TOTAL: 45hrs

12C508 - SOIL MECHANICS LABORATORY

L	T	P	C
0	0	3	2

Prerequisites: Mechanics of Soils

COURSE OBJECTIVES:

- *To impart practical knowledge on testing of soil for various properties such as physical ,engineering, swell and insitu testing and its relevance in the selection and design of foundations*

COURSE OUTCOMES:

CO1: *The student gains adequate knowledge on Physical , Engineering and swell properties of soil.*
CO2: *The student acquires the knowledge on handling of field testing equipments.*

LIST OF EXPERIMENTS

1. Moisture content determination
2. Specific gravity and relative density test for sand
3. Sieve analysis for coarse grained soil
4. Hydrometer analysis for fine grained soil
5. Consistency limits and Indices
6. Field density tests (Sand replacement method and core cutter method)
7. Permeability tests – Constant Head method and variable Head method
8. Unconfined compression test for Soil
9. Vane Shear Test for Cohesive Soil
10. Direct Shear test
11. Standard Proctor's Compaction Test
12. Consolidation Test
13. Swell Pressure Test
14. Triaxial Compression Test
15. Standard Penetration Test (Demonstration only)
16. SCPT and DCPT (Demonstration only)

TOTAL: 45hrs

12C601 - STRUCTURAL ANALYSIS – II

L	T	P	C
3	1	0	4

Prerequisites: *Structural Analysis I*

COURSE OBJECTIVES:

- *To enhance the ability of students to use methods of analysis like classical methods, matrix methods, and also analysis of space trusses.*

COURSE OUTCOMES:

CO1: *Students are able to solve beams and frames using slope deflection and moment distribution methods*
CO2: *Students have an ability to analyse plane trusses, space trusses and frames*
CO3: *Students are able to analyse beams, frames and trusses by Matrix methods*

UNIT – I SLOPE DEFLECTION AND MOMENT DISTRIBUTION METHOD (09)

Degree of static and kinematic indeterminacy: Analysis of continuous beams - Sinking of Supports – Analysis of single storey and single bay rectangular vertical frames with and without sway - Slope Deflection Method.- Carry over factor – Distribution factor – Analysis of continuous beams – Sinking of Supports –Analysis of single storey and single bay rectangular vertical frames with and without sway - Gable portals – Moment Distribution Method.

UNIT – II ANALYSIS OF PLANE AND SPACE TRUSSES (09)

Analysis of plane trusses with maximum two redundant members by displacement and force methods – Continuous trusses –Trusses with lack of fit –Thermal Stresses – Settlement of support – Trussed Beams – Analysis of Space trusses using method of tension coefficients.

UNIT – III FRAME ANALYSIS (09)

Analysis of multistoreyed building frame for horizontal loads by portal method and cantilever method.
Analysis of multistoreyed building frame for vertical loads by two cycle moment distribution method-using substitute frames.

UNIT – IV MATRIX FLEXIBILITY METHOD (09)

Analysis of continuous beams, indeterminate frames and trusses with maximum two degrees of static indeterminacy.

UNIT – V MATRIX STIFFNESS METHOD (09)

Analysis of continuous beams, indeterminate frames and trusses with maximum three degrees of kinematic indeterminacy.

LECTURE : 45 TUTORIAL : 15 TOTAL : 60 hrs

TEXT BOOKS

1. Punmia B.C, "Strength of Materials and Mechanics of Structures" Vol.II, Standard Publishers, 2007.
2. Pandit.G.S.and GuptaS.P,"Theory of Structure",vol.I,TataMcGraw–Hill,NewDelhi, 2003.
3. Vaidyanathan.R, Perumal.P, "Comprehensive Structural Analysis", Vol I and II, Laxmi Publications, 2008.

REFERENCE BOOKS

1. Sterling Kinney, J ”IndeterminateStructuralAnalysis”, Narasa Publishing House, Delhi,1987.
2. Meek J.L,”MatrixStructuralAnalysis”,Mc Graw – HillBook Company,1971.
3. Negi, L.S. and Jangid, R.S,”Structural Analysis”, 6th Edition, Tata McGraw-Hill Publications, 2003.
4. Rajasekaran S. and Sankarasubramanian .G,”Computational Structural Mechanics”, Prentice Hall of India, 2001.
5. Manickaselvam.V.K, “Elementary Matrix Analysis of Structures”, Khanna Publishers, New Delhi, 1994.
6. Bhavikatti.S.S, “Structural Analysis”,Vol.I and II, Vikas Publishing House Pvt.Ltd.,2008.
7. Reddy.C.S, “Basic Structural Analysis”,Third Edition, Tata McGraw-Hill Publications, 2011.

12C602 - BASIC STRUCTURAL DESIGN II (CONCRETE)

	L	T	P	C
Prerequisites: *Basic Structural Design I, Mechanics of solids I, Mechanics of Solids II, Concrete Technology*	**3**	**1**	**0**	**4**

COURSE OBJECTIVES:

- *To know the design philosophies of concrete structures.*
- *To understand the limit state design of slabs and beams.*
- *To know the behavior of RC beams in shear and torsion.*
- *To get the concepts of limit state design of columns.*
- *To understand the limit state design of footings.*

COURSE OUTCOMES:

CO1: *The students are able to understand the stress strain behavior of steel and concrete and the concepts of working stress and limit state methods.*

CO2: *The students are able to design singly and doubly reinforced rectangular beam, flanged beam, one way and two way rectangular slabs by limit state method.*

CO3: *The students are able to design the columns subjected to both axial and eccentric loads and understand the use of interaction diagrams.*

CO4: *They can design axially and eccentrically loaded wall and isolated footings.*

UNIT – I REINFORCED CONCRETE MATERIALS (08)

Materials:

Stress strain curve for concrete – Standard concrete mixes for RCC works – types of Reinforcements – plain and deformed bars – Stress – strain curve for reinforcing steel.

Design concepts:

Design philosophy – Characteristic load and strength – permissible stresses – partial safety factors – limit state of collapse– limit state of Serviceability – Durability limit state – deflection and cracking – modification factors. Basic design concepts – working stress and limit state methods.

UNIT – II LIMIT STATE DESIGN OF BEAMS (10)

Design of singly and doubly reinforced rectangular and flanged sections by limit state method with IS code specifications– Analysis and design of singly and doubly reinforced rectangular and flanged beams. Design of sections subjected to the combined action of bending moment, transverse shear and torsion

UNIT – III LIMIT STATE DESIGN OF SLABS (10)

Behaviour of one way & two way slabs – Design of one way slab – span / effective length ratio – two way slab –Analysis, design and detailing of rectangular slabs subjected to uniformly distributed load. Design of lintel and lintel cum sunshade– Design of stair case.

UNIT – IV LIMIT STATE DESIGN OF COLUMNS (08)

Types of columns – Effective length of columns - Design of rectangular and circular columns for axial load – Codal Provisions for the analysis of columns subjected to axial load and uniaxial bending – Design of short columns subjected to axial load and uniaxial/ biaxial bending moment using interaction charts.

UNIT – V LIMIT STATE DESIGN OF FOOTINGS (09)

Design of wall footing – strip foundation to wall under axial load, eccentric load – Design of isolated footing for axially loaded columns.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60hrs

TEXT BOOKS

1. Varghese P.C., "Limit State Design of Reinforced Concrete", Prentice hall of India Pvt. Ltd.,2004.
2. Krishna Raju, N and Pranesh, R.N., "Reinforced Concrete Design – IS 456 – 2000 Principles and Practice",New Age International Publishers, New Delhi, 2003.
3. Syal I.C., and Goel A.K.,"Reinforced Concrete Structure", A.H .Wheeler & Co, 2004.

REFERENCE BOOKS

1. BIS 456 – 2000, Indian Standard code of practice for Plain and Reinforced concrete (Fourth revision)
2. Dayaratnam P.,"Design of Reinforced Concrete Structures", Oxford & IBH publishing Co.Pvt.Ltd., 2003.
3. Pillai, S. U., and Menon, D., Reinforced Concrete Design Tata McGraw Hill, 2003.
4. Ashok K. Jain, "Reinforced Concrete – Limit State Design" – Nem Chand & Bros., 2003.
5. Sinha.W.C and Roy.," Fundamentals of Reinforced Concrete", Chand and Co., 2005. Sinha.S.N, "Reinforced Concrete Design", Tata McGraw Hill publishing company Ltd., 2005.

12C603 - IRRIGATION ENGINEERING AND HYDRAULIC STRUCTURES

Prerequisites: *Water Resource Engineering*

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *The student shall understand the need and mode of practiced in Tamil Nadu and gets an idea about design of different hydraulic structures.*

COURSE OUTCOMES:

CO1: *The student will obtained knowledge on the needs and methods of irrigation system.*
CO2: *The Students are able to explain and design the storage and diversion head works.*
CO3: *The students are able to design the different hydraulic structures which are needed for the real life.*

UNIT–I IRRIGATION PRACTICE **(09)**

Necessity – Advantages and types of irrigation – methods of irrigation – Soil- water- plant relations - main crops and their seasons – saline, alkaline soils and their reclamation – root zone depth – Duty and Delta – relationship – Factors affecting duty – optimum utilization of water – Consumptive use of water by a crop – Estimation - assessment of irrigation water – Irrigation efficiencies – Problems.

UNIT–II DIVERSION HEAD WORKS **(09)**

Functions of diversion head works – Types – Layout of diversion head works – Component parts – functions - Weir –types – Causes of failure of weirs and their remedies – Design of impervious floor – Creep theories – Bligh's theory -Khosla's theory – Design of a vertical drop weir – Design principles for under sluices.

UNIT–III GRAVITY DAM **(09)**

Forces acting and their computation – Modes of failures - Elementary profile of a gravity of a dam – High and Low gravity dams – Practical profile – Stresses acting on dam - Design procedure for a gravity dam – Zoning in a non–overflow and overflow section – Gallery–Joints in dam -Problems to check stability Analysis – Spillways – Main types of Spillway.

UNIT–IV ARCH, BUTTRESS AND EARTH DAMS **(09)**

Types of Arch dams – forces acting on it – advantages - design procedure by thin cylinder theory. Buttress dams – types and uses of buttress dams. Earth dam-types of earth dams – Method of construction - elementary section of earth dams – Causes of failure of earth dams - criteria for safe design of earth dams – Cross sections of earth dam according to materials- seepage control in earth dam.

UNIT–V CANAL REGULATION WORKS **(09)**

Canal falls – types – Design of vertical drop fall – Functions of Regulators - Design of head and cross regulators – Cross drainage works – types of cross drainage works – Selection of suitable types of cross drainage works – Classification of aqueducts and syphon aqueducts – Design features for cross drainage works

TOTAL: 45hrs

TEXT BOOKS

1. Santosh Kumar Garg, "Irrigation Engineering and Hydraulics Structures", Khanna Publications Pvt.Ltd. New Delhi, 2009.
2 .Punmia .B.C. and Pande B.B.Lal, "Irrigation and Water Power Engineering", Laxmi Publications Pvt.Ltd.New Delhi, 2009.

REFERENCE BOOKS

1. Sharma. R.K. and Sharma.T.K "Irrigation Engineering and Hydraulics Structures", S. Chand & Company Pvt.Ltd, New Delhi, 2007.
2. Michel A.M., "Irrigation Engineering", Vikas Publishing House Pvt.Ltd, New Delhi, 2006.

12C604 - FOUNDATION ENGINEERING

Prerequisites: *Mechanics of soils*

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *Student acquires the knowledge of field soil investigation and testing, besides design of shallow, pile foundation based on bearing capacity and settlement. Knowledge on earth pressure and stability of slopes is also improved.*

COURSE OUTCOMES:

CO1: *Students are able to understand the various methods of soil exploration and field testing.*
CO2: *Able to design shallow and pile foundation*
CO3: *Able to analyse earth pressure and the stability of slope.*

UNIT-I SELECTION OF FOUNDATION AND SOIL EXPLORATION (09)

Types of foundation – Requirements of good foundation – Factors governing location and depth — Choice of types of foundation. Soil exploration – Methods – Augering and boring – Wash boring and rotary drilling – Depth of exploration – Samples –Disturbed and undisturbed – Samplers – Number and spacing of bore holes – Sounding tests – SPT – SCPT – DCPT – Bore log.

UNIT-II BEARING CAPACITY (09)

Bearing capacity – Terzagh's formula – Types of failure – Effect of water table – Shape of foundation – Skempton's formula – Meyerhoff's formula – Hansen's formula – Inclination of load and eccentricity of load on bearing capacity – BIS formula - Bearing capacity based on 'N' value. Allowable bearing pressure — Plate load test – Seismic consideration in bearing capacity evaluation – Introduction to methods improving bearing capacity.

UNIT-III SETTLEMENT AND DESIGN OF FOUNDATION (09)

Settlement – Immediate and time dependent settlements – Differential settlement – Causes – Effect – Control – Permissible settlement – BIS code provisions – Contact pressure distribution – Design – Proportioning – Isolated footing, combined footing and strap footing - raft foundation – Types – Floating foundation.

UNIT-IV PILE FOUNDATIONS (09)

Classification of piles – Functions – Merits – Load carrying capacity – Dynamic analysis – Hammers – Static analysis – Pile load test – Capacity from penetration test - Pile group (Feld's rule, Converse – Labarre formula and block failure criterion) – Spacing and group action – Efficiency of pile group – Settlement – Negative skin friction - –Under reamed pile foundation.

UNIT-V STABILITY OF SLOPES AND EARTH PRESSURE (09)

Stability of slopes – Infinite and finite slopes – Types of failure – Slip circle method – Friction circle method – Taylor's stability chart. Lateral earth pressure – Plastic equilibrium – Rankine's theory – Surcharge – Inclined backfill – Stratified backfill – Coulomb's theory – Earth pressure on retaining walls of simple configurations – Graphical constructions (Rebhan's and Culmann's graphical procedure) – Stability analysis of retaining wall – Drainage of backfill.

