

COURSE STRUCTURES

I SEMESTER

S.No	Course code	Course Title	Contact hours/week				Credits	Scheme of Valuation		
			L	T	P	Total		CIE	SEE	Total
1	17FE01	Professional Communication - I	3	-	-	3	3	40	60	100
2	17FE04	Differential Equations and Linear Algebra	3	2	-	5	4	40	60	100
3	17FE13	Engineering Physics	3	2	-	5	4	40	60	100
4	17CI01	Computer Programming	2	2	-	4	3	40	60	100
5	17CE01	Building Materials and Construction	2	2	-	4	3	40	60	100
6	17FE60	English Communication Skills Lab	-	-	2	2	1	40	60	100
7	17FE63	Engineering Physics Lab	-	-	2	2	1	40	60	100
8	17CI60	Computer Programming Lab	-	-	2	2	1	40	60	100
9	17ME60	Engineering Workshop	1	-	2	3	2	40	60	100
Total			14	8	8	30	22	360	540	900

II SEMESTER

S.No	Course code	Course Title	Contact hours/week				Credits	Scheme of Valuation		
			L	T	P	Total		CIE	SEE	Total
1	17FE02	Professional Communication - II	3	-	-	3	3	40	60	100
2	17FE06	Transformation techniques and Vector Calculus	3	2	-	5	4	40	60	100
3	17FE14	Applied Chemistry	4	-	-	4	4	40	60	100
4	17CE02	Applied Mechanics	2	2	-	4	3	40	60	100
5	17CE03	Surveying	2	2	-	4	3	40	60	100
6	17FE64	Applied Chemistry Lab	-	-	2	2	1	40	60	100
7	17CE60	Computer Based Engineering Drawing Lab	-	-	2	2	1	40	60	100
8	17CE61	Civil Engineering Drafting Techniques Lab	-	-	2	2	1	40	60	100
9	17CE62	Survey Field Work Lab	1	-	2	3	2	40	60	100
Total			15	6	8	29	22	360	540	900

III SEMESTER

S.No	Course code	Course Title	Contact hours/week				Credits	Scheme of Valuation		
			L	T	P	Total		CIE	SEE	Total
1	17FE07	Numerical Methods and Fourier Analysis	3	2	-	5	4	40	60	100
2	17EE51	Fundamentals of Electrical Engineering	3	-	-	3	3	40	60	100
3	17CE04	Strength of Materials - I	2	2	-	4	3	40	60	100
4	17CE05	Engineering Geology	2	2	-	4	3	40	60	100
5	17CE06	Mechanics of Fluids	2	2	-	4	3	40	60	100
6	17CE07	Concrete Technology	2	2	-	4	3	40	60	100
7	17CE63	Engineering Geology Lab	-	-	2	2	1	40	60	100
8	17CE64	Solid Mechanics Lab	-	-	2	2	1	40	60	100
9	17CE65	Advanced Survey Field Work Lab	-	-	2	2	1	40	60	100
10	17PD01	Problem Assisted Learning	-	-	1	1	0	100	-	100
11	17PD03	Professional Ethics and Human Values	3	-	-	3	0	40	60	100
Total			17	10	7	34	22	500	600	1100

IV SEMESTER

S.No	Course code	Course Title	Contact hours/week				Credits	Scheme of Valuation		
			L	T	P	Total		CIE	SEE	Total
1	17FE03	Environmental Science	3	-	-	3	3	40	60	100
2	17FE08	Probability and Statistics	3	2	-	5	4	40	60	100
3	17CE08	Strength of Materials – II	3	-	-	3	3	40	60	100
4	17CE09	Hydraulics and Hydraulic Machinery Systems	3	-	-	3	3	40	60	100
5	17CE10	Structural Analysis – I	2	2	-	4	3	40	60	100
6	17CE11	Geo Technical Engineering – I	3	-	-	3	3	40	60	100
7	17CE66	Fluid Mechanics Lab	-	-	2	2	1	40	60	100
8	17CE67	Concrete Technology Lab	-	-	2	2	1	40	60	100
9	17CE68	Computer Aided Building Drawing Lab	-	-	2	2	1	40	60	100
10	17PD02	Problem Based Learning	-	-	1	1	0	100	-	100
Total			17	4	7	28	22	460	540	1000

V SEMESTER

S.No	Course code	Course Title	Contact hours/week				Credits	Scheme of Valuation		
			L	T	P	Total		CIE	SEE	Total
1	17HS01	Engineering Economics and Accountancy	3	-	-	3	3	40	60	100
2	17CE12	Structural Analysis – II	3	-	-	3	3	40	60	100
3	17CE13	Design of Reinforced Concrete Structures – I	3	-	-	3	3	40	60	100
4	17CE14	Highway Engineering	3	-	-	3	3	40	60	100
5	17CE15	Hydrology	3	-	-	3	3	40	60	100
6	PROGRAM ELECTIVE – I									
	17CE16	Repair and Rehabilitation of Structures								
	17CE17	Town Planning and Architecture	3	-	-	3	3	40	60	100
	17CE18	Construction Management								
	17CE19	Interior Designs and Decorations								
7	17CE69	Transportation Engineering Lab	-	-	2	2	1	40	60	100
8	17CE70	Geo Technical Engineering Lab	-	-	2	2	1	40	60	100
9	17PD04	Mini Project	-	-	4	4	2	100	-	100
10	17CE90	Green Buildings (*Add on course – I)	3	-	-	-	3	40	60	100
11	17PD05	Employability Enhancement Skills - I	1	-	-	1	0	100	-	100
12	17PD06	Industrial Training/In-house Training	-	-	-	-	-	-	-	-
Total			22	-	8	27	22/25*	560	540	1100

VI SEMESTER

S.No	Course code	Course Title	Contact hours/week				Credits	Scheme of Valuation		
			L	T	P	Total		CIE	SEE	Total
1	17CE20	Design of Steel Structures	2	2	-	4	3	40	60	100
2	17CE21	Irrigation and Water Resources Engineering	2	2	-	4	3	40	60	100
3	17CE22	Water and Waste Water Engineering	3		-	3	3	40	60	100
4	17CE23	Geo Technical Engineering – II	3		-	3	3	40	60	100
5	PROGRAM ELECTIVE – II									
	17CE24	Matrix Methods in Structural Analysis								
	17CE25	Railways, Airport Planning and Harbour Engineering	3	-	-	3	3	40	60	100
	17CE26	Construction Techniques and Equipment Planning								
	17CE27	Urban Hydrology								
6	OPEN ELECTIVE – I		3	-	-	3	3	40	60	100
7	17FE61	Presentation Skills Lab	-	-	2	2	1	40	60	100
8	17CE71	Environmental Engineering Lab	-	-	2	2	1	40	60	100
9	17CE72	Computer Aided Analysis and Design Lab	-	-	2	2	1	40	60	100
10	17PD07	Seminar	-	-	2	2	1	100	-	100
11	17CE91	Low Cost and Eco-Friendly Building Technology (*Add on course – II)	3	-	-	-	3	40	60	100
12	17PD08	Employability Enhancement Skills – II	1	-	-	1	0	100	-	100
		Total	20	4	8	29	22/25*	600	600	1200

VII SEMESTER

S.No	Course code	Course Title	Contact hours/week				Credits	Scheme of Valuation		
			L	T	P	Total		CIE	SEE	Total
1	17CE28	Estimation and Quantity Surveying	2	2		4	3	40	60	100
2	17CE29	Remote Sensing and GIS Applications	2	2		4	3	40	60	100
3	17CE30	Design of Reinforced Concrete Structures - II	2	2		4	3	40	60	100
4	PROGRAM ELECTIVE – III									
	17CE31	Pre-stressed Concrete								
	17CE32	Pavement Analysis Design Engineering	3	-	-	3	3	40	60	100
	17CE33	Ground Water Engineering and Management								
	17CE34	Earthquake Resistant Design								
5	PROGRAM ELECTIVE – IV									
	17CE35	Environmental Engineering								
	17CE36	Rural Road Technology	3	-	-	3	3	40	60	100
	17CE37	Ground Improvement Techniques								
	17CE38	Safety Engineering								
6	OPEN ELECTIVE - II		3			3	3	40	60	100
7	17CE73	GIS and Computer Applications in Civil Engineering Lab	-	-	2	2	1	40	60	100
8	17CE74	Quantity Estimation and Project Management Lab	-	-	2	2	1	40	60	100
9	17PD09	Internship	-	-	1	1	2	100	-	100
10	17CE92	Environmental Sanitation (*Add on course – III)	3	-	-	-	3	40	60	100
11	17PD10	Extra-curricular/Co-curricular Activities	-	-	1	1	-	-	-	-
Total			18	6	6	27	22/25*	460	540	1000

VIII SEMESTER

S.No	Course code	Course Title	Contact hours/week				Credits	Scheme of Valuation		
			L	T	P	Total		CIE	SEE	Total
1	PROGRAM ELECTIVE – V									
	17CE39	Traffic Engineering and Transport Planning								
	17CE40	Environmental Hydraulics and Advanced Waste Water Treatment	3	-	-	3	3	40	60	100
	17CE41	Pre-fabricated Structures								
	17CE42	Bridge Engineering								
2	PROGRAM ELECTIVE – VI									
	17CE43	Advanced Structural Design								
	17CE44	Finite Element Methods in Civil Engineering	3	-	-	3	3	40	60	100
	17CE45	Watershed Management								
	17CE46	Building Technology								
3	OPEN ELECTIVE – III		3			3	3	40	60	100
4	17PD11	Project Work	-	-	24	24	12	40	60	100
5	17PD12	Comprehensive Viva-Voce	-	-	2	2	1	100	-	100
Total			9	-	26	35	22	260	240	500

OPEN ELECTIVE – I **(VI Semester)**

S.No	Course Code	Title of the Course	Offered by	Chosen by
1	17MB80	Industrial Engineering and Management	MBA	AE, CE, CSE, ECE, EEE, EIE & IT
2	17MB81	Project Management	MBA	AE, CE, CSE, ECE, EEE, EIE, IT & ME
3	17MB82	Logistics and Supply Management	MBA	AE, CE, CSE, ECE, EEE, EIE, IT & ME
4	17MB83	Banking and Insurance Management	MBA	AE, CE, CSE, ECE, EEE, EIE, IT & ME

OPEN ELECTIVE – II **(VII Semester)**

S.NO	Course Code	Title of the Course	Offered by	Chosen by
1	17AE80	Principles of Flight	AE	CE, CSE, ECE, EEE, EIE, IT & ME
2	17CE80	Basic Civil Engineering	CE	AE, CSE, ECE, EEE, EIE, IT & ME
3	17CS80	Java Programming	CSE	AE, CE, ECE, EEE, EIE & ME
4	17CS81	Introduction to Operating Systems	CSE	AE, CE, ECE, EEE, EIE & ME
5	17EC80	Satellite Technology	ECE	AE, CE, CSE, EEE, EIE, IT & ME
6	17EC81	Analog and Digital Communications	ECE	AE, CE, CSE, EEE, IT & ME
7	17EE80	Basic Control Systems	EEE	AE, CE, CSE, IT & ME
8	17EE81	Utilization of Electrical Energy	EEE	AE, CE, CSE, ECE, EIE, IT & ME
9	17EI80	Instrumentation Technology	EIE	AE, CE, CSE, ECE, EEE, IT & ME
10	17IT80	Introduction to Database	IT	AE, CE, ECE, EEE, EIE & ME
11	17ME80	Optimization Techniques	ME	AE, CE, CSE, ECE, EIE & IT
12	17ME81	Elements of Automobile Engineering	ME	AE, CE, CSE, ECE, EEE, EIE, & IT