LECTURE: 45 TOTAL: 45hrs

TEXT BOOKS

1. Arora. K.R., “Soil Mechanics and Foundation Engineering”, Standard Publishers and Distributors, NewDelhi, 2005.
2. Punmia. B.C., “Soil Mechanics and Foundations”, Laxmi Publications Pvt. Ltd., New Delhi, 2005.
3. Varghese. P.C.,”Foundation Engineering”, Prentice Hall of India Pvt. Ltd., New Delhi, 2005.

REFERENCE BOOKS

1. GopalRajan and Rao, A.S.R., “Basic and Applied Soil Mechanics”, New Age International Publishers, ThirdEdition, New Delhi, 2006.
2. Venkataramaiah. C, “Geotechnical Engineering” Wiley Eastern Ltd., New Delhi, 2001.
3. Murthy. V.N.S., “Soil Mechanics and Foundation Engineering”, DhanapatRai Publication, 2000.
4. Teng. W.L., “Foundation Design” Prentice Hall of India Ltd.,New Delhi,1969.

12C605 - DESIGN AND DRAWING – I

(IRRIGATION AND ENVIRONMENTAL ENGINEERING)

L	T	P	C
2	0	3	5

COURSE OBJECTIVES:

The students are able to design and draw the various irrigation and environmental structures.

COURSE OUTCOMES:

CO1: *The students acquire hands on experience in design and preparation of detailed drawings for Irrigation Structures.*

CO2: *In the second part of the course, the students will learn to design and draw various Environmental Engineering structures.*

Prerequisites: *Water supply Engineering, Wastewater Engineering and Irrigation Engineering and Hydraulic Structures.*

PART – A

IRRIGATION ENGINEERING **(25)**

1. Tank Surplus Weir (Type A and D)
2. Tank Sluice with a Tower Head
3. Direct Sluice
4. Notch type Canal Drop
5. Canal Regulators and river regulators.
6. Cross-Drainage Works (Syphon Aqueduct type II & III)

PART – B

ENVIRONMENTAL ENGINEERING **(25)**

1. Intake tower
2. Sedimentation tank
3. Clariflocculator
4. Slow sand filters
5. Rapid sand filters
6. Secondary settling tanks
7. Trickling filter
8. Activated sludge process
9. Sludge digestion tank
10. Septic tank with dispersion trench and soak pit.

QUESTION PAPER PATTERN:

Question paper shall consist of two questions from each part. Part A consist of 60 marks and part B consist of 40 marks and the students have to answer one question from each part.

LECTURE: 20 DRAWING: 30 TOTAL: 50hrs

TEXT BOOK

1. Sathya Narayana Murthy Challa , “Water Resources Engineering “ Principles and Practice NewAgeInternational (P) Ltd., New Delhi – 2005.
2. Rangwala.S.C, “Fundamentals of water supply and sewerage engineering”, Charotar Publishing 2000.

REFERENCE BOOKS

1. Santosh Kumar Garg, Irrigation Engineering and Hydraulics Structures, Khanna Publications Pvt.Ltd, NewDelhi, 2002.
2. Birde.G.S and Birde.J.S, “Water supply and sanitary Engineering”, Dhanpat Rai Publications Pvt.Ltd NewDelhi, 2001.

12C607 - COMPUTER AIDED BUILDING DRAWING

Prerequisites: *Engineering Graphics & Basic Structural Design II*

L	T	P	C
0	0	3	2

COURSE OBJECTIVES:

- *To learn about planning and preparation of building drawings as per functional requirements.*
- *To familiarize the software tools in the preparation of building drawings.*

COURSE OUTCOMES:

CO1: *The student will be able to prepare the plan and elevation of various buildings according to its functional requirements.*
CO2: *The students will be able to draw the plan, elevation and sectional views with the aid of software.*
CO3: *The students will be able to communicate effectively the design data and specifications through drawing.*

PART-A

Building drawing in accordance with development and control rules satisfying orientation and functional requirements for the following:

1. Residential buildings with load bearing walls (RCC roof)

2. Office buildings (RCC roof)

3. RCC framed structures

4. Industrial buildings-North light roof-Trusses

5. Perspective view for small buildings.

PART-B

Building drawing in accordance with development and control rules satisfying orientation and functional requirements using AutoCAD, PHOTOSHOP,3DS MAX,3D Architect for the following:

1. Residential buildings with load bearing walls (RCC roofs)

2. Office buildings (RCC roof)

3. RCC framed structures

4. Perspective view for small buildings

TOTAL: 45 hrs

TEXT BOOKS

1. B. P. Verma, "Building Drawing" Khanna publishers.
2. Dr.Balagopal, T.S.Pabhu, "Building drawing and detailing", Spades publishers, Calicut

REFERENCE BOOKS

1. IS: 962 – 1967 Code of Practice for Architectural and Building Drawing.
2. Parrnar, V.S, "Design Fundamentals in Architecture", Somaiya Pulications, 1973.
3. Dr.N.Kumarasamy,A.Kamaswara Rao., "Building planning and Drawing", Charotiar publishing house, New Delhi.

12C608 - CONCRETE AND HIGHWAY LABORATORY

L	T	P	C
0	0	3	2

Prerequisites: *Concrete Technology & Highway Engineering*

COURSE OBJECTIVES:

- *To learn the testing procedures of cement and concrete as per IS codal provisions.*
- *To impart practical knowledge on testing and quality control of aggregates and bitumen used in pavements.*

COURSE OUTCOMES:

CO1: *Able to conduct quality control tests on concrete making materials & fresh and hardened concrete.*
CO2: *Able* to *design and test concrete mix and* to *conduct non destructive tests on concrete.*
CO3: *The students gain information on the testing of aggregates and bitumen for pavement design.*

LIST OF EXPERIMENTS

1. Normal consistency and initial and final setting time tests on cement
2. Fineness and Soundness test on cement\
3. Concrete mix design using IS method - Compressive strength of cement and concrete cubes
4. Compaction factor test on concrete
5. Splitting tension test on concrete cylinder
6. Slump cone test on concrete
7. Flexure test on concrete prism
8. Strength test on concrete using Rebound hammer (Demo only)
9. Quality test of concrete using ultrasonic tester (Demo only)
10. Aggregate Impact value test
11. Aggregate Crushing value test
12. Flakiness and Elongation Index Test
13. Attrition and Abrasion test
14. Specific gravity test
15. California Bearing ratio test
16. Penetration test on Bitumen
17. Viscosity test on Bitumen
18. Ductility test on Bitumen

TOTAL: 45 hrs

12C701 - PRESTRESSED CONCRETE STRUCTURES

Prerequisites: Basic Structural Design - II (Concrete)

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- *To understand the basic concepts, principles and methods of prestressing.*
- *To compute shear strength and ultimate shear resistance capacity as per IS code.*
- *To determine losses in prestress and anchorage zone stresses.*
- *To be acquainted with the codal provisions for the design of prestressed concrete elements.*
- *To understand the design concepts of composite constructions.*

COURSE OUTCOMES:

CO1: *The student will be able to describe the systems and methods of prestressing.*
CO2: *The students will be able to obtain the internal forces due to prestressing, being able to identify the primary and secondary components of the total internal forces.*
CO3: *The students will be able to propose an appropriate system to prestress a particular structure and to design the prestressed concrete elements and end blocks as per the codal provisions.*
CO4: The students can evaluate the initial and time dependent losses and deflection of prestressed elements.
CO5: The students can determine the resultant stresses of prestressed concrete composite section.

UNIT– I INTRODUCTION (09)

Principles – Pretensioning – Post – tensioning – Advantages and Types of prestressing – systems of prestressing –Comparison of prestressed concrete with reinforced concrete – Materials – Characteristics of concrete – Characteristics of high tensile steel. Analysis and Behaviour: Theory and behaviour of prestressed concrete beams in bending – calculating fibre stresses for various section (Rectangle, I, T) of simply supported beam due to prestressing force, dead load and external live load- Stress method – Moment of resistance method – Load balancing method.

UNIT– II DESIGN OF PRESTRESSED CONCRETE BEAMS (09)

Pre tensioned and post tensioned simply supported rectangle, I, T sections – Stress method – Design for flexure, bond and shear – IS Code provisions. End block: Introduction – Transmission length – End zone reinforcement – Anchorage zone stresses-Guyon and Magnel's method – Calculation of bearing stress and bursting tensile forces – Reinforcement in Anchorage zone.

UNIT–III DESIGN OF TENSION AND COMPRESSION MEMBERS (09)

Design of prestressed tension members subject to axial load – Design of axially prestressed compression members subjected to axial compression load and Bending – Design of sleepers and poles.

UNIT– IV LOSSES AND DEFLECTIONS (09)

Various losses in prestressed concrete members – Causes for losses in prestressed – calculation of losses – losses due to elastic shortening of pre tensioned and post tensioned members – losses due to creep , shrinkage of concrete – Relaxation losses – friction and anchorage losses. Deflection of prestressed concrete flexural members due to prestressing force, dead load, live load- BIS Code provisions – Effect of tendon Profile on deflection - Calculation of Elastic short term deflection for simply supported beams –Deflections due to creep effect – calculation of long term deflection.

UNIT– V COMPOSITE PRESTRESSED CONCRETE BEAMS (09)

Types of composite construction – Transformation of composite sections – flexural analysis of composite simply supported beams – calculation of stresses – Differential Shrinkage. Limit state design criteria – partial prestressing – Non- prestressed reinforcements

LECTURE : 45 TUTORIAL : 15 TOTAL : 60 hrs

TEXT BOOKS

1. Sinha. N.C and Roy.S.K.,"Fundamentals of prestressed concrete" S.Chand and Co Ltd 2011.
2. Krishnaraju.N., "Prestressed concrete", Tata McGraw Hill Publishing company Ltd., New Delhi, 2008.

REFERENCE BOOKS

1. Lin .T.Y., and Ned H. Burns., "Design of prestressed concrete structures",John Wiley & Sons, InternationalEdition, New York, 1995.
2. Dayaratnam.P., "Prestressed Concrete Structures" , Oxford and IBH Publishing Company pvt, Ltd, New Delhi,2008.
3. N.Rajagopalan "Prestressed Concrete", Narosana Publications,2006.
4. Guyon, Y. "Limit State Design of Prestressed Concrete Vols. I & II", Applied Science Publishers, London,1974.

12C702 - STEEL STRUCTURES

L	T	P	C
3	1	0	4

Prerequisites: *Mechanics of Solids I and II, Basic Structural Design I*

COURSE OBJECTIVES:

- *To Familiar with the design concepts of seated connections, plate girder and gantry girder.*
- *To know about the design concepts of roof trusses, chimneys and water tanks.*
- *To understand about the plastic theory.*

COURSE OUTCOMES:

CO1 : *Able to design seated connections, plate girder and gantry girder.*
CO2 : *Able to design the industrial buildings, chimneys and water tanks.*
CO3 : *Able to determine the plastic moment capacity and collapse load of sections.*

UNIT– I BUILT UP GIRDERS (09)

Design of bolts and welded connections (Stiffened and seated connections) - Design of welded plate girders – Design of stiffeners and splices – Design of girders with unrestrained compression flange – design of gantry girders.

UNIT– II ROOF TRUSSES AND INDUSTRIAL BUILDINGS (09)

Roof trusses – Dead, live and wind loads – types of roof trusses – Design of purlins – design of roof trusses. Industrial building – structural frame work for braced and unbraced – bracing of industrial buildings (types and principles only)

UNIT– III CHIMNEYS (09)

Design of chimneys – self supporting type – Guyed type at single level – Foundations for Chimneys.

UNIT– IV WATER TANKS (09)

Types of steel water tank – rectangular and cylindrical with hemispherical water tanks - design of staging and foundation

UNIT– V PLASTIC THEORY (09)

Plastic bending of beams – plastic moment capacity of sections – plastic section modulus – shape factor for rectangular, triangular, circular and hollow circular sections – Plastic hinge concept – Load factor – plastic analysis – Basic theorems – Principle of virtual work – Determination of collapse load for simply supported beam, propped cantilever beam, fixed beam, continuous beam subjected to concentrated loads and UDL – collapse load for single storey single bay portal frames.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 hrs

TEXT BOOKS

1. Duggal S.K., “Design of Steel structures”, Tata McGraw Hill., and New Delhi.2009.
2. Subramanian.N., “Design of steel structures”, Oxford university press, 2008
3. Duggal S.K..“Limit State Design of Steel Structures”, Tata McGraw Hill., and New Delhi.2010.

REFERENCE BOOKS

1. Arya A.S and Ajmani J.L, “Design of Steel structures”.Nem Chand and Bros. Roorkee,2000.
2. Bhavikatti.S.S. ,”Design of steel Structures”,I.K.International Pvt Ltd,2009
3. Ramachandra,”. Design of Steel structures” Vol I & II. Standard Book House, New Delhi, 2005.
4. Salmon C.G and Johnson J.E, “Steel Structures and Behaviour”, Harper and row, Cambridge.
5. IS:800-2007, Code of practice for general construction in steel (Third revision)
6. BIS: SP 6(I) – Hand book for structural steel sections.
7. P.Dayaratnam “Design of steel structures”, S.Chand Publishers 2011-12
8. “Teaching Resources for Structural Steel Design-Vol I&II”-INSDAG,Kolkatta
9. M.RShiyekar, “ Limit State Design of Steel Structures”,PHI Learning Private Ltd,New Delhi,2011.

12C703 - CONCRETE STRUCTURES

Prerequisites: *Basic Structural. Design-I & Basic Structural. Design-II*

L	T	P	C
3	1	0	4

COURSE OBJECTIVES:

- *To learn the types of footings, choice of foundation and its design concept.*
- *To learn the design procedures for complex structures like retaining walls, flat slabs and water tanks.*
- *To make the students to know about the earthquake resistant design and ductile detailing of structures.*

COURSE OUTCOMES:

CO1*: The students will be able to make the choice of foundation and its design as per IS codal provisions.*
CO2: *The students will be able to analyze and design the complex structures like retaining walls, flat slabs and water tanks.*
CO3: *The students will be able to apply the provisions of earthquake resistant design and ductile detailing of structures.*

UNIT–I FOOTINGS **(09)**

Design of Eccentrically loaded footings for columns – combined rectangular footings – combined trapezoidal footings for axially loaded column - Strap beam footings – Design of mat and raft foundations.