OPEN ELECTIVE – III **(VIII Semester)**

S. No.	Course Code	Title of the Course	Offered by	Chosen by
1	17AE81	Space Technology	AE	CE, CSE, ECE, EEE, EIE, IT & ME
2	17CE81	Disaster Management	CE	AE, CSE, ECE, EEE, EIE, IT & ME
3	17CS82	Internet Technologies	CSE	AE, CE, ECE, EEE, EIE & ME
4	17CS83	Shell Programming	CSE	AE, CE, ECE, EEE, EIE & ME
5	17EC82	Elements of Communication Systems	ECE	AE, CE, CSE, IT & ME
6	17EC83	Systems and Signal Processing	ECE	AE, CE, CSE, IT & ME
7	17EE82	Energy Auditing	EEE	AE, CE, CSE, ECE, EIE, IT & ME
8	17EE83	Renewable Energy Sources	EEE	AE, CE, CSE, ECE, EIE & IT
9	17EI81	Nano Technology	EIE	AE, CE, CSE, ECE, EEE, IT & ME
10	17IT81	Computer Networks	IT	AE, CE, EEE & ME
11	17ME82	Robotics and Automation	ME	AE, CE, CSE, ECE, EEE & IT
12	17ME83	Mechanical Handling Systems and Equipments	ME	AE, CE, CSE, ECE, EEE, EIE & IT

L	T	P	Cr.
3	-	-	3

B.Tech. (I Sem.)

17FE01 - PROFESSIONAL COMMUNICATION – I

Pre-requisites : Basics in English Grammar & Vocabulary

Course Educational Objective:

To improve the proficiency of students in English with an emphasis on Vocabulary & Grammar for better communication in formal and informal situations; Develop listening skills required for thorough understanding and analysis to face interviews with confidence.

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

CO1: Use English vocabulary & grammar effectively while speaking and writing.

CO2: Comprehend the given text and Communicate confidently in formal and informal contexts.

CO3: Draft E-mails & Memos

CO4: Understand the written and spoken information thoroughly.

CO5: Face interviews with confidence.

UNIT – I

Presidential Address – Dr. A.P.J. Abdul Kalam

Vocabulary: Word formation: Prefixes, suffixes & Compound Collocations

Grammar: Punctuation; Parts of Speech

Reading: Double Angels, David Scott

Writing: Sentence structure; Paragraph writing & Dialogue writing

UNIT – II

SatyaNadella's E-Mail to his Employees

Vocabulary: Homonyms, Homophones, Homographs (Words often confused)

Grammar: Types of verbs; Types of sentences

Reading: The Road Not Taken – Robert Frost

Writing: Letter Writing: Official Letters

UNIT – III

Technology with a Human Face – E.F.Schumacher

Vocabulary: Synonyms & Antonyms, commonly misspelt words

Grammar: Tenses: Types & Uses

Reading: Extract from 'Preface' to Lyrical Ballads – William Wordsworth

Writing: E-mails; Memo drafting

UNIT – IV

Listening Skills: The boy who broke the bank – Ruskin Bond; Importance of active listening; understanding the people; understanding places & events; expanding the proverbs on listening & listening at work place.

UNIT – V

Interview Skills: The lighthouse keeper of Aspinwall – Henryk Sienkiewicz; Interview skills from the story; expanding proverbs on Interview skills; Tips for attending an Interview -

Covering letters for job applications & Writing a CV/Résumé

TEXT BOOKS

1. Board of Editors, “Fluency in English – A Course book for Engineering Students”, Orient Black Swan, Hyderabad, 2016
2. Dhanavel S.P, “English and Soft Skills”, Orient Black Swan, Hyderabad, 2010.

REFERENCE

1. Murphy, “English Grammar with CD”, Cambridge University Press, New Delhi, 2004.
2. Rizvi Ashraf M., “Effective Technical Communication”, Tata McGraw Hill, New Delhi, 2008
3. BaradwajKumkum, “Professional Communication”, I.K.International Publishing House Pvt.Lt., New Delhi, 2008.
4. Raman, Meenakshi and Sharma, Sangeeta, . “Technical Communication -Principles and Practice”.Third Edition. New Delhi: Oxford University Press. 2015.

B.Tech.(I Sem.)

**17FE04- DIFFERENTIAL EQUATIONS AND
LINEAR ALGEBRA**

L	T	P	Cr.
3	2	-	4

Pre-requisites : Basics of Differential Calculus and Matrix Algebra

Course Educational Objective :

The objective of this course is to introduce the first order and higher order differential equations, functions of several variables. The students will also learn Matrix Algebra.

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

- CO1: Apply first order and first degree differential equations to find Orthogonal trajectories and to calculate current flow in a simple LCR circuit.
- CO2: Discriminate among the structure and procedure of solving a higher order differential equations with constant coefficients and variable coefficients.
- CO3: Developing continuous functions as an infinite series and compute the Jacobian to determine the functional dependence.
- CO4: Distinguish among the pros and cons between the Row operation methods and Iterative methods in solving system of linear equations.
- CO5: Compute the Eigen values and Eigen vectors and powers, Inverse of a square matrix through Cayley – Hamilton theorem.

UNIT –I

Differential Equations of First Order and First Degree

Differential equations of first order and first degree – Exact and Non Exact Differential Equations, Applications to Orthogonal trajectories, Newton’s Law of Cooling and Law of Growth and Decay.

UNIT –II

Higher Order Differential Equations

Linear differential equations of second and higher order with constant coefficients, method of variation of parameters.

UNIT – III

Functions of Several variables

Generalized Mean Value Theorem (without proof), Maclaurin’s series, Functions of several variables, Jacobians (polar, cylindrical, spherical coordinates), Functional dependence.

Partial Differential Equations.

Formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions. Solution of first order and first degree linear partial differential equation – Lagrange’s method.

UNIT –IV

System of Linear Equations.

Matrices - Rank- Echelon form, Normal form, PAQ form– Solution of Linear Systems – Homogeneous system of equations and Non Homogeneous system of equations

UNIT – V

Eigen Values and Eigen Vectors

Eigen values – Eigen Vectors – Properties – Cayley Hamilton Theorem – Inverse and Powers of a matrix by using Cayley Hamilton Theorem.

TEXT BOOKS

1. B.S. Grewal, "*Higher Engineering Mathematics*", 42nd Edition, Khanna Publishers, New Delhi, 2012.
2. B. V. Ramana, "*Higher Engineering Mathematics*", 1st Edition, TMH Publications, New Delhi, 2010.

REFERENCE

1. M. D. Greenberg, "*Advanced Engineering Mathematics*", 2nd Edition, TMH Publications, New Delhi, 2011.
2. Erwin Krezig, "*Advanced Engineering Mathematics*", 8th Edition, John Wiley & Sons, New Delhi, 2011.
3. W. E. Boyce and R. C. DiPrima, "*Elementary Differential equations*", 7th Edition, John Wiley and sons, New Delhi, 2001.

L	T	P	Cr.
3	2	-	4

B.Tech. (I Sem.)

17FE13 - ENGINEERING PHYSICS

Pre-requisites : Basics in Light, Crystals, Magnetism, Conductivity etc.,

Course Educational Objective : To make students learn the basic concepts of Optics such as Interference, Diffraction, Polarization and Lasers; the principle of quantum mechanics, different types of crystals, magnetic materials and the concept of super conductivity.

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

CO1: Define the nature of Interference and Diffraction.

CO2: Describe the polarization and LASER, types of lasers and their applications.

CO3: Analyze the dual nature of matter waves and the crystal structures.

CO4: Identify the different types of magnetic materials and their applications.

CO5: Propose the different superconducting materials.

UNIT – I

INTERFERENCE AND DIFFRACTION

INTERFERENCE: Introduction, coherence, Conditions for Interference, Interference in thin film by reflection, Newton's rings (reflection), Working principle of Interferometer.

DIFFRACTION: Introduction, Diffraction, Fraunhofer diffraction at single slit- Diffraction due to circular aperture –Diffraction due to N- slits- Diffraction Grating- Resolving power of Grating, Telescope.

UNIT – II

POLARIZATION AND LASERS

POLARIZATION: Introduction – Polarization of light, Brewster's law–Double refraction, Quarter wave plate – Half wave plate - Polarimeter.

LASERS: Introduction- Characteristics of Lasers – Principle of laser (Absorption, Spontaneous and stimulated emission of Radiation), Einstein Coefficients - Nd-YAG laser, Helium Neon Laser.

UNIT – III

PRINCIPLES OF QUANTUM MECHANICS , CRYSTALLOGRAPHY AND X-RAY DIFFRACTION

PRINCIPLES OF QUANTUM MECHANICS

De Broglie waves, Experimental verification- Schrodinger wave equation-time independent wave equation, physical significance of the wave function – particle in a box.

CRYSTALLOGRAPHY AND X-RAY DIFFRACTION

Fundamental terms of crystallography, Types of crystals, Miller Indices, Relation between Inter planar and atomic distance, simple cubic crystal structure, Body centred cubic structure, Face centred cubic structure, Bragg's law, Laue's method .

UNIT – IV

MAGNETIC MATERIALS

Magnetic parameters, Classification of magnetic materials-Diamagnetic materials, paramagnetic materials, ferromagnetic materials, Antiferromagnetic materials and Ferri magnetic materials, Weiss theory of ferro magnetism, soft and hard magnetic materials, Applications of magnetic materials.

UNIT – V

SUPER CONDUCTIVITY

Introduction- General properties of super conducting material, Meissner effect, Effect of electric current, Types of super conductors- Type I super conductors, Type II super conductors, DC and AC Josephson Effect, London Equations Applications of super conductors- SQUID , Cryotron, Magnetic levitation.

TEXT BOOKS

1. V. Rajendran, “*Engineering Physics*”, TMH, New Delhi, 6th Edition ,2013.
2. D.K.Bhattacharya, Poonam Tandon, “*Engineering Physics*”, Oxford press, New Delhi, 5th Edition, 2015.

REFERENCES

1. 1. M. N. Avadhanulu , TVS Arun Murthy “*Engineering Physics*”, S Chand & Co, New Delhi, 2017.
2. P K Palaniswamy, “*Engineering Physics*” Sci. Publ. Chennai, 2016.
3. P. Sreenivasa Rao, K. Muralidhar, “*Engineering Physics*”, Himalaya Publishing House, Hyderabad, 2016.

L	T	P	Cr.
2	2	-	3

B.Tech. (I Sem.)

17CI01 - COMPUTER PROGRAMMING

Pre-requisites : NIL

Course Educational Objective: In this course student will learn about The basic elements of C programming structures like data types, expressions, control statements, various I/O functions and how to solve simple mathematical problems using control structures. The derived data types like arrays, strings, various operations on them. Modular programming using functions and Memory management using pointers. User defined structures and various operations on it. The basics of files and its I/O operations.

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

CO1: Identify basic elements of C programming structures like data types, expressions, control statements, various simple functions and in view of using them in problem solving.

CO2: Apply various operations on derived data types like arrays and strings in problem solving.

CO3: Design and Implement Modular Programming and memory management using pointers.

CO4: Implement user defined data structures used in specific applications.

CO5: Compare different file I/O operations on text and binary files.

UNIT – I

Introduction to Problem solving through C-Programming: Problem Specification.

Algorithm / pseudo code, flowchart, examples.

C-Programming: Structure of C program, identifiers, basic data types and sizes, Constants, variables, Input-output statements, A sample C program, operators: arithmetic, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, expressions, type conversions, conditional expressions, precedence of operators and order of evaluation.

Conditional statements: if, if else, else if ladder and switch statements, continue, goto. Loops: while, do-while and for statements, break, programming examples.

UNIT – II

Arrays- one dimensional arrays-concept, declaration, definition, accessing elements, storing elements, two dimensional and multi-dimensional arrays.

Character Strings: declaration, initialization, reading, writing strings, arithmetic operations on characters, string handling functions, programming examples

UNIT – III

Functions: basics, category of functions, parameter passing techniques, recursive functions-comparison with Iteration, Functions with arrays, storage classes- extern, auto, and register, static, scope rules, Standard library functions, dynamic memory management functions, command line arguments, programming examples.

Pointers- concepts, declaring & initialization of pointer variables, pointer expressions, pointer arithmetic, pointers and arrays, pointers and character strings, pointer to pointer, Pre-processor Directives and macros.

UNIT –IV

Derived types- structures- declaration, definition and initialization of structures, accessing structures, nested structures, array of structures, structures and functions, pointer to structure, self-referential structures, unions, typedef, programming examples.