UNIT–II RETAINING WALLS **(09)**

Types of retaining walls – Cantilever retaining wall – check for structural stability – design of concrete thickness and reinforcement for stem, heel and toe slab – Counterfort retaining wall – check for structural stability – design of concrete thickness and reinforcement for stem, Counterfort, heel and toe slab - Curtailment of bars-Use of geomembranes.

UNIT–III FLAT SLAB DESIGN **(09)**

Design loads other than earthquake loads (only an introduction) – Imposed loads, wind loads, construction loads. Design by BIS code – middle panel and end panel – column strip – middle strip – with and without column head –reinforcement details.

UNIT–IV WATER TANKS DESIGN (W.S.D) **(09)**

Design of underground and on ground rectangular and circular tanks – Overhead tanks of rectangular shape and circular shape with flat and domed roof – Design of all components including staging and foundation.

UNIT– V EARTHQUAKE FORCES – DUCTILE DETAILING **(09)**

Earthquake forces – Bureau of Indian standards for Earthquake resistant design – earthquake magnitude and intensity – basic seismic coefficients and seismic zone factors – design forces – design factors – Analysis of structures– choice of method for multistoreyed buildings. Ductile detailing of frames for seismic forces – general principles.

LECTURE: 45 TUTORIAL: 15 TOTAL: 60 hrs

TEXT BOOKS

1. Varghese P.C., “Limit State Design of Reinforced Concrete”, Prentice hall of India Pvt. Ltd., 2004.
2. Sinha.S.N. “Reinforced Concrete Design”, Tata McGraw Hill publishing company Ltd., 2003.
3. Pankaj Agarwal and Manish ShriKhande, “Earthquake Resistant Design of Structures”, Prentice- Hall Of India, 2007, New Delhi

REFERENCE BOOKS

1. BIS 456 – 2000, Indian Standard code of Practice for plain and Reinforced concrete (fourth revision)
2. Dayaratnam P., "Design of Reinforced Concrete Structures", Oxford & IBH Publishing Co. Pvt. Ltd.,
3. Ramchandra," Limit State Design", Standard Book House, Delhi-6, 2002.
4. IS 13920(1993), "Ductile detailing of Reinforced concrete structures subjected to seismic forces", NewDelhi.
5. Syal.I.C & Goel.A.K, "Reinforced Concrete Structures", A.H. Wheeler and Co. Chennai – 2002
6. Sinha. W. C. and Roy. S.K, "Fundamental Reinforced Concrete", S.Chand & Company Ltd, NewDelhi-6, 2002.
7. Ramamurtham and Narayanan, "Reinforced Concrete Structures", Dhanpat Roy publishers, 2002.

12C704 - DESIGN AND DRAWING – II

(CONCRETE AND STEEL)

L	T	P	C
2	0	3	4

Prerequisites: *Steel Structures, Concrete Structures*

COURSE OBJECTIVES:

The students are able to design and detailing the concrete and steel structures

COURSE OUTCOMES:

CO1: *The student acquires hands on experience in design and preparation of structural drawings for Concrete structures*

CO2: *Students are trained to do detailed design and drawing of Steel structures.*

PART A

Detailed design and drawing of the following concrete structures:

1. Typical building floors consisting of beam and slab using BIS code.
2. Flat slab design as per BIS code
3. Isolated footings and combined footings (Rectangular, Trapezoidal)
4. Cantilever and Counterfort retaining walls.
5. Under ground water tanks.
6. Elevated water tanks.

PART B

Detailed design and drawing of the following Steel structures:

1. Columns with base plate
2. Design of Gantry Girder
3. Welded plate girder
4. Over head water tanks.
5. Simple trusses with connections.
6. Industrial building with gable frame, knee joint etc

QUESTION PAPER PATTERN:

Question paper shall consist of two questions from each part. Part A consists of 60 marks and Part B consists of 40 marks and the students have to answer one question from each part.

LECTURE: 20 DRAWING: 30 TOTAL: 50hrs

TEXT BOOKS

1. Ramamurtham and Narayanan, “Reinforced concrete structures”, Dhanpat Rai publishers, 2009.
2. Duggal .S.K, “Design of steel structures”, Tata Mcgraw –Hill Publishing company Ltd, 2009
3. N.KrishnaRaju., “Structural Design and Drawing”, University Press,2005.

REFERENCE BOOKS

1. Ramchandra, “Limit State Design”, Standard Book House, Delhi-6, 2005.
2. Ramchandra, “Design of Steel Structures”, Standard Book House, Delhi-6, 2004.
3. Sinha.S.N, “Reinforced Concrete Design”, Tata McGraw Hill publishing company Ltd., 2005.
4. Krishna Raju, N and Pranesh, R.N., “Reinforced Concrete Design – IS 456 – 2000 Principles and Practice”,New Age International Publishers, New Delhi, 2003.

12C707 - ESTIMATION AND COSTING

Prerequisites: *Steel Structures & Concrete Structures*

L	T	P	C
0	0	3	2

COURSE OBJECTIVES:

The students are able to estimate and costing of various types of buildings and also able to prepare tender and contract documents of project.

COURSE OUTCOMES:

CO1 : *This subject covers the various aspects of estimating of quantities of items of works involved in \ buildings, water supply and sanitary works.*

CO2 : *This also covers the rate analysis, valuation of properties and preparation of reports for estimation of various items.*

CO3 : *At the end of this course the student shall be able to estimate the material quantities, prepare a bill of quantities, make specifications and prepare tender documents.*

CO 4 : *Student should also be able to prepare value estimates.*

UNIT I INTRODUCTION: (09)

Estimating – preparation of detailed estimate – preparation of specifications – Report accompanying the estimate.

UNIT II RATE ANALYSIS: (09)

Purpose – Schedule of rates and data sheets – requirements of labour and materials for different types of works. Costing – Approximate methods of costing – types of estimate – costing of various structure – abstract estimate.

UNIT III TENDER AND CONTRACT: (09)

Tender notice – Types – Corrigendum notice – Tender procedures – Drafting – model tenders. Contract – types of contract – contract for labour and material – work order – billing – running account bill – first and final bill.

UNIT IV VALUATION: (09)

Scopes of valuation – types of valuation – escalation – evaluation.

UNIT V COST ESTIMATION FOR THE FOLLOWING USING MICROSOFT EXCEL (09)

Estimation of quantities and rate abstracts for

1. Single storey buildings
2. Two storeyed buildings
3. Water tanks

TOTAL: 45hrs

TEXT BOOKS:

1. S.Dutta, “Estimation and costing in Civil Engineering”, UBS publishers Limited, 2007.
2. Bhasin, P.L., “Quantity Surveying”, 2nd Edition, S.Chand & Co., 2000.

REFERENCE BOOKS

1. Jagannathan, G. ,”Getting more at less cost – The value Engineering way”, Tata McGraw Hill Publishing company, New Delhi, 2000.
2. Sengupta, “Contruction Engineering and Management”, Tata McGraw Hill Publishing company, New Delhi, 2001.

12C708 - COMPUTER APPLICATION LABORATORY

Prerequisites: *Basic Structural Design II (Concrete)& Concrete Structures*

L	T	P	C
0	0	3	2

COURSE OBJECTIVES:

- *To improve the programming skills for analysis and design of structures.*
- *To use the modern computing tools to formulate analyze and design of various concrete and steel structures*

COURSE OUTCOMES:

CO1: *The students will be able to apply software tools for analyzing and designing concrete and steel Structures.*

CO2: *The students will be able to use STAAD PRO for analyzing and design of concrete and steel Structures*

DEVELOPMENT AND IMPLEMENTATION OF PROGRAM USING SOFTWARE (25)

1. Design of singly and doubly reinforced beams (Design and check for shear & deflection)
2. Design of one way slab and two way slab
3. Design of Flat slab
4. Design of columns
5. Design of RCC Retaining wall
6. Concrete mix design for M25 & M30 grade.

DEVELOPMENT AND IMPLEMENTATION OF PROGRAM USING STAAD PRO (25)

1. Analysis & Design of 2D & 3D Truss
2. Analysis & Design of 2D & 3D Frames
3. Design and detailing of trusses & frames (2D& 3D)
4. Structural design of Steel Gable Frames
5. Analysis and Design of simple two storey buildings

TOTAL: 50hrs

TEXT BOOK

1. Krishnamoorthy C.S., and Rajeev.S., “Computer Aided Design and Analytical tools”, Narosa., 2000

12C6E0 - CONSTRUCTION MANAGEMENT

Prerequisites: Construction Technology

COURSE OBJECTIVES:	**L**	**T**	**P**	**C**
The students are able to plan and execution of projects	**3**	**0**	**0**	**3**

COURSE OUTCOMES:

CO1: *To understand the basic concepts of materials and equipment management in construction industry.*

CO2: *The students acquire knowledge on the preparation of project budget, schedule and control of project activities.*

CO3: *The subject also helps the students in maintaining financial accounting systems and application of project management software.*

UNIT – I BASIC CONCEPTS IN MANAGEMENT (09)

Principles of Management – Functions of Management – Types of organisation – Types of Business Operations – Sole proprietorship – Partnership – Company, Public and private sector enterprises – joint Ventures – Collaborations – Bank Accounts Cheques – Operations.

UNIT – II CONSTRUCTION PLANNING AND SCHEDULING (09)

Development of construction plans – Defining work tasks and their relationship – Estimating activity duration and resource requirements – Work Breakdown Structure – coding systems. Relevance of Construction schedules – Bar charts – The Critical Path Method – float calculations – PERT – Scheduling with uncertain duration – Precedence Network Analysis– Crashing and Time/cost trade-offs.

UNIT – III MATERIALS AND EQUIPMENT MANAGEMENT (09)

Planning – Identification, Procurement and Inventory Control – Resource Allocation, Resource Leveling – Linear Programming – Transportation Problem – System approach in resource management – ABC analysis, VED analysis,FSN analysis, Vendor rating evaluation, Buying versus leasing of equipment.

UNIT – IV HUMAN RESOURCE MANAGEMENT (09)

Scope and objectives of HRM – Manpower policy and planning – Recruitment and selection – Training Performance appraisal – Wage Policy and Compensation systems – Company union relationship and collective bargaining – Accidents– Absenteeism and Labour Turn over – Grievances/Conflicts – Identification and resolution.

UNIT – V COST CONTROL AND SOFTWARE APPLICATIONS

The cost control problem – The Project Budget – Forecasting for Activity cost Control – Financial accounting systems and cost accounts – Control of project cash flows – Schedule control – Schedule and Budget updates – Relating cost and schedule information – Software applications – Project Management Software – Planning, Scheduling and Resource analysis – Recording and operations – Project accounting, costing and finance.

LECTURE : 45 TOTAL: 45hrs

TEXT BOOKS

1.Chitkara, K.K.,"Construction Project Management Planning, Scheduling and Controlling", Tata McGrawHill Publishing Company Ltd., 2006.

2. B Sengupta H Guha " Construction Management and Planning", Tata McGraw Hill Company Ltd., 2003.

3. Sangareddi P L Meiyappan , "Construction Management", Kumaran Publications,Coimbatore.

REFERENCE BOOKS

1. Moder. J., C.Philips and Davis, "Project management with CPM, PERT and Precedence Diagramming, Vann strand Reinhold Company, 2001.

2. Clifford F. Gray and Erik W, Larson, "Project management-The Managerial Process", Tata McGraw Hill Company Ltd., 2008.

3. Momoria, "Personnel Management", Himalaya Publishing Company, 2000.

12C6E1 - RAILWAY ENGINEERING

L	T	P	C
3	0	0	3

Prerequisites: Nil

COURSE OBJECTIVES:

The students are able to plan, design and construction of railway networks and stations.

COURSE OUTCOMES:

CO1 : *The students gain information regarding the basics of railway engineering and railway components.*
CO2: *Students will be able to do geometric design of railway network.*
CO3: *Students gain information regarding railway construction and maintenance.*
CO4: *Students are able to know about the signals and control systems in railway engineering.*

UNIT – I INTRODUCTION TO RAILWAY PLANNING AND RAIL ELEMENTS (09)

Historical development of Indian railways-Route alignment surveys, modern methods – Elements of permanent way –Rails, sleepers, ballast, rail fixtures and fastenings, coning of wheels, creep in rails, defects in rails.

UNIT – II RAILWAY GEOMETRIC DESIGN (09)

Geometric design of railway track, gradient, super elevation, widening of gauge on curves

UNIT – III RAILWAY STATION YARDS AND OPERATIONS (09)

Planning and development of railway station yards, –Turnouts, points and crossings – Signaling - Interlocking, track circuiting – Modern developments in railways, urban railways, underground and tube railways–Basic planning for MRTSand Suburban railways–Electric traction.

UNIT – IV RAILWAY CONSTRUCTION AND MAINTENANCE (09)

Earthwork – Stabilization of track on poor soil- Tunneling - Methods, drainage and ventilation – Construction and maintenance of tracks – unigauge – Maintenance of rolling stocks.

UNIT – V SIGNALLING AND INTERLOCKING (09)

Signaling and Interlocking – Automatic signals – Electric circuiting- modern signals, maintenance of signals.

LECTURE : 45 TOTAL: 45hrs

TEXT BOOKS

1. Saxena Subhash, C. and Satyapal Arora, A Course in Railway Engineering, Dhanpat Rai and Sons, Delhi,1998
2. Rangwala.P.S, Railway Engineering, Charotar Publishing House, 1995

REFERENCE BOOKS

1. Vazirani.V.N. and Chandola.S.P., Transportation Engineering-Vol.1, Khanna Technical Publications, NewDelhi 1991.
2. Agarwal.M.M., Indian Railway Track, New Delhi.