UNIT – V

Files – concept of a file, text files and binary files, streams, standard I/O, Formatted I/O, file I/O operations, error handling, and programming examples.

TEXT BOOKS

Jeri R.Hanly, Elliot B.Koffman, Problem Solving and Program Design in C, Pearson Publishers, 7th Edition, 2013

REFERENCE

1. N.B.Venkateswarlu and E.V.Prasad, C and Data Structures, S.Chand Publishing, 1st Edition, 2010,
2. ReemaThareja, Programming in C, Oxford University Press, 2nd Edition, 2015
3. Stephen G.Kochan, Programming in C, Pearson Education, 3rd Edition, 2005
4. PradeepDey, Manas Ghosh, Programming in C, Oxford University Press, 2nd Edition, 2011
5. E Balagurusamy, Computer Programming, McGraw Hill Education, 1st Edition

B.Tech. (I Sem.)

**17CE01 - BUILDING MATERIALS AND
CONSTRUCTION**

L	T	P	Cr.
2	2	-	3

Pre-requisites : NIL

Course Educational Objective:

This course aims to provide study of the properties, making and applications of basic civil engineering materials such as stones, bricks, lime, cement and wood. The course also provides an insight into the different types masonry work used in construction practice, various building components and building finishing activities.

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

- CO1 : Identify suitability of stones and bricks as building materials
- CO2 : Recognize the importance of lime and cement as building materials
- CO3 : Make out the appropriate masonry and mortar to be used for building construction
- CO4 : Pick up the appropriate building components for comfortable construction
- CO5 : Identify the appropriate type of finishing techniques to be used in buildings

UNIT-I

STONES & BRICKS

Introduction-classification of rocks- common rock forming minerals – characteristic of good building stone-dressing of stones- common building stones, their properties- compositions- uses-quarrying of building stone

Bricks: Composition of brick, constituents of brick earth- manufacturing process of bricks, characteristics of good building bricks, classification of bricks, special bricks- Fly ash bricks, hollow bricks - uses.

UNIT-II

LIME AND CEMENT

LIME: Introduction-important terms – limestone cycle-sources of lime-properties of lime-uses – constituent of lime-classification of lime-precaution in handling of lime-storage of lime. CEMENT-Introduction –classification-properties of cements- comparison between cement and lime-constituents of cement-functions of ingredients of cement-out line of manufacture of Portland cement- field tests for cement -types and uses of cements-storage of cements.

UNIT-III

MORTAR AND MASONRY

Introduction-classification of mortars-characteristics of good mortar-Types of mortars - Preparation of mortar-Uses-Precautions in the uses of mortars-selection of mortars for different Engineering works. Types of masonry-joints in stone masonry, different bonds in bricks-tools for brick laying-English and Flemish bonds-defects in brick masonry-, importance of Cavity and Partition walls.

UNIT-IV

BUILDING COMPONENTS

Components of a building – Substructure and superstructure-Importance of foundation-functions of foundations-requirements of good foundations - different types of foundations –Purposes of foundation.

Basic details of Lintels, Arches, walls, vaults, stair cases - types of floors - types of roofs - flat, curved, trussed;

UNIT-V

TIMBER AND FINISHINGS IN BUILDINGS

Classification of timber trees, cross section of exogenous tree, hard wood and soft wood, seasoning of timber, important types of timber and their uses, ply wood and its uses.

Finishings: Paints: Functions of paints-types of paints - constituents of paints - characteristics of good paint-General precautions-defects in painting.

Varnishes: Composition, types and uses- Distempering

Damp proofing: Introduction-effects of dampness- methods of damp proofing –material used for D.P.C and treatment in buildings.

TEXT BOOKS

1. Rangwala “Engineering Materials (Material science)” Charotar Publishing House Pvt. ltd., Edition-2012
2. B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain-“Building Construction”- Laxmi Publications (P) Ltd.

REFERENCES

1. S.K. Duggal “Building Materials”- - New age International Publisher, Fourth edition-2012
2. R.K. Rajput “Engineering Materials (Including construction materials)”-, S.Chand Publications.
3. P.C Varghese “Building Construction” Prentice-Hall of India Private Ltd.
4. <http://nptel.ac.in/courses/105102088/>
5. <http://www.nptelvideos.in/2012/11/building-materials-and-construction.html>

B.Tech. (I Sem.) 17FE60 - ENGLISH COMMUNICATION SKILLS LAB

L	T	P	Cr.
-	-	2	1

Pre-requisites: Students should have fundamental knowledge in making sentences and be with readiness to speak

Course Educational Objective:

To improve the proficiency of students in English with an emphasis on better communication in formal and informal situations; Develop speaking skills required for expressing their knowledge and abilities and to face interviews with confidence.

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

- CO1 : Articulate English with good pronunciation.
 CO2 : Manage skilfully through group discussions.
 CO3 : Communicate with the people effectively.
 CO4 : Collect and interpret data aptly.

Syllabus: English Communication Skills Lab (ELCS) shall have two parts:

- **Computer Assisted Language Learning (CALL) Lab** for 60 students with 60 systems, LAN facility and English language software for self- study by learners.
- **Interactive Communication Skills (ICS) Lab.** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo – audio & video system and camcorder etc.

Exercise – I

CALL Lab:

Understand: Sentence structure, written language.

ICS Lab:

Practice: Introduction to English Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs - Phonetic Transcription.

Exercise – II

CALL Lab:

Understand: Usage of various words in different parts of speech.

ICS Lab:

Practice: Ice-Breaking Activity and JAM Session – Introducing Oneself.

Exercise – III

CALL Lab:

Understand: Features of Good Conversation – Strategies for Effective Communication

ICS Lab:

Practice: Situational Dialogues – Role-Play – Expressions in various situations – Making Requests and seeking permissions.

Exercise – IV

CALL Lab:

Understand: Data collection strategies – Interpretation of collected data.

ICS Lab:

Practice: Data interpretation – Information transfer from flow charts, pie charts, bar graphs, pictograms etc.

Exercise – V

CALL Lab:

Understand: Features of Good Conversation – Strategies for Effective Communication.