12C6E2 - SMART MATERIALS AND SMART STRUCTURES

L	T	P	C
3	0	0	3

Prerequisites: Nil

COURSE OBJECTIVES:

- *To make the students to gain the knowledge on strain measuring techniques, smart materials and signal processing and control systems.*

COURSE OUTCOMES:

CO1: *Able to explain the functions and response of instrumented structures and measurement of strain using electrical strain gauges.*

CO2: *Able to know the various smart materials such as sensors and actuators.*

CO3: *Able to know about the control systems for smart structures.*

UNIT–I INTRODUCTION (09)

Introduction to Smart Materials and Structures - Instrumented structures functions and response - Sensing systems – Self -diagnosis - Signal processing consideration -Actuation systems and effectors.

UNIT–II MEASURING TECHNIQUES (09)

Strain Measuring Techniques using Electrical strain gauges, Types - Resistance - Capacitance - Inductance – Wheatstone bridges - Pressure transducers - Load cells - Temperature Compensation - Strain Rosettes.

UNIT–III SENSORS (09)

Sensing Technology - Types of Sensors - Physical Measurement using Piezo Electric Strain measurement – Inductively Read Transducers - The LVDT - Fiber optic Techniques. Chemical and Bio-Chemical sensing in structural Assessment- Absorptive chemical sensors - Spectroscopes - Fibre Optic Chemical Sensing Systems and Distributed measurement.

UNIT–IV ACTUATORS (09)

Actuator Techniques - Actuator and actuator materials - Piezoelectric and Electrostrictive Material – Magneto structure Material - Shape Memory Alloys-Electro-rheological Fluids- Electromagnetic actuation - Role of actuators and Actuator Materials.

UNIT–V SIGNAL PROCESSING AND CONTROL SYSTEMS (09)

Data Acquisition and Processing - Signal Processing and Control for Smart Structures - Sensors as Geometrical Processors- Signal Processing - Control System - Linear and Non-Linear.

LECTURE: 45 TOTAL: 45hrs

TEXT BOOKS

1. Brain Culshaw,"Smart Structure and Materials", Artech House - Borton. London, 2003..

2. Srinivasan, A.V. and Michael McFarland, D., "Smart Structures: Analysis and Design", Cambridge UniversityPress, 2010.

3. Yoseph Bar Cohen, "Smart Structures and Materials", The International Society for Optical Engineering2003.

REFERENCE BOOKS

1. L. S. Srinath, "Experimental Stress Analysis", Tata McGraw Hill, 2004.

2. J. W. Dally & W. F. Riley,"Experimental Stress Analysis", Tata McGraw Hill Company.

12C6E3 - MAINTENANCE AND REHABILITATION OF STRUCTURES

Prerequisites: Construction Technology & Concrete technology

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *To make the students to gain the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures*

COURSE OUTCOMES:

CO1 : *The students will obtain the knowledge of maintenance and repair of structures.*

CO2 : *The students acquire the concepts of various techniques for strengthening of structures.*

UNIT I - MAINTENANCE AND REPAIR STRATEGIES (9)

Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration, Diagnosis of causes and preventive measures.

UNIT II - SERVICEABILITY AND DURABILITY OF CONCRETE (9)

Quality assurance for concrete construction concrete properties – strength, permeability, thermal properties and cracking.– Effects due to climate, temperature, chemicals, corrosion – design and construction errors – Effects of cover thickness and cracking.

UNIT III- SPECIAL MATERIALS FOR REPAIR (9)

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, ferro cement, Fibre reinforced concrete.

UNIT IV- TECHNIQUES FOR REPAIR AND DEMOLITION (9)

Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Gunite and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, coating and cathodic protection. Engineered demolition techniques for Dilapildated structures – case studies.

UNIT V- REPAIRS, REHABILITATION & STRENGTHENING OF STRUCTURES (9)

Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure. Strengthening of Super Structures – plating - Conversion to composite construction – post stressing - Jacketing - Reinforcement addition, strengthening the substructures - Increasing the load capacity of footing.

LECTURE: 45 TOTAL: 45hrs

TEXT BOOKS

1. *Denison Campbell, Allen and Harold Roper, Concrete Structures, Materials, Maintenance and Repair, LongmanScientific and Technical UK, 1991.*
2. *R.T.Allen and S.C.Edwards, Repair of Concrete structures, Blakie and Sons, UK, 1987*
3. *Johnson,S.M., "Deterioration, Maintenance and repair of Structures", McGraw-Hill Book Company, Newyork,1965.*

REFERENCE BOOKS

1. *M.S.Shetty, Concrete Technology – Theory and Practice, S.Chand and Company, New Delhi, 1992.*
2. *M.L. Gambhir, Concrete Technology, Tata Mc-Graw Hill Company, Noida, 2011.*
3. *Santhakumar, A.R., Training Course notes on Damage Assessment and repairs in Low Cost Housing, "RHDC– NBO" Anna University, July 1992.*
4. *Lakshmipathy, M. etal. Lecture notes of Workshop on "Repairs and Rehabilitation of Structures", 29 - 30thOctober 1999*

12C6E4 - SAFETY IN CIVIL ENGINEERING PRACTICES

Prerequisites: Construction management

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

To impart the basic knowledge about safety requirement during construction work

COURSE OUTCOMES:

CO1: *The students got idea on safety measures taken during pre-construction and post-construction work*
CO2: *The students acquire knowledge on equipments needed for safety during construction*

UNIT I PRE-CONSTRUCTION CONSIDERATIONS (09)

Planning and scheduling , Housekeeping and on-site safety , Basic checklist , Asbestos removal Electrical power lines, Overhead high-voltage electricity Overhead low-voltage electricity, Underground electrical hazards.

UNIT II CONSTRUCTION (09)

Basic personal protective equipment and clothing -Foot protection ,Head protection Hearing protection- Trenches and excavations- General requirements, Sloping and shoring requirements Additional excavation requirements.

UNIT III FORMWORK AND POURING (09)

Formwork , Concrete pouring and pumping - General framing - Guardrails and floor openings, Floor and roof openings, Lifting walls, Fall protection, Selecting fall protection Planning for fall protection on your project Fall protection plan

UNIT IV TRUSSES AND ROOF WORK (09)

Trusses- Instruction for truss installers , Truss erection Roof work -Roof jacks and toe-holds(slide guards) Scaffolds Guardrails for scaffolds Toe boards for scaffolds -Wood scaffold erection guidelines -Design and erection requirements for job-constructed wood scaffolds Scaffold planks -Other types of scaffolds ,Ladder-jack scaffolds Trestle scaffolds ,Shore and lean-to scaffolds - Rolling scaffolds

UNIT V EQUIPMENT SAFETY (09)

Ladders Requirements for safe ladder use , Job-built ladders, Stepladders. Safe Work Practices for House Construction, Electrical power tools and cords Safe work procedures ,Hand tool ergonomics Factors affecting tool use ,Reducing risk of injury Compressed air for cleaning Pneumatic nailing and stapling equipment, Safe work procedures, Power tools—saws ,Basic safety Kickback, Construction site hazards

LECTURE : 45 TOTAL : 45 hrs

TEXT BOOKS

1. Allen St.John Hot ,"Principles of Construction Safety" John Wiley & Sons (2005)
2. Mark Mc.Guire Moran "Construction Safety Hand Book" (1996)

REFERENCE BOOKS

1. Grimaldi Simonds "Safety Management " AITBS Publishers ,New Delhi (2001)
2. V.J.Davies .K.Tomasin " Construction Safety Handbook" (1996)

12C7E0 - FINITE ELEMENT METHOD

L	T	P	C
3	0	0	3

Prerequisites: Engineering Mathematics

COURSE OBJECTIVES:

- *To apprise the students about the basics of Finite Element theory, computer implementation of this theory and its practical applications*

COURSE OUTCOMES:

CO1: *To understand the basic principles of structural mechanics and to apply the concepts on simple structural elements*

CO2: *The students are able to solve simple structural mechanics problems using finite elements and Isoparametric elements*

CO3*: To learn about various numerical solution techniques*

UNIT– I ELEMENTS OF ELASTICITY (09)

Basic principles of structural mechanics – Equations of equilibrium – Strain displacement relations – Stress strain relations– Plane stress and plane strain cases – Principles of Virtual work and minimum potential energy.

UNIT– II DIRECT STIFFNESS METHOD (09)

Steps in direct method of FEA – Element stiffness matrix – Global stiffness matrix – Boundary conditions – Problems on simple beams and Trusses.

UNIT– III FINITE ELEMENTS (09)

Discretization - Basic element shapes - Element properties – Node numbering procedure – Convergence requirements – Generalised co-ordinates – Natural co-ordinates – Shape functions for linear & quadratic models – Stiffness matrix – Nodal load vector – Static condensation – Simple problems.

UNIT– IV INTRODUCTION TO ISOPARAMETRIC ELEMENTS (09)

Concept of sub, iso, super parametric elements – Gauss quadrature – Examples in one and two dimensional elements.

UNIT– V SOLUTION TECHNIQUES (09)

Different solvers – Variational approach – Weighted mean residual methods like Collocation method, Subdomainmethod, Galerkin method and Least square method – Simple problems only

LECTURE : 45 TOTAL :45 hrs

TEXT BOOKS

1. Krishnamoorthy C.S., "Finite Element Analysis- Theory and Programming", Second Edition, Tata McGrawHill Publishing Co.,2004.

2. Tirupathi R. Chandrupatla and Ashok D. Belugundu , "Introduction to Finite Elements in Engineering",Third Edition, Prentice Hall India Pvt Ltd, 2011.

3. P.Seshu, "Textbook of Finite Element Analysis", Prentice Hall India Pvt Ltd, 2008.

REFERENCE BOOKS

1. Cook Robert. D, "Concepts and Applications of Finite Element Analysis", John Wiley and Sons, INC,1995.

2. Rajasekaran.S., "Finite Element Analysis in Engineering Design", Wheeler Publishing,2000.

3. S.S.Rao, "The Finite Element Method in Engineering", Buttersworth-Heinemann publishing, 2000.

12C7E1 - ADVANCED CONCRETE DESIGN

Prerequisites: *Basic Structural Design II (Concrete), Concrete Structures*

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *To create an awareness on yield line theory of slabs.*
- *To understand the design principles of Grid floors, ribbed slabs and bunkers and silos.*
- *To understand the design of slender columns, RC walls, bridges, corbels and deep beams.*

COURSE OUTCOMES:

CO1: *Able to analyse slabs using yield line.*
CO2: *Able to design Grid floors, ribbed slabs and bunkers and silos.*
CO3: *Able to design of slender columns, RC walls, bridges, corbels and deep beams.*

UNIT– I YIELD LINE THEORY OF SLABS AND INELASTIC BEHAVIOUR OF CONCRETE BEAMS **(09)**

Yield line theory- Assumptions made in analysis – analysis of isotropically and orthotropic ally reinforced slabs for various shapes and different edge conditions by virtual work method and equilibrium method – design by limit state method. Inelastic behaviour of concrete beams, moment rotation curves, moment redistribution

UNIT– II DESIGN OF SPECIAL RC ELEMENTS **(09)**

Design of slender columns – concrete confined by reinforcement – provision for ties in reinforced concrete slab –frame system – Design of cast-in-situ joints in frames – design of RC walls – ordinary and shear walls – design of corbels.

UNIT– III GRID FLOORS AND RIBBED SLABS **(09)**

Grid floors – design principles – analysis of grid floor by approximate method – detailing of steel in flat grids. Ribbed slabs– specifications – analysis of slab for moment and shear – deflection – Design – arrangement of reinforcement – deep beams.

UNIT– IV BUNKERS AND SILOS **(09)**

Design of Bunkers – Design of Silo- Detailing.

UNIT–V SPECIAL TOPICS **(09)**

Types of bridges – IRC loadings – Design of single span slab bridge deck for class A loading – Design of the deck of T– beam and slab bridge for class AA loading. Design of Corbels – Deep beams.

LECTURE : 45 TOTAL :45 hrs

TEXT BOOKS

1. Varghese.P.C., "Advanced Reinforced concrete design", Prentice – Hall of India Private Ltd, NewDelhi,2007..
2. Krishna raju, " Advanced reinforced concrete design – S.I units", C.B.S., New Delhi, 2006.

REFERENCE BOOKS

1. Purushothaman,P., "Reinforced concrete structural Elements", Tata McGraw Hill, NewDelhi,2002..
2. Ashok. K.Jain., "Reinforced concrete- Limit state design", NemChand Bros, Roorkee, 2000.
3. Sinha. S.N., "Reinforced Concrete Design", Tata McGraw Hill, New Delhi, 2003.
4. Syal I.C. and Goel A.K., "Reinforced Concrete Structures", A.H.Wheeler &Co., 2004.
5. IS 456-2000, "Indian standard code of practice for plain and reinforced concrete", Bureau of Indian standards, New Delhi, 2000.
6. SP 34(1987), "Handbook on Concrete Reinforcement and Detailing", BIS, New Delhi.

12C7E2 - BASICS OF DYNAMICS AND ASEISMIC DESIGN OF STRUCTURES

L	T	P	C
3	0	0	3

Prerequisites: Structural Analysis I & II

COURSE OBJECTIVES:

- *To learn the basics of various dynamic forces and its effects on the structure.*
- *To enhance the ability to identify the mode shapes of the structure under dynamic loading*
- *To learn the causes and effects of earthquake and its measurement.*
- *To enhance the ability to design an earthquake resistant structures by using IS codal provisions.*

COURSE OUTCOMES:

CO1: *The student will be able to understand the theory of vibrations and determine response of structures.*
CO2: *The student will be able to calculate the magnitude and interpret the intensity of earthquake.*
CO3: *The student will be able to design an earthquake resistant structure as per IS codal provisons.*

UNIT – I THEORY OF VIBRATIONS (09)

Concept of inertia and damping – Types of damping – Difference between static forces and dynamic excitation –degrees of freedom – SDOF idealization – Equations of motion of SDOF system of mass as well as base excitation –Free vibration of SODF system – response to harmonic excitation – Impulse and response to unit impulse–Duhamel integral.

UNIT – II MULTIPLE DEGREE OF FREEDOM SYSTEM (09)

Two degree of freedom system – Normal modes of vibration – Natural frequencies – Mode shapes – Introduction to MODF systems – Decoupling of equations of motion – Concept of mode superposition (No derivations)

UNIT – III ELEMENTS OF SEISMOLOGY AND SEISMIC DESIGN CONCEPT (09)

Causes of earthquake – Geological faults – tectonic plate theory –Elastic rebound – Epicentre – Hypocentre – primary, shear and Raleigh waves – seismogram – magnitude and intensity of earthquake – magnitude and intensity scales– Spectral acceleration – Information on some disastrous earthquakes – concept of earthquake resistant design –strong column weak beam concept – guide lines for seismic resistant construction – effects of structural irregularities – seismo resistant building architecture.

UNIT – IV RESPONSE OF STRUCTURES TO EARTHQUAKES (09)

Response and design spectra –Design earthquake – concept of peak acceleration – Site specific response spectrum –Effect of soil properties and damping – Liquefaction of soils – Importance of ductility – Methods of introducing ductility into RC structures.

UNIT – V DESIGN METHODOLOGY (09)

IS 1893, IS 13920 and IS 4326 – Codal provisions – design as per the codes – Base isolation techniques – Vibration control measures – Important points in mitigating effects of earthquakes on structures.

LECTURE : 45 TOTAL :45 hrs

TEXT BOOKS

1. Chopra, A.K., "Dynamics of structures – Theory and Applications to Earthquake Engineering", Second Edition, Pearson Education, 2005.
2. David Key, " Earthquake design practice for building ", Thomas Telford, London NPEEE Publications.
3. Pankaj Agarwal and Manish ShriKhande, "Earthquake Resistant Design of Structures", Prentice- Hall Of India, 2007, New Delhi

REFERENCE BOOKS

1. *Arya.A.S., ed., "Earthquake engineering", Jai Krishna 60th Birthday Anniversary commemoration volume, ISET, Sarita prakashan, Meerut, 1974.*
2. *Biggs, J.M., "Introduction to Structural Dynamics", McGraw – Hill Book Co., Ny., 1964.*
3. *Dowrick, D.J., "Earthquake Resistant Design", John Wiley & sons, London, 1977.*
4. *Paz, M., "Structural Dynamics – Theory & Computation", CSB Publishers & Distributors, Shahdara, Delhi,1985.*

12C7E3 - PAVEMENT ENGINEERING

Prerequisites: *Highway Engineering*

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *Student gains knowledge on various IRC guidelines for designing rigid and flexible pavements. Further, he/she will be in a position to assess quality and serviceability conditions of roads.*

COURSE OUTCOMES:

CO1: *The students will learn the types of pavements and approaches to pavement design.*
CO2: *Students learn to use IRC guidelines for designing pavements*.
CO3: *The students will also learn about the evaluation of pavements and strengthening methods.*

UNIT – I BASIC CONCEPTS **(09)**

Objects and Requirements of Pavements – Pavement types – Functions and characteristics of pavement – Approaches to Pavement design – Design factors considered in design of Pavements – Design wheel load – Maximum wheel load –contact pressure – ESWL – Repetition of loads – Stresses and deflections in layered systems.

UNIT – II FLEXIBLE PAVEMENT **(09)**

Design of flexible pavement by group index – CBR – California R value – Triaxial McLeod and Burmister – IRC design guidelines.

UNIT – III RIGID PAVEMENT **(09)**

Design – General design considerations – Westerguard's equation for wheel loads – Evaluation of wheel load stresses –Temperature stresses – Design of joints – IRC design guidelines – Airfield pavements – design principles.

UNIT – IV QUALITY CONTROL **(09)**

Field compaction – Rammers – Rollers – Compaction control – Insitu density –Pavement materials - Bitumen – Ductility– Viscosity – Binder content and Softening point Tests – Aggregate – Crushing – Abrasion – Impact Tests – Water absorption – Flakiness and Elongation indices.

UNIT – V EVALUATION AND REHABILITATION **(09)**

Need for highway maintenance – classification of maintenance works – maintenance management system – Pavement failures – causes and Types – importance of highway drainage – Pavement evaluation and rehabilitation – condition and evaluation surveys – serviceability index of rural roads – Strengthening of existing pavements – overlay design.

LECTURE : 45 TOTAL :45 hrs

TEXT BOOKS

1. Yoder, R.J and Witchak, M.W "Principles of Pavement Design", John wiley, 2000.
2. Khanna, S.K and Justo C.E.G "Highway Engineering", New Chand and Brothers, Roorkee, 2002.

REFERENCE BOOKS

1. Kadiyali, L.R., "Transport planning & Traffic Engineering" Khanna Publishers, 2003.

2. Wright, P.H "Highway Engineers", Johnwiley& Sons, Inc, New York, 1996.

3. Design and specification of Rural Roads (Manual), Ministry of rural roads, Government of India, New Delhi,2001.

4. Guidelines for the Design of Flexile Pavements, IRC : 37-2001, The Indian roads congress, New Delhi.

5. Guidelines for the Design of Rigid Pavements for Highways, IRC : 58-1998, The Indian Roads Congress,New Delhi.

6. O' Flaherry, C.A – Highway Engineering Vol 2, Edward Arnold Cp. 1978.

12C7E4 - TOWN PLANNING AND ARCHITECTURE

Prerequisites: Computer Aided Building Drawing

L	T	P	C
3	0	0	3

COURSE OBJECTIVES: Students are introduced the basics of Town Planning and Architecture

COURSE OUTCOMES:

CO1: *Students will be able to know about the basics of town planning and building rules.*
CO2: *Students able to apply the architectural principles in the area of Civil Engineering.*
CO3: *Students will be able to do planning and interior design of building.*

UNIT I: TOWN PLANNING (09)

History of evolution of towns - Town and environment - Climate, humidity, wind and radiation - Surveys and Data collection - Residential neighborhoods - Industrial areas - Public Buildings - Housing and Slum clearance.

UNIT II: BUILDING RULES AND GUIDELINES (09)

General – Zoning regulations – Regulations regarding layouts or subdivisions – Building regulations – Rules for special types of buildings – Floor space index – minimum plot size and building front age – Open spaces – Minimum standard dimensions of building elements – Provision for lighting and ventilation – Provision for means of access.

UNIT III : BASIC ELEMENTS OF ARCHITECTURE (09)

Introduction of Architecture – Definition – Mass and space visual emotional effects of geometric forms and their derivatives– The sphere, the cube, the pyramid, the cylinder and cone – The aesthetic qualities of Architecture – Proportion, scale, balance, symmetry, rhythm and axis – contrast in form – Harmony.

UNIT IV : PRINCIPLES OF OREINTATION AND PLANNING OF BUILDINGS (09)

General – factors affecting orientation – sun – Wind – Rain – Orientation criteria for Indian conditions – Principles governing the theory of Planning – Planning of Residential buildings.

UNIT V: ELEMENTS OF INTERIOR DESIGN (09)

General – Decorative Materials – Cement Bonded Board (BISON PANEL), Water proof cement paint, Industrial glazing and Roofing, unit masonry, plaster and dry wall, Wall surface materials, Effect of colour on architecture – Home furnishing– plans in rooms.

LECTURE : 45 TOTAL :45 hrs

Text Book

1. S.C.Rangwala, "Elements of Town Planning", Mc Graw Hill, London, 2006.

REFERENCE BOOKS

1. V.S.Pramar, 'Design fundamentals and architecture' Lakshmi Publishers, 2003.
2. Hiraskar, "fundamentals in town planning" Khanna Publishers, 2005.

12C7E5 - INDUSTRIAL WASTEWATER MANAGEMENT

Prerequisites: Waste water Engineering

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To impart knowledge on sources and characteristics of various industrial wastes and strategies for its prevention and control

COURSE OUTCOMES:

CO1: Students are exposed to the effects of wastes, effluent standards, recovery and reuse methods and various environmental legislations.
CO2: Students will know about the conventional and advanced waste water treatment processes.
CO3: Case studies of all industrial units with its manufacturing and effluent treatment flow sheets.

UNIT–I INTRODUCTION (09)

Effects of Industrial Wastes on Streams, Land and wastewater Treatment Plants – water quality criteria – Effluent standards – Industrial effluent - volume reduction – Strength reduction – Process Modification - Methods and Materials changes - Housekeeping – established recovery and reuse methods for byproducts within the plant operations – Regularity requirements and Environmental legislations.

UNIT– II INDUSTRIAL EFFLUENT TREATMENT (09)

Equalization and Neutralization – separation of Solids - Physio-chemical treatment – Removal of organic and inorganic solids – combined treatment of Industrial and municipal Wastes - Individual and Common Effluent Treatment Plants. Biological treatment methods – Aerobic and Anaerobic digestion – Ultimate disposal of sludge – Cleaner Technologies and pollution prevention – Waste minimization – Management of RO rejects.

UNIT– III ADVANCED WASTEWATER TREATMENT, REUSE AND RESIDUE MANAGEMENT (09)

Chemical Oxidation - Ozonation - Photocatalysis - Wet Air Oxidation - Evaporation - Ion exchange – Membrane technologies - Nutrient removal - Land treatment – Well injection. Quantification and characteristics of sludge -thickening, Digestion, Wet combustion - Conditioning, Dewatering and Disposal of Sludge

.

UNIT– IV CASE STUDIES – 1 (09)

Industrial manufacturing process description, wastewater characteristics and effluent treatment flow sheet for Textiles, Sugar mill, distilleries, Thermal power plant, Nuclear power plant, Petroleum refineries, Fertilizers and Dairy.

UNIT–V CASE STUDIES – 2 (09)

Industrial manufacturing process description, wastewater characteristics and effluent treatment flow sheet for Tanneries, Pulp and Paper mill, Chemical industries, Metal finishing industries, Iron and Steel industries, Meatpacking industries and Poultry plant - Industrial estates and Industrial Clusters.

LECTURE : 45 TOTAL :45 hrs

TEXT BOOKS

1. M. Narayana Rao and Amal K. Dutta, "Wastewater Treatment", Oxford & IBH Publishing Co., Pvt. Ltd., New Delhi, 2001.

2. D. Barnes, P. J. Buss and B. W. Gould, "Water and Wastewater Systems", Pitman Publishing Inc., Marshfield, 2000.

REFERENCE BOOKS

1. Nemerow N. L., "Industrial Water Pollution", Addison - Wesley Publishing Company Inc.,USA,1978.

2. Wesley Eckenfelder Jr. W, "Industrial water pollution control", McGraw Hill book Co, New Delhi, 2001.

3. Mahajan S. P. "Pollution Control in process industries", Tata McGraw Hill Publishing Co Ltd., New Delhi,1989.

4. "Pollution Prevention and Abatement Handbook Towards Cleaner Production" - The World Bank Group,Washington, D. C., 1998.

12C7E6 - OPERATIONS RESEARCH

Prerequisites: Nil

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

To understand the basics of linear, network, inventory and replacement models and queuing theory.

COURSE OUTCOMES:

CO1*: Able to formulate the linear programming model for real life problem.*
CO2: *Obtain the concept of CPM and PERT network*
CO3: *Usage of various models in operation research for the project work*

UNIT I LINEAR MODEL **(09)**

The phases of OR study – formation of an L.P model- graphical solution – simplex algorithm – artificial variables technique– Big M method, two phase method, Duality in LPP. Transportation problems- VAM – MODI technique, Assignment problems.

UNIT II NETWORK MODELS **(09)**

Shortest route – minimal spanning tree - maximum flow models – project network- CPM and PERT network critical path scheduling.

UNIT III INVENTORY MODEL **(09)**

Types of Inventory- EOQ –ERL- Deterministic inventory problems – Price breaks - Stochastic inventory problems selective inventory control techniques.

UNIT IV REPLACEMENT MODELS **(09)**

Replacement of items that deteriorate with time – value of money changing with time – not charging with time –optimum replacement policy – individual and group replacement. Sequencing problem: models with n jobs with 2machines – problem with jobs with m machines.

UNIT V QUEUING THEORY **(09)**

Queuing models – queuing systems and structures – notation –parameter – single server and multiserver models –Poisson input – exponential service – constant rate service – infinite population.

LECTURE : 45 TOTAL :45 hrs

TEXT BOOKS

1. Wayne.L.Winston, Operations research applications and algorithms, Thomson learning,4th edition 2007.
2. Taha H.A, "Operation Research", Pearson Education sixth edition, 2003.

REFERENCE BOOKS

1. Frederick.S.Hiller and Gerald.J.Lieberman, "Operations research concepts and cases", TMH (SIE) 8th edition.
2. J.K.Sharma, "Operations research theory and applications", Macmillan India .3rd edition 2007,
3. Hira and Gupta " Problems in Operations Research", S.Chand and Co,2002.
4. Panneerselvam, "Operations Research" Prentice Hall of India, 2003.
5. G Srinivasan, "Operations research principles and applications", PHI (EEE) 2007.
6. Wagner, "Operations Research", Prentice Hall of India, 2000.

12C7E7 - PROFESSIONAL ETHICS

Prerequisites: Nil

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *To enable the students to create an awareness on Engineering Ethics and Human Values, to instill Moral and Social Values and Loyalty and to appreciate the rights of others.*

COURSE OUTCOMES:

CO1: *This subject covers the various ethical theories in Engineering.*
CO2: *The students acquire knowledge on Engineering responsibility for safety and rights.*
CO3: *Students will gain knowledge about the global issue related to Engineering ethics.*

UNIT–I ENGINEERING ETHICS (09)

Senses of Engineering ethics – Variety of moral issues – Types of inquiry- Moral dilemmas. Moral autonomy – Kolberg's theory – Gilligan's theory – consensus and controversy – professions and professionalism – professional ideals and virtues – theories about right action – self interest – customs and religion – use of ethical theories.