ICS Lab:

Practice: Introduction to Group Discussions

Lab Manual:

Board of Editors, “ELCS Lab Manual – A Workbook of CALL and ICS Lab Activities”, Orient Black Swan Pvt. Ltd., Hyderabad, 2016.

SUGGESTED SOFTWARE:

1. Digital Mentor: Globarena, Hyderabad, 2005
2. Sky Pronunciation Suite: Young India Films, Chennai, 2009
3. Mastering English in Vocabulary, Grammar, Spelling, Composition, Dorling Kindersley, USA, 2001
4. Dorling Kindersley Series of Grammar, Punctuation, Composition, USA, 2001
5. Oxford Talking Dictionary, the Learning Company, USA, 2002
6. Learning to Speak English - 4 CDs. The Learning Company, USA, 2002
7. Cambridge Advanced Learners English Dictionary (CD). Cambridge University Press, New Delhi, 2008.

L	T	P	Cr.
-	-	2	1

B.Tech. (I Sem.)

17FE63 – ENGINEERING PHYSICS LAB

Pre-requisites : Awareness about the usage of Vernier callipers, Screw Gauge etc.,

Course Educational Objective:

To make students learn the theoretical concepts, Analytical techniques and graphical analysis through completing a host of experiments with the procedures and observational skills using simple and complex apparatus.

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

CO1: Analyze the wave characteristics of light.

CO2: Estimate the wave length and width of the slit with Laser light source.

CO3: Evaluate the specific parameters in electrical circuits.

CO4: Analyze the characteristics of Torsional Pendulum, Thermister, Stewart and Gee's.

List of Experiments
(ANY 8 EXPERIMENTS)

GENERAL EXPERIMENTS:

1. Determine the frequency of AC supply by using Sonometer.
2. Determine the frequency of a tuning fork by using Melde's arrangement.
3. Study the characteristics of L.C.R Circuit.
4. Study the magnetic field along the axis of a current carrying circular coil using Stewart's & Gee's apparatus and to verify Biot - Savart's law.
5. Determine the rigidity modulus of a given material using Torsional pendulum.
6. Study the characteristics of Thermister.
7. Determination of time constant of a RC Circuit.

OPTICS LAB EXPERIMENTS:

8. Determine the wavelength and divergence of a laser radiation.
9. Determine the width of a single slit by forming diffraction pattern.
10. Determine the Radius of Curvature of a Plano - Convex lens by forming Newton's Rings.
11. Find the specific rotation of sugar solution by using a polarimeter.
12. Determine the Refractive index of a material of the given prism.
13. Determine the Wavelengths of various spectral lines by using diffraction grating.
14. Determination of a thickness of thin wire by using wedge shaped film.

TEXT BOOKS

Lab Manual Prepared by the LBRCE.

B.Tech. (I Sem.)

17CI60 - COMPUTER PROGRAMMING LAB

L	T	P	Cr.
		2	1

Pre-requisites : NIL

Course Educational Objective: In this course student will learn about Software development tools like algorithm, Pseudo codes and programming structure. Basic elements C programming structures like data types, expressions, Control statements, various I/O functions and how to solve simple mathematical Problems using control structures. Design and implementation of various software components which solve real world problems.

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

CO1: Apply and practice logical formulations to solve some simple problems leading to specific applications.

CO2: Demonstrate C programming development environment, compiling, debugging, linking and executing a program using the development environment.

CO3: Design effectively the required programming components that efficiently solve computing problems in real world.

Mandatory: All Programs must have Algorithms and Flow Charts

LAB CYCLE SYLLABUS

I) Exercise Programs on Basics of C-Program

Write a program in 'C' language to cover the following problems.

- Example program which shows the usage of various preliminary Data types available in C Language.
- Example program which shows the usage of various Operators available in C Language.
- Example programs to illustrate the *order of evaluation*.

II) Exercise Programs on Control Structures:

- To check whether the given year is leap year (or) not
- Roots of Quadratic Equation.
- Finding smallest & biggest number from the given set of 4 numbers using 'if' statement.
- Calculate the student grade in the examination – assume suitable Constraints.
- Prepare electricity bill for the consumed units – assume suitable Constraints.
- Converting given two digit number into words using switch statement
- To illustrate the usage of 'goto' statement.

III) Exercise Programs on Loops:

- To Display first N natural numbers
- To find whether the given number is Armstrong (or) not
- To find reverse of the given number and to check whether it is palindrome (or) not.
- To find whether given number is strong number (or) not.
- To check whether given number is Prime (or) not
- To display prime numbers with in the given range (Nesting of Loops).
- To display the following structure (Nesting of Loops)

```

i)
      1
     1 2
    1 2 3
   1 2 3 4
  1 2 3 4 5

ii) 5 4 3 2 1
     4 3 2 1
     3 2 1
     2 1
     1

```

IV) Exercise Programs on Arrays & Strings:

Write example programs in C Language to perform following operations:

- a) Finding the sum and average of given numbers using Arrays.
- b) To display elements of array in reverse order
- c) To search whether the given element is in the array (or) not using linear search & binary search.
- d) Write a C program to perform the following operations
 - i) Addition, subtraction and multiplication of Matrices
 - ii) Transpose of given matrix(The above operations are to be exercised using functions also bypassing arguments)
- e) Write a C program to find whether the given string is palindrome (or) not.
- f) To accept line of text and find the number of characters, number of vowels and number of blank spaces in it.
- g) Write an example program to illustrate the use of any 5 string handling functions.

V) Exercise Programs on Functions & Pointers:

- a) Example program to bring clarity on pointer declaration & initialization and Pointer arithmetic.
- b) Write an example program to describe the usage of *call by reference*.
- c) Write a program to find sum of the elements of the array using functions.

VI) Exercise Programs on Functions:

Write example programs in C Language:

- a) To find factorial of a given number using functions.
- b) Swap two numbers using functions.
- c) To find GCD of two numbers using recursion
- d) Write a recursive function to solve Towers of Hanoi problem.
- e) Write an example program to illustrate use of external & static storage classes.
- f) Write an example program to illustrate the usage of command line arguments.
- g) Program to illustrate the usage of dynamic memory management functions.