UNIT–II ENGINEERING AS SOCIAL EXPERIMENTATION (09)

Engineering as social experimentation – engineers as responsible experimenters – codes of ethics – a balanced outlook on law – Case studies

UNIT–III ENGINEERS RESPONSIBILITY FOR SAFETY (09)

Safety and risk – assessment of safety and risk – risk benefit analysis – reducing risk – Case studies

UNIT–IV RESPONSIBILITIES AND RIGHTS (09)

Collegiality and loyalty – respect for authority – collective bargaining – confidentiality – conflicts of interest – occupational crime – professional rights – employee right – discrimination – intellectual property rights, Case studies

UNIT–V GLOBAL ISSUE (09)

Multinational corporations – environmental ethics – computer ethics – weapons development – engineers as managers– consulting engineers – engineers as expert witnesses and advisors – moral leadership – sample code of conduct, Case studies

LECTURE : 45 TOTAL :45 hrs

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering" McGraw hill, New York, 2004.
2. Charles d Fleederman, " Engineering Ethics" prentice hall, New Mexico, 2003.
3. Charles e Harris.J.R.Micheal S. Pritchard, Micheal J.Rabins, " Engineering Ethics" Second Edition ThomsonWadsworth, 2000.

REFERENCE BOOKS

1. *Laura Schlesinger, "How Could You Do That The Abdication of Character, Courage and Conscience" HarperCollins, New York, 1996.*
2. *Stephen Carter, "Integrity Basic book", New York, 1996.*
3. *Tom Rusk "The Power of Ethical Persuation : From Conflict to Partnership at Work and In Private Life"Viking, New York, 1993.*
4. *Govindarajan. M, Natarajan. S ,Senthilkumar. V.S, "Engineering Ethics" Prentice Hall, New Delhi, 2004.*

12C7E8 - AIRPORT, DOCKS AND HARBOUR ENGINEERING

Prerequisites: Nil

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To expose the students to design principles of Airports and Harbours.

COURSE OUTCOMES:

CO1: *The student shall understand the Airport components and its design.*
CO2: *Student will have the knowledge on types of docks and harbours, functional design and usage.*
CO3: *Student will have the knowledge on types of signals, dredging and its application*.

UNIT– I AIRPORTS **(09)**

Air transport-development in India and importants in national transportation sector-airport planning and site selection for landing and terminal areas – layout of their components and locational requirements- airport classification- design standards of airports.

UNIT– II AIRPORT COMPONENTS AND DRAINAGE **(09)**

Runways – Orientation – types, pattern layout- basic runway length-runway design – orientation, geometric design and corrections- Taxiways and apron - general principles of design, layout, construction and maintenance terminal area- terminal buildings, hangers and auxiliary structures. Airport drainage- various types, materials and construction features- airport marking and lighting.

UNIT– III DOCKS AND HARBOURS **(09)**

Historical development of docks, harbours and seaports- Basic definition - Requirements and classification- recent trends in seaport planning and construction including container and special purpose terminals- inland water transport. Types of wet and dry docks- their functional design and usage.

UNIT– IV BREAK WATER AND QUAYS **(09)**

Types, uses and general construction methods of break water- layout and construction of quays and jetties and Wharves.

UNIT–V NAVIGATIONAL AIDS AND DREDGING **(09)**

Necessity and types of signals including floating signals – buoys and beacons- mooring and mooring accessories – Types of dredging and its application – Cargo handling.

LECTURE : 45 TOTAL :45 hrs

TEXT BOOKS

1. Khanna.S.K and Arora.M.G., "Airport planning and design", S.Chand and bros, 2006.
2. Vazirani.V.N and Chandola.S.P.,"Transportation and Engineering" vol.2 Khanna publishers, New Delhi,2005.

REFERENCE BOOKS

1. Shahani .P.B, "Airport techniques", second edition- Oxford publishing, NewDelhi,1990.
2. Srinivasan.R., "Harbour, Dock and Tunnel Engineering", Chartor publishing house, Anand, India ,2004.

12C7E9 - HYDROLOGY

Prerequisites: *Water Resources Engineering*

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *To impart knowledge on hydrological cycle, spatial and temporal measurement and analysis of rainfall and their applications including flood routing and ground water hydrology*.

COURSE OUTCOMES:

CO1: *To obtain the behavior of water molecule in atmosphere.*
CO2: *Presentation of meteorological data which is needed for forecasting.*
CO3: *Prediction of future floods and identifies the controlling measures.*

UNIT– I HYDROMETEOROLOGY (09)

Hydrological cycle – Hydrometeorological factors – Cloud formation – Winds and their movement – Types of precipitation– Forms of precipitation – Density and Adequacy of rain gauges – Recording and non - recording rain gauges – Optimum number of rain gauges.

UNIT – II PRECIPITATION AND ABSTRACTIONS (09)

Spatial distribution – Consistency analysis – Frequency analysis – Intensity, duration, frequency relationships – Evaporation– Infiltration – Horton's equation – Infiltration indices – measurement of infiltration – abstraction loss.

UNIT – III HYDROGRAPH ANALYSIS (09)

Flood Hydrograph – Components of flood hydrograph – Factors affecting shape of Hydrograph - Base flow separation– Unit hydrograph – Advantages – Instantaneous Unit hydrograph - S curve Hydrograph - Synthetic unit hydrograph –Applications.

UNIT – IV GROUND WATER HYDROLOGY (09)

Occurrence of ground water – Types of aquifer – Dupuit's assumptions – Darcy's law – Estimation of aquifer parameters– Pump tests – steady state discharge in a Confined and Unconfined Aquifers – Leaky aquifer – well loss – aquifer loss– problems.

UNIT – V FLOOD ANALYSIS (09)

Flood estimation – Gumbel's method – Log Pearson type III method – Reservoir flood routing – Channel routing – Types of streams – Stage discharge relationships - Flow measurements – Current meter method for velocity measurements.

LECTURE : 45 TOTAL :45 hrs

TEXT BOOKS

1. Santosh Kumar Garg, "Hydrology and Water Resources Engineering", Khanna Publications Pvt.Ltd.NewDelhi, 2009.
2. Jayaramy Reddy. P., "Hydrology", Tata McGraw-Hill Publications Pvt.Ltd, New Delhi, 2003.

REFERENCE BOOKS

1. Subramanya. K., "Engineering Hydrology", Tata McGraw-Hill Publications Pvt.Ltd, New Delhi, 2002.
2. Warren Viessman and Gary L.Lewis,"Introduction to Hydrology", Prentice Hall of India Pvt.Ltd, New Delhi,2003.

12C8E0 - EXPERIMENTAL STRESS ANALYSIS

L	T	P	C
3	0	0	3

Prerequisites: *Mechanics of Solids I*

COURSE OBJECTIVES:

- *To familiarize about various types of strain gauges and measuring instruments.*
- *To understand the behaviour of structural elements using various techniques.*
- *To know about the concepts of model analysis.*

COURSE OUTCOMES:

CO1: *Able to describe the working principles of various stain gauges and calculation of stresses using strain rosettes.*
CO2: *Able to demonstrate about various measuring instruments.*
CO3 : *Able to explain about two dimensional photo elasticity and its applications.*
CO4: *Able to apply model analysis and various techniques for stress analysis.*

UNIT - I STRAIN MEASUREMENT METHODS (09)

Strain gauges – basic characteristics – mechanical, optical, acoustic, electrical inductance and capacitance, pneumatic types – description and working principles – factors producing strain sensitivity – Gauge construction – temperature compensation – Gauge sensitivities and gauge factors – Strain rosettes –Calculation of principal strains and principal stresses.

UNIT – II MEASURING INSTRUMENTS (09)

Linear Variable Differential Transducer – Cathode Ray Oscilloscope – XY Plotter – Digital Data Acquisition System –Hydraulic Jacks – Pressure Jacks – load cells – Proving Rings – Vibration meter – Wind Tunnel – Calibration of Testing Instruments.

UNIT - III PHOTO ELASTICITY (09)

Two dimensional photo elasticity – Stress optic law – Polariscope – isoclinic and isochromatic fringes – compensators –Separation techniques – Model materials – Calibration of photo elastic materials.

UNIT - IV MODEL ANALYSIS (09)

Model analysis – Direct and Indirect models – laws of structural similitude – choice of scales – Model materials –Limitations of model studies –Buckingham pi theorem –Design of direct and indirect models – Begg's Deformeter and its applications.

UNIT-V ADVANCED TECHNIQUES (09)

Fundamentals of photo elastic coatings – Morie fringe and Brittle coating technique – crack detection techniques –Introduction to stress freezing technique. – Introduction to nondestructive testings – Holography

LECTURE : 45 TOTAL :45 hrs

TEXT BOOKS

1. Dally and Railey, "Experimental stress analysis", 2003.
2. Richard G Budynas, "Advanced Strength and Applied Stress Analysis", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2011.

REFERENCE BOOKS

1. Sadhu Singh, "Experimental stress analysis", Khanna Publishers, New Delhi, 2005.
2. Dove and Adam, "Experimental stress analysis and Motion measurements",1989
3. L.S.Srinath. 'Experimental stress Analysis', Tata McGraw Hill company Book Ltd., NewDelhi. 1984
4. Bray and Stanley, Non Destructive Evaluation, McGraw Hill Publishing co., New York,1989

12C8E1 - FUNDAMENTALS OF REMOTE SENSING AND GIS APPLICATIONS

L	T	P	C
3	0	0	3

Prerequisites: *Surveying – I & Surveying – II*

COURSE OBJECTIVES:

- *To introduce the students to the basic concepts and principles of various components of remote sensing.*
- *To provide an exposure to GIS and its practical applications in civil engineering*

COURSE OUTCOMES:

CO1 : *Students understand the principles and methods of remote sensing.*

CO2: *Get idea of various satellites such as LANDSAT, SPOT and IRS series, types and characteristics of imageries.*

CO3: *To know about the hardware and software of GIS.*

CO4: *To acquire knowledge on the application of GIS in the areas of water resources, land use studies, soil science, Agriculture, forestry and Oceanography.*

UNIT - I PRINCIPLES OF REMOTE SENSING (09)

Definition – Historical background – Basic principles and methods of remote sensing – Electromagnetic radiation and source – Electromagnetic spectrum – Wave and particle theory – energy equations – Interference - Atmospheric effects on remote sensing – Atmospheric windows – Energy interaction with surface features – Reflectance – Specular and diffuse reflection surfaces – Spectral signatures – Spectral signature curves – Thermal and microwave.

UNIT – II REMOTE SENSING DATA ACQUISITION (09)

Data acquisition – Active and passive remote sensing – Platforms – Aerial and space platforms – Aircraft and satellites– Synoptivity and Repetivity – Sensors – Aerial camera – Non-photographic optical sensors – Multispectral scanners –Thermal scanners, Imaging radars – SLAR and SAR LIDAR.

UNIT – III SATELLITE REMOTE SENSING AND DIGITAL IMAGE PROCESSING (09)

Satellites – Classification – Based on orbits – Based on purpose – Remote sensing satellites –LANDSAT, SPOT, IRS and IKONOS – Their orbital characteristics – Sensors onboard – Characteristics of thermal imagery and radar imagery– Comparison with image types – Characteristics of digital image processing – Pre-processing – Image enhancement –Filtering – Classification.

UNIT - IV GEOGRAPHIC INFORMATION SYSTEM (09)

GIS – Components of GIS – Hardware, Software and organizational set up – Data – Spatial and Non spatial – Maps –Types of maps – Map Projection – Types of projection – Data input – Digitization – Editing – Raster and Vector data structures – Comparison – Analysis using Rastor and Vector data – Retrieval, Reclassification, Overlying, Buffering –Data output – Printers and plotters.

UNIT – V SATELLITE IMAGERY AND GIS APPLICATIONS (09)

Application of satellite imagery – Merits – Limitations – Comparison with aerial photographs – Visual interpretation of satellite imagery – Elements of interpretation – Interpretation keys-
GPS and its Applications- Application of remote sensing and GIS in Surveying, Water resources exploration – Land use/Land cover studies – Geology –Agriculture, Disaster Management, Coastal zone Management and Environmental Engineering.

LECTURE : 45 TOTAL :45 hrs

TEXT BOOKS

1. Patel A.N and Surendra singh, "Remote Sensing Principles and applications ", Scientific Publishers, Jodhpur , 2001.
2. Anji Reddy, "Remote Sensing and Geographical Information system",, BS Publications 2001.
3. M.G. Srinivas (Edited by) " Remote sensing applications", Narosa publishing House, 2001.

REFERENCE BOOKS

1. Thomas M.Lille sand & Raiph W.Kiefer, "Remote sensing and Image Interpretation "John Wiley Sons, 2004.
2. Burrough P.A, Principles of GIS for land resources assessment, Oxford, 2002.

12C8E2 - NON-CONVENTIONAL ENERGY SOURCES

	L	T	P	C
Prerequisites: Nil	**3**	**0**	**0**	**3**

COURSE OBJECTIVES: To understand the basics of natural energy resources.

COURSE OUTCOMES:

CO1: *This subject enables the students to know the sources and production of energy both globally and in India.*

CO2: To understand the principles, collection, measurement, design aspects and applications of solar, wind and biomass energy.

CO3: *To get idea of various alternate sources of energy.*

UNIT - I WORLD'S PRODUCTION AND RESOURCES OF ENERGY SOURCES (09)

World energy consumption pattern, commercial energy sources, Non conventional and renewable energy sources " Study of global availability and in India – low energy building materials" Energy economy – Human development index.

UNIT – II SOLAR ENERGY (09)

Total Energy concept and installation " solar radiation and its measurement, collecting devices. Low temperature, medium temperature collectors and their efficiencies-solar passive cooling " Design of collectors " solar energy its applications" solar cells.

UNIT – III WIND ENERGY (09)

Wind Machines- Basic principles - types and performance – wind energy estimation " wind power and power coefficient" energy conservation and storage " batteries and battery storage, fly wheel storage, hydrogen storage and compressed air storage.

UNIT – IV BIOMASS (09)

Energy from Biomass " resources, properties, benefits – Biomass conversion technologies " Bio gas generation " Bio gas plant - types and design " Biodiesel production –Bio-hydrogen production " Gasification - types of Gasifiers.

UNIT – V OTHER ALTERNATE SOURCES (09)

Hydro Energy conversion – Hydro power systems - Energy from ocean " Ocean Thermal Energy Conservation(OTEC) " Tidal power, geothermal energy generation " Fuel cells " Photovoltaic devices.