VII) Exercise Programs on Derived data types:

- a) Write an example program using structures to process the student record. Assume suitable fields for student structures (Different kinds of initialization of structure variables are to be exercised)
- b) Write a program to read records of 10 employees and find their average salary (Exercise array of structures & Nested structures concepts through this program).
- c) Write a program to handle a structure variable using pointers and implement self referential structure (i.e. A structure variable having a pointer to itself)

VIII) Exercise Programs on Files:

Write an example program on file to perform following operations:

- a) Accessing content from files and writing content in to it.
(Exercise different file operation modes)
- b) Copy the contents of one file into another.
(Exercise different file operation modes)

L	T	P	Cr.
1	-	2	2

B.Tech. (I Sem.)

17ME60 - ENGINEERING WORKSHOP

PRE-REQUISITES: Knowledge in dimensions and units, Usage of geometrical instruments and analytical ability

COURSE EDUCATIONAL OBJECTIVE:

The objective of this course is to get familiarized with various trades used in Engineering Workshop and learn the safety pre-cautions to be followed in the workshops, while working with the different tools.

COURSE OUTCOMES: After completion of the course students are the able to:

CO1 : Design and model different prototypes in the carpentry trade such as Cross lap joint, Dove tail joint.

CO2 : Fabricate and model various basic prototypes in the trade of fitting such as Straight fit, V- fit.

CO3 : Produce various basic prototypes in the trade of Tin smithy such as rectangular tray, and open Cylinder.

CO4 : Perform various basic House Wiring techniques.

(Conduct at least 4 Trades with 2 exercises from each Trade and demonstrate about 2 Trades)

Trade –1: CARPENTRY SHOP

- 1.1. Introduction to various types of wood such as Teak, Mango, Sheesham, etc. (Demonstration and their identification).
- 1.2. Demonstration, function and use of commonly used hand tools.
- 1.3. Introduction to various types of wooden joints, their relative advantages and uses.
- 1.4. Care maintenance of tools and safety precautions in carpentry shop.

Job I- Marking, sawing, planning and chiselling & their practice

Job II -Preparation of half lap joint

Job III -Preparation of Mortise and Tenon Joint

Trade –2: FITTING SHOP

- 2.1. Introduction to fitting shop tools, common materials used in fitting shop.
- 2.2. Description and demonstration of simple operation of hack-sawing, various types of blades and their specifications, uses and method of fitting the blade.
- 2.3. Care and maintenance of tools & safety precautions in fitting shop.

Job I-Making a L-Fit from a rectangular piece of MS

Job II-Making a T-Fit from a rectangular piece of MS

Job III-Making a V-Fit from a rectangular piece of MS

Job IV-Making a Half round Fit from a rectangular piece of MS

Trade -3: TIN- SMITHY SHOP

- 3.1. Introduction to tin -smithy shop, use of hand tools and accessories e.g. different types of hammers, hard and soft mallet, sheet and wire gauge, necessary allowance required during job fabrication, selection of material and specifications.
- 3.2. Introduction and demonstration of various raw materials used in sheet metal shop e.g. M.S. sheet, galvanized-iron plain sheet, galvanized corrugated sheet, aluminium sheets etc.
- 3.3. Care and maintenance of tools & safety precautions in Tin-Smithy shop.

Job I - Preparation of a rectangular tray.

Job II- Preparation of a open scoop/ funnel.

Job III - Preparation of a Single Seam Joint and Double Seam Joint.

Job IV - Preparation of a Corner Seam Joint.

Trade –4: PLUMBING SHOP

- 4.1. Introduction to plumbing –use of hand tools and accessories e.g. pipe vice, Die sets, adjustable spanners, pipe wrench, pipe cutter and pipes and pipe fittings -various raw materials used in plumbing such as PVC Pipes, CI Pipes, MS pipes, Brass Pipes, Copper Pipes, Aluminium Pipes.
 - 4.2. Demonstration of hand tools used in plumbing – preparation of pipe layout and pipe threading.
 - 4.3. Care and maintenance of tools & safety precautions in Plumbing.
- Job I – preparation of pipe layout.
Job II – Pipe threading.

Trade -5: BLACK SMITHY

- 5.1. Introduction to Black smithy –use of tools and equipments e.g.
 - 5.2. Demonstration of forging operations.
 - 5.3. Care and maintenance of tools & safety precautions in Black smithy.
- Job I – preparation of S –Hook.
Job II – preparation of Chisel

Trade -6: HOUSE WIRING

- 6.1. Study, demonstration and identification of common electrical materials such as wires, cables, switches, fuses, PVC Conduits.
 - 6.2. Study of electrical safety measures and demonstration about use of protective devices such as fuses, and relays including earthing.
- Job I - Two lamps in series and parallel connection with one way switch
Job II – Florescent lamp and calling bell circuit.
Job III- One lamp connection with two 2- way switches(stair case connection).
Job IV – House wiring circuit.

REFERENCE

1. LBRCE Workshop Lab Manual
2. S.K.Hajra Choudary & A.K.Choudary, “Workshop Technology-I”, Media Promoters and Publishers Pvt.Ltd., Mumbai, 2012.
3. B.S.Raghuvamsi, “Workshop Technology-I”, Dhanpatrai and company, New Delhi, 2014.
4. P.Khannaiah, K.L.Narayana, “Workshop Mnual”, Scitech Publications India Pvt.Ltd, 2015.

B.Tech. (II Sem.)

17FE02 - PROFESSIONAL COMMUNICATION - II

L	T	P	Cr.
3	-	-	3

Pre-requisites: Students should have basics in English vocabulary and Grammar & they should write error free sentences

Course Educational Objective : To Improve vocabulary, Grammar, Verbal – Non verbal Communication; to develop adaptability, assertive skills and Team spirit for skillful management in work place; and to Interpret technical data given in the form of charts, graphs & pictograms for writing technical reports.

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

- CO1 : Use appropriate vocabulary to interpret data thoroughly and to write reports effectively.
- CO2 : Face any situation with confidence and voice opinions/decisions assertively.
- CO3 : Use English Language effectively in spoken and written forms.
- CO4 : Work effectively in teams for better result.
- CO5 : Communicate effectively using verbal and non-verbal dimensions aptly.