LECTURE : 45 TOTAL :45 hrs

TEXT BOOKS

1. *Mukherjee. D & Chakrabarti. S, "Fundamentals of renewable energy systems", New Age International,(P).Ltd, New Delhi 2005.*
2. *Rai.G.D, "Non Conventional Energy sources", Khanna Publications, 1994.*

REFERENCE BOOKS

1. Duffie and Beckmann, "solar Energy thermal processes", John Wiley & sons.

2. B.R.Pai, M.S.Rama Prasad, "Power Generation Through Renewable Sources", Tata McGraw " Hill, Bombay,1990.

3. Hall.D.O. and Ravindranath.N.H., Biomass, "Energy and Environment - A developing country perspectivefrom India", Oxford University Press, Oxford, 1995

12C8E3 - MACHINE FOUNDATION

L	T	P	C
3	0	0	3

Prerequisites: Foundation Engineering

COURSE OBJECTIVES:

To understand the machine foundation and its design parameters.

COURSE OUTCOMES:

CO1: *Students understand the types and general requirements of machine foundation.*
CO2: *Get idea about analysis and design of various types of machine foundation.*
CO3: *To know about the methods of vibration isolation.*

UNIT – I INTRODUCTION (09)

Types of Machine Foundation – General Requirements of Machine Foundations – Wave Propagation in an elastic homogenous medium – Rayleigh, shear and compression waves. Permissible amplitudes and Bearing Pressures

UNIT – II VIBRATIONS OF MACHINES (09)

Theory of Vibrations – Vibration of Elementary Systems – vibratory motion – free vibration and Forced Vibration –Single degree of freedom and multi degree of freedom systems – Principles of vibration measuring instruments.

UNIT – III DESIGN PARAMETERS (09)

Elastic Properties of soils – Coefficient of elastic uniform and non uniform compression and shear – determination of dynamic properties of soils - Standard tests. Evaluation of Design Parameters – their importance.

UNIT – IV DESIGN OF MACHINE FOUNDATION (09)

Design Criteria-analysis of loads-design procedure for block foundations – framed type foundations – foundations for impact machines – reciprocating machines.

UNIT – V VIBRATION ISOLATION (09)

Vibration isolation – isolation technique – construction details – isolation by location- isolation by barriers – Active and Passive isolation methods – control measures.

LECTURE : 45 TOTAL :45 hrs

TEXT BOOKS

1. Prakash .S.,& Puri .V.K., "Foundations for Machines", Mcgraw Hill Publishing company 1998.
2. Srinivasalu P and Vaidhyanadhan C.V., "Hand book of Machine Foundation", Tata Mcgraw Hill Publishing Ltd.,New Delhi,2007.

REFERENCE BOOKS

1. Swamisaran,"Soil Dynamics and Machine Foundations",Galgotia Publications Pvt. Ltd, 2010
2. Kameswara Rao, "Dynamics Soil Tests and Applications", Wheeler Publishing, New Delhi, 2003
3. Barkan, "Dynamics of bases and foundations" , McGraw Hill Book Company,1962
4. IS 2974 part 1-1982, IS 2974 part 2-1980, IS 2974 part 3-1992, IS 2974 part 4-1979, IS 2974 part5-1987.

12C8E4 - GEOTECHNICAL EARTHQUAKE ENGINEERING

Prerequisites: Soil Mechanics & Foundation Engineering

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *To understand the dynamics of earth and to estimate dynamic properties of soils*
- *To develop the site specific design spectrum for design of sub structure and evaluation of liquefaction potential*

COURSE OUTCOMES:

CO1: *Ability to obtain the knowledge on earthquake measurements*.
CO2: *Ability to understand the ground response analysis.*
CO2: *Acquire the importance of earthquake hazard mitigation.*

UNIT I Elements of Earthquake Seismology and Dynamics (09)

Mechanism of Earthquakes – Causes of earthquake – Earthquake Fault sources – Elastic Rebound theory – Seismic wave in Earthquake shaking – Definition of earthquake terms – Locating an earthquake – Quantification of earthquakes.

UNIT II Ground Motion Characteristics (09)

Strong Motion Records – Characteristics of ground motion – Factors influencing ground motion – Estimation of frequency content parameters – Seismic site investigations – Evaluation of Dynamic soil properties.

UNIT III Ground Response Analysis - Local Site Effects and Design Ground Motion (09)

Wave propagation Analysis – Site Amplification – Need for Ground Response Analysis – Shear Beam analysis – Methods of analyses – One Dimensional Analysis – Equivalent linear Analysis - Site effects – Design Ground Motion – Developing Design Ground Motion. Codal Recommendations.

UNIT IV Seismic Stability Analysis (09)

Earthquake – Resistant Design of foundation of buildings – Design considerations – Geotechnical – Architectural –Structures – Capacity Design – Seismic analysis. Dynamic Analysis – Earth pressure due to ground shaking – Liquefaction– Susceptibility – evaluation – Cyclic stress approach – Liquefaction Resistance – Laboratory and Field Tests – Interpretation– Lateral Deformation – Codal recommendation

UNIT V Earthquake Hazard Mitigation (09)

Seismic risk vulnerability and hazard – Percept of risk – Risk mapping – Hazard assessment – Maintenance and modifications to improve hazard resistance – Different type of foundation and its impact on safety – Ground Improvement Techniques.

LECTURE : 45 TOTAL :45 hrs

REFERENCE BOOKS

1. *KameswaraRao, N.S.V., "Dynamics soil tests and applications", Wheller Publishing – New Delhi, 2000.*
2. *Krammer S.L., "Geotecnical Earthquake Engineering", Prentice hall, International series Pearson Education(Singapore) Pvt. Ltd., 2004.*
3. *Kameswara Rao, "Vibration Analysis and Foundation Dynamics", Wheeler Publishing, New Delhi, 1998.*
4. *McGuire, R.K., "Seismic Hazard and Risk Analysis", Earthquake Engineering Research Institute. MNo – 10,ISBN 0-943198-01-1, 2004.*
5. *Mahanti, N.C., Samal, S.K., Datta, P., Nag N.K., "Disaster Management", Narosa Publishing House, NewDelhi, India ISBN : 81-7319-727X-2006.*

12C8E5 - BRIDGE ENGINEERING

L	T	P	C
3	0	0	3

Prerequisites: *Basic Structural Design II (Concrete)& Highway Engineering*

COURSE OBJECTIVES:

- *To make the student to know about various bridge structures, selection and its site investigation.*
- *To learn the design of slab bridges and culverts as per IRC provisions*
- *To learn the modern bridge types and its design principles.*
- *To make the student to know about various bridge substructures.*

COURSE OUTCOMES:

CO1: *The student will be able to determine the design parameters needed for bridge design.*
CO2: *The student will be able to analyze and design the slab bridge components and also know about the design principles of modern bridges.*
CO3: *The student will be to know about various substructure components and its requirements.*

UNIT–I INTRODUCTION **(09)**

Components of a bridge structure – inspection and site investigations for a bridge – Determination of linear waterway, design discharge and scour depth – Economical span – Types and choice of bridges. IRC loading classifications – simple problems.

UNIT–II SLAB BRIDGE **(09)**

Slab Bridge - Distribution of concentrated loads by IRC and Pigeaud's Method – Design of tee beam bridge – design of main girder– Design of cross girders – Load distribution by Courbon's Method – Skew slab Bridge.

UNIT–III BRIDGE & CULVERT **(09)**

Single span rigid frame bridge (barrel or slab type only) – box culvert (single vent only). Balanced cantilever RC bridges– Design of articulations.

UNIT–IV MODERN BRIDGES **(09)**

Temporary and movable bridges. RC Arch bridge (open spandrel and string girder type only) – Cable stayed bridges –Suspension bridges – design principles only.

UNIT–V BEARING, SUBSTRUCTURE AND REBUILDING OF STRUCTURES **(09)**

Bearings – types, functions – simple problems – substructures – abutment, pier – materials-stability requirements -Rebuilding of bridges – replacement – pier tops – girders – side sleeving and end launching methods.

LECTURE : 45 TOTAL :45 hrs

TEXT BOOKS

1. Jhonson Victor .D., "Bridge Engineering", Oxford & IBH publishing Co., Ltd, New Delhi, 2003.
2. Ponnuswamy.S, "Bridge Engineering", Tata McGraw Hill Publishing Co., Ltd, New Delhi, 2001.

REFERENCE BOOKS

1. Vazirani V.N., Ratwani M.M., & Vaswani, "Bridge Engineering", Khanna publishers, 2000.
2. Bindra S.P., "Principles and practice of Bridge Engineering", Dhanpat Rai & Sons, New Delhi,1995.
3. Krishnaraju,"Design of bridges", New age international publishing ltd, Newdelhi, 2005.

12C8E6 - ENVIRONMENTAL MANAGEMENT

L	T	P	C
3	0	0	3

Prerequisites: *Environmental Science and Engineering*

COURSE OBJECTIVES:

To understand the importance of nature and study about the water, air and soil pollution control as well as solid waste management.

COURSE OUTCOMES:

CO1: *Students are exposed to the sources, causes and effects of water, air and noise pollution.*
CO2: *To know about the various management techniques of solid waste and environmental protection legislations.*
CO3: *To understand the relation of food to disease, health aspects of housing*.

UNIT – I NATURE AND SCOPE OF ENVIRONMENTAL PROBLEMS (09)

Environment and sustainable development – Natural and human environmental disturbances – Global warming –acid rain – ozone depletion – effects and control - climate change conventions – Kyoto protocol – India's efforts for Environmental protection – Public policy and role of NGO's

UNIT – II WATER POLLUTION AND CONTROL (09)

Fresh water and its pollution – Natural processes – sources and pollutants – pollution due to industrial, agricultural and municipal wastes – effects on streams - limitations of disposal by dilution – BOD consideration in streams – Oxygen Sag Curve – Strategies for sustainable water management Water management – Marine environment and its management – Water acts

UNIT – III AIR AND NOISE POLLUTION (09)

Pollutant emissions - sources and sink – effects of air pollution on human health, vegetation and climate– Global effects – prevention and control of air pollution – Control of particulates – Air pollution survey sand sampling – Air quality monitoring - Air Act – Management of air pollution – Sound level – Effect of noise on people – Environmental noise control- noise pollution rules, 2000

UNIT–IV SOLID WASTE MANAGEMENT AND SOIL POLLUTION (09)

Sources – Characteristics – Quantities – Collection methods – Processing and disposal techniques – Onsite Handling, storage and processing – sanitary landfill – Incineration and pyrolysis – Composting – aerobic and anaerobic of compositing – Recycling and reuse of solid wastes – Hazardous wastes – Definition – Sources & types only – Integrated system for waste management – The Basel convention Land use and degradation – Management problems – strategies for sustainable land management – soil pollution –wetland conservation

UNIT–V ENVIRONMENTAL MANAGEMENT SYSTEM (09)

Terminology – installation and common motives of EMS – Environmental standards – ISO 14000 (Series) – basicprinciples – Environmental Audit – Environmental Impact assessment - Trade rules and environmental protection– Practices For Waste Minimisation And Cleaner Production

LECTURE : 45 TOTAL :45 hrs

Text Book

1. N.K.Uberoi, Environmental Management, Excel Books, New Delhi(2006).

REFERENCE BOOKS

1. S.Vigneahwaran,M.Sundaravadivel and D.S.Chaudhary ,EnvironmentalManagement, SCITECH Publications(India) Pvt.Ltd, Chennai & Hyderabad (2004).

2. Technobanoglous, Environmental, Mc Graw Hill Book Company (2006).

12C8E7 - TRAFFIC ENGINEERING AND MANAGEMENT

L	T	P	C
3	0	0	3

Prerequisites: *Highway Engineering*

COURSE OBJECTIVES:

- *To give an overview of Traffic engineering, traffic regulation, management and traffic safety with integrated approach in traffic planning as well*

COURSE OUTCOMES:

CO1: *The objective of the course is to educate the students on the various components of Traffic Engineering.*
CO2: *The students further learn the types of survey and traffic signals.*
CO3: *This course enables the students to understand the design of parking facilities and case studies.*

UNIT – I INTRODUCTION (09)

Scope– Properties of traffic engineering elements – vehicle, driver and road characteristics - skid resistance and breaking efficiency – simple problems. Components of traffic Engineering – control mechanisms

UNIT – II TRAFFIC SURVEYS (09)

Surveys – Clssification - Volume, Speed and delay, origin and destination - parking, accidents-design of questionnaire for socio economic surveys – analysis-capacity of roads-level of services – interpretation of traffic studies and conclusions.

UNIT – III TRAFFIC CONTROL (09)

Traffic signs – location and design recommendations - Road markings – Classification and design of traffic signals –signal co-ordination – Traffic islands and rotaries – Traffic control aids and street furniture – Regulation of traffic –Modern methods of traffic control.

UNIT – IV TRAFFIC SAFETY AND MANAGEMENT (09)

Road accidents – types - causes and prevention with emphasis on engineering factor s – Traffic management, Transport system management (TSM) and Transport Demand Management (TDM), restrictions on turning movements, one way streets, traffic segregation, tidal flow operation, exclusive bus lanes and other management measures – introduction to intelligent transport systems (ITS).

UNIT – V TRAFFIC MANAGEMENT PROJECTS (09)

Design of parking facilities, on street and off street parking – case studies on area traffic management – street lighting –noise abatement –Basis of comprehensive traffic and transport studies – intersection improvements including design of roundabouts.

LECTURE : 45 TOTAL :45 hrs

TEXT BOOKS

1. Kadiyali.L.R., "Traffic Engineering and Transport planning", Khanna Publishers, 2004.
2. Salter.R.I., and Hounsell.N.B., "Highway Traffic Analysis and Design", Macmillan Press Ltd.,2000.

REFERENCE BOOKS

1. Manual of Transportation Engineering studies, Institution of Transportation Engineering, Prentice hall Publications, 1994.
2. John.E.Tyworth., "Traffic Management Planning", Operation and Control, Addison Wesley Publishing Company, 1997.

12C8E8 - GROUND IMPROVEMENT TECHNIQUES

Prerequisites: Mechanics of Soils

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *At the end of the course student is expected to identify the problematic soil and suitable suggest remedial measures to improve their behavior.*

COURSE OUTCOMES:

CO1 : *To understand the selection of suitable ground improvement techniques.*
CO2 : *The students acquire knowledge on types and applications of reinforcement materials.*
CO3 : *The subject also imparts the types and injection methods of grouts, monitoring aspects.*

UNIT I DEWATERING (09)

Introduction – Scope and necessity of ground improvement – New Technologies – Basic concepts – Drainage methods– Ground water lowering by well points – Deep well, Vacuum and Electro – Osmosis methods.

UNIT II COMPACTION AND SAND DRAINS (09)

In-situ compaction of cohesion less and cohesive soil – Shallow and deep compaction – Vibration methods – Vibrocompaction, Blasting, Vibrating probe, Vibratory rollers, Vibroflotation – Concept, Factors influencing compaction –Heavy Tamping – Vertical drains – Preloading with sand drains, Fabric drains, Wick drains – Relative merits of different methods – Limitations

UNIT III STONE COLUMN AND CONSOLIDATION (09)

Precompression and consolidation – Dynamic consolidation – Electro-osmotic consolidation – Stone column – Lime piles– Earth reinforcement – Soil Nailing

UNIT IV SOIL STABILIZATION (09)

Introduction – Stabilization methods – Mechanical, Chemical stabilisation-Cement, Lime, Bitumen – Electrical stabilization– Stabilization of expansive clays – Prewetting.

UNIT V GROUTING (09)

Introduction – Applications – Functions – Characteristics of grouts – Types of grout – Suspension and solution grouts –Basic requirements of grout – Displacement grouting – Compaction grouting - Permeation grouting – Grouting equipment– Grout monitoring

LECTURE : 45 TOTAL :45 hrs

Text Book

1. Purushothama Raj, P., "Ground Improvement Techniques", Laxmi Publications (P) Ltd., New Delhi, 2005.

REFERENCE BOOKS

1. Moseley M.D., "Ground Treatment, Blackie Academic and Professional", 1998.
2. Shroff, A.V., "Grouting Technology, in Tunneling and Dam", Oxford & IBH Publishing Co. Pvt. Ltd., NewDelhi, 1999.
3. Koerner, R.M., "Designing with Geosynthetics (fourth edition)", Prentice Hall, New Jersey, 1999.

12C8E9 - PREFABRICATED STRUCTURES

Prerequisites: Nil

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *To impart knowledge to students on modular construction, industrialized construction and design of prefabricated elements and construction methods.*

COURSE OUTCOMES:

CO1: *To understand the need of prefabricated structures and materials.*
CO2: *To know about the components of prefabricated structures and design principles.*
CO3: *To get idea on the types of connections and design of abnormal loads.*

UNIT I GENERAL PRINCIPLES OF FABRICATION (09)

Comparison with monolithic construction – Types of prefabrication – site and plant prefabrication - Economy of prefabrication – Modular coordination – Standardization – Planning for Components of prefabricated structures –Disuniting of structures – Design of simple rectangular beams and I beams – Handling and erection stresses –Elimination of erection stresses – Beams, columns - Symmetrical frames.

UNIT II PREFABRICATED ELEMENTS (09)

Roof and floor panels, ribbed floor panels – wall panels – footings – Joints for different structural connections– Effective sealing of joints for water proofing – Provisions for non-structural fastenings – Expansion joints in pre-cast construction.

UNIT III PRODUCTION TECHNOLOGY (09)

Choice of production setup – Manufacturing methods – Stationary and mobile production – Planning of production setup– Storage of precast elements – Dimensional tolerances – Acceleration of concrete hardening.

UNIT IV HOISTING TECHNOLOGY (09)

Equipments for hoisting and erection – Techniques for erection of different types of members like Beams, Slabs, Wall panels and Columns – Vacuum lifting pads.

UNIT V APPLICATIONS (09)

Designing and detailing of precast unit for factory structures – Purlins, Principal rafters, roof trusses, lattice girders, gable frames – Single span single storeyed frames – Single storeyed buildings – slabs, beams and columns.

LECTURE : 45 TOTAL :45 hrs

TEXT BOOKS

1. L. Mokk, "Prefabricated Concrete for Industrial and Public Structures", Publishing House of the Hungarian Academy of Sciences, Budapest, 2007.
2. I. T. Koncz, "Manual of Precast Concrete Construction", Vol. I, II, III & IV, Berlin, 1971

REFERENCE BOOKS

1. CBRI, "Building materials and components", India, 1990.

2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction And manufacturing, Academic Press Inc., 1994.

3. B. Lewicki, "Building with Large Prefabricates", Elsevier Publishing Company, Amsterdam, London, NewYork, 1998.

4. Structural Design Manual, "Precast Concrete Connection Details", Society for the Studies in the use of Precast Concrete, Netherland Betor Verlag, 2009.

12CEI1 HIGHWAYS – STATE OF THE ART

Prerequisites: Highway Engineering.

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *To give an overview about the design and construction of various types of highways and to understand the procedures in the Tamilnadu Highways Department.*

COURSE OUTCOMES:

CO1: This subject exposes the students about the various types of highways in Tamilnadu and in India.
CO2: The students will be able to design and construct highways.
CO3: The students to acquires knowledge about the functioning of the State Highways Department.

UNIT I HIGHWAYS - BIRD'S EYE VIEW (09)

Classification of roads in India and it's Authorities - Ministry of Road Transport and Highways (MORT&H) and its functions - Indian Roads Congress and its duties - Highways Research centers in India – Financing of Highways Infrastructures.

Tamilnadu Highways Department organizational setup and duties - Projects Announcements - Financial Allotment - Government Orders - Issue of Letter of Credit.

Elements of Highways – Terrain, Land width, Building lines and Control lines, Right of Way, Carriage Way, Camber, Kerbs, Shoulders, Side slopes and Footpaths [IRC Standards] – Typical cross section - Components of bridge structures.

UNIT II DESIGN AND CONSTRUCTION OF ROADS (09)

Flexible pavements - Design Principles of Flexible Pavements – Key factors in Design - Design Practice for Flexible Pavements [IRC Method and Recommendations – Design calculations] - Overlay design by Benkelman Beam Deflection method – Construction practices in Flexible Pavement - CMP site machineries and operations - Laying site machineries and operations - Quality Assurance activities in plant site and laying site.

Rigid pavements - Design Principles of rigid Pavements – Key factors in Design - Design Procedure for rigid pavements [IRC Method] – Construction practices in Rigid Pavement.

UNIT III DESIGN AND CONSTRUCTION OF BRIDGES (09)

Engineering Surveys for Alignment of road bridges - Investigations for bridge works and preparation of field particulars - linear waterway calculation.

Classification of bridges – Basics of bridge design and drawings – Construction practices in Bridges - CMP site machineries and operations – Construction site machineries and operations - Quality Assurance activities in plant site and construction site.

Grade Separators and Elevated Structures : Basics - Common types of Interchanges - Trumpet interchange, Diamond interchange, Cloverleaf interchange, Rotary interchange and Directional interchange - General features and Geometric Standards – Construction problems.

UNIT IV HIGHWAY MAINTENANCE (09)

Road maintenance – Basic objectives – Classification of maintenance activities – Procedure for inspection and planning maintenance works - Highway Drainage – Road markings and appurtenances.

Defects in Flexible pavements – Surface defects, Cracks, Deformation, Disintegration – Symptoms, Causes and Treatments.

Failures in Rigid Pavements – Scaling, Shrinkage, Warping, Structural cracks, Spalling of joints and Mud pumping - Treatments.

Hill roads - Construction & maintenance - V shaped drains, Shadow and swamp areas, land slide - causes, investigation, preventive and remedial measures - protection of embankment and cut slopes – flood damage and emergency works – problems and remedial measures in hill road construction.

Applications of geosynthetics, reinforced earth and soil nailing in highways.

UNIT V TENDERING AND ACCOUNTING PROCEDURES (09)

Estimate preparation and sanctions – tendering and contracting procedures, laws of contracts – COT approval - agreements - recording measurements – bill preparation and processing – Working estimates – RAS – disputes and arbitration - Completion Certificates - Completion Report - Internal Audit and Accountant General Audit.

LECTURE: 45 TOTAL: 45 hrs

TEXT BOOKS:

1. T.F. Fwa, The Handbook of Highway Engineering, CRC Press, 2006.
2. Nicholas J. Garber, Lester A. Hoel, Traffic and Highways Engineering, Cengage Learing.
3. Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001.
4. Kadiyali L R, Principles & Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2000.
5. H.J.Yoder, Principles of Pavement Design, John Wiley and Sons.

REFERENCES:

1. Fred L. Mannering, Walter P. Kilareski, Scott S. Washburn, Principles of Highway Engineering and Traffic analysis, Wiley student Edition.
2. IRC codes (IRC: 37–2012, IRC-SP: 19-2001, IRC-SP:90-2010, IRC:81, IRC-SP:48-1998, IRC: 58-1998, etc.,).
3. Specifications for Road and Bridge works, MORT&H (Fifth Revision).
4. Tamil Nadu Highways manuals.
5. Pocket book for Highway Engineers and Bridge Engineers.
6. Indian Highways, Monthly Journal, www.irc.org.in

12CEI2 ROLE OF ENVIRONMENTAL LEGISLATIONS IN INDUSTRIES

Prerequisites: Water Supply Engineering, Wastewater Engineering.

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- *To make the students conversant with the legislations in India.*
- *To understand the basic principles in pollution control.*
- *To expose the students to the pollution control policies in India.*

COURSE OUTCOMES:

CO1: *To make the students conversant with the legislations related to pollution control.*
CO2: *The Students will get idea about the implementation of rules.*
CO3: *The student shall be able to enforce the rules.*

UNIT I The Water (Prevention & Control of Pollution) Act, 1974 (09)

Definitions-Salient features-Powers &functions of Regulatory agencies – Responsibilities of occupier, provisions relating to prevention& control-procedures to obtain consent− Monitoring and compliance mechanisms-legal provision for violation of Water(P&CP)Act-Case studies on water polluting industries-Textile dyeing, Paper mills-Electroplating, Starch industries-inventorisation of new water polluting industry and its management-field visits.

UNIT II The Air (Prevention & Control of Pollution) Act, 1981 (09)

Definition-Salient features- Powers &functions of Regulatory agencies -National ambient Air quality standards-Emission standards for industries specific- Responsibilities of occupier, provisions relating to prevention& control-procedures to obtain consent Monitoring and compliance mechanisms- legal provision for violation of Air(P&CP)Act- Case studies on Air polluting industries-Foundries, Cement, Thermal power plants-inventorisation of new Air polluting industry and its management-field visits.

UNIT III The Environment (Protection) Act, 1986 (09)

Genesis of the Act-Salient features-Role of Central Government-various notifications and rules –prohibition on import of genetically modified organisms-chemicals-hazardous wastes- Batteries management-Restriction on Ozone depleting substances-EIA notification-Siting of industries-State level EIA Authorities-eco-mark-Control on noise pollution-coastal regulations- Monitoring and compliance mechanisms-Role of National Green Tribunals(NGT),Environmental courts &Public interest litigation -Case studies

UNIT IV Regulations on Industrial solid waste management (09)

Restriction on Hazardous waste-Bio-medical wastes-Recycled plastic wastes-Municipal solid wastes-e-waste-Salient features-Responsibilities of occupier/generator/local bodies/PCBs- Monitoring and compliance mechanisms-consent clearance ,Authorisation, Registration procedures for industry specific-Issues &Challenges-Best practices-Case studies on lead refining, engineering units ,hospitals, plastic units, Municipal landfills,-field visits.

UNIT V Electronic Waste (Management &Handling) Rules2011 (09)

Definition-Environmental& Occupational Health hazards of e-waste-Salient features of E -waste Rules-Extended producers responsibility-issues and challenges – Compliance and Consent Clearance mechanisms-Best practices of E-waste management-Case studies on E-waste recycling units, Bulk consumers, Collection Centres-field visits.

LECTURE: 45 TOTAL: 45 hrs

TEXT BOOKS :

1. Rosencrannz, S. Divan, M.L.Noble, Environmental law and policy in India, cases, materials and statutes, Tripathi pvt.Ltd. Bombay.
2. Stem A.C. Air pollution, Vol. I to VIII, Academic press.
3. Shyam Divan and Armin Roseneranz "Environmental law and policy in India "Oxford University Press, New Delhi, 2001.
4. The safe disposal of hazardous waste. Vol. I, II, & III Bat stone, Smith, Wilson, Joint study Sponsored by the world bank, the WHO, & UN Environmental Program UNEP, The world bank Freeman, H.M. standard Handbook of Hazardous Waste Treatment and Disposal, 1989.
5. E WASTE MANAGEMENT IN INDIA (2009), Electronics for you**,** www. efymag.com.

REFERENCE BOOKS :

1. Hilary Theisen and Samuel A, Vigil, George Tchobanoglous, Integrated Solid Waste Management, McGraw- Hill, New York, 1993
2. CPHEEO, Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organization, Government of India, New Delhi, 2000
3. Michael D. LaGrega, Philip L Buckingham, Jeffrey C. E vans and Environmental Resources Management, Hazardous waste Management, Mc-Graw Hill International edition, New York, 2001.
4. Vesilind P.A., Worrell W and Reinhart, Solid waste Engineering, Thomson Learning Inc., Singapore, 2002.
5. Charles A. Wentz, Hazardous Waste Management, Second Edition, Pub: McGraw Hill International Edition, New York, 1995.

LIST OF WEBSITES :

1. www.usepa.gov/epaoswer/hazwaste/recycle/ecycling/index.htm
2. www.defra.gov.uk/environment/waste/index.htm
3. www.ec.gc.ca
4. www.environment.gov.au
5. http://ec.europa.eu/environment/waste/weee/index_en.htm
6. www.ewasteguide.info
7. www.basel.int
8. www.unep.org
9. http://www.unep.ch/ozone/index.shtml
10. www.cpcb.nic.in/Hazardous%20Waste/default_Hazardous_Waste.html
11. http://www.basel.int/industry/mppiwp/guid-info/index.html