UNIT – I

Good Manners – J.C. Hill

Vocabulary: Idioms; One-word substitutes

Grammar: Subject-Verb agreement (Concord)

Reading: If – Rudyard Kipling

Writing: Information transfer: Tables, Bar graphs, Line graphs, Pie charts, Flow charts, Tree Diagrams, Pictograms; Note-making& Abstract/Summary writing

UNIT – II

Assertive Skills: Verger – Somerset Maugham; Assertive skills from the story; Assertive skills at personal level & at workplace; Expanding proverbs & their Significance

Team work skills: White washing the fence – Mark Twain; Teamwork skills from the story; Teamwork at work place & its Importance

UNIT – III

Oh Father, Dear Father – Raj Kinger

Vocabulary: Foreign Languages and their Influence on English

Grammar: Conditional Sentences; Degrees of Comparison; Question Tags

Reading: Basic Education – M.K. Gandhi

Writing: Report Writing: Nature, Significance & Types of Reports

UNIT – IV

Adaptability: Sen~or Payroll – W E Barrett; Understanding the Organizational Communication; Adaptability skills from the story; Expanding proverbs on Adaptability skills; Importance at work place & Real life - Active & Passive Voice; Direct & Indirect Speech.

UNIT – V

Non-Verbal Communication Skills: A real good smile – Bill Naughton; ‘Wh’ & ‘Yes’ or ‘No’ questions; Working on articulation and gestures; Non-Verbal Communication Skills from the story; Expanding the proverbs on Non-Verbal Communication; enhancing skills through real life experiences - Common Errors.

TEXT BOOKS

1. Board of Editors, “Fluency in English – A Course book for Engineering Students”, Orient Black Swan, Hyderabad, 2016
2. Dhanavel S.P, “English and Soft Skills”, Orient Black Swan, Hyderabad, 2010.

REFERENCES

1. Murphy, “English Grammar with CD”, Cambridge University Press, New Delhi, 2004.
2. Rizvi Ashraf M., “Effective Technical Communication”, Tata McGraw Hill, New Delhi, 2008
3. BaradwajKumkum, “Professional Communication”, I.K.International Publishing House Pvt.Lt., New Delhi, 2008.
4. Raman, Meenakshi and Sharma, Sangeeta, . “Technical Communication -Principles and Practice”.Third Edition. New Delhi: Oxford University Press. 2015.

B.Tech. (II Sem.)

17FE06 - TRANSFORMATION TECHNIQUES AND VECTOR CALCULUS

L	T	P	Cr.
3	2	-	4

Pre-requisites : Basics of Integral Calculus and Vector Calculus

Course Educational Objective : In this course the students are introduced to Integral transformations which includes Laplace Transforms and Z – Transforms. They will also learn Multiple Integrals in different coordinate systems and Vector Calculus.

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

CO1: Apply the concepts of Laplace Transforms to solve ordinary differential equations.

CO2: Apply Z - Transforms to solve difference equations

CO3: Discriminate among Cartesian, Polar and Spherical coordinates in multiple integrals and their respective applications to areas and volumes.

CO4: Evaluate the directional derivative, divergence and angular velocity of a vector function.

CO5: Apply Vector Integration for curves, surfaces and volumes and relationship among themselves.

UNIT – I**Laplace Transforms**

Laplace transforms of standard functions –Linear Property - Shifting Theorems, Change of Scale Property – Multiplication and Division by ‘t’ - Transforms of derivatives and integrals – Unit step function –Dirac’s delta function..

Inverse Laplace Transforms

Inverse Laplace transforms– Linear Property - Shifting Properties - Convolution theorem, Applications of Laplace transforms to ordinary differential equations.

UNIT – II**Z-Transforms**

Z-transform – properties – Damping rule – Shifting rule – Initial and final value theorems - Inverse Z –transform - Convolution theorem – Solution of difference equation by Z-transforms.

UNIT – III**Multiple Integrals**

Multiple integrals - double and triple integrals (Cartesian, polar, spherical coordinates) – Changing of order of Integration and applications to areas and volumes.

UNIT – IV**Vector Differentiation**

Vector Differentiation: Gradient- Directional Derivatives -Divergence – Solenoidal fields- Curl – Irrotational fields-potential surfaces - Laplacian and second order operators and related properties of sums and products

UNIT – V**Vector Integration**

Vector Integration - Line integral – work done –area - surface and volume integrals. Vector integral theorems: Greens, Stokes and Gauss Divergence Theorems (Without proof) and related problems

TEXT BOOKS

1. Dr. B.S. Grewal, "*Higher Engineering Mathematics*", 42nd Edition, Khanna Publishers, New Delhi, 2012.
2. Dr. B. V. Ramana, "*Higher Engineering Mathematics*", 1st Edition, TMH, New Delhi, 2010.

REFERNCES

1. Michael D. Greenberg , "*Advanced Engineering Mathematics*", 2nd Edition, TMH, New Delhi, 2011.
2. Erwin Krezig, "*Advanced Engineering Mathematics*", 8th Edition, John Wiley & Sons, New Delhi, 2011.

B.Tech. (II Sem.)

17FE14 - APPLIED CHEMISTRY

L	T	P	Cr.
4	-	-	4

Pre-requisites : Knowledge of atomic weights, molecular weights, equivalent weights, galvanic cell, working principle of battery, concept of polymerization .

Course Educational Objectives

In this course, students will learn the concepts and applications of chemistry in engineering. It aims at strengthening the students with the fundamental concepts of chemistry. It provides them with the knowledge of water specification for different industries along with solutions to the problems that arise due to hardness of water.

It enables the students to know analysis of fuels and alternate fuels used in diverse fields. It makes the students to effectively use the knowledge of electrochemistry, battery technology, and corrosion science in engineering applications it enables the students to identify the role of polymers and lubricants in various fields.

Course Outcomes: After completion of course, students will be able to

- CO1: Identify the troubles due to hardness of water and its maintenance in industrial applications.
- CO2: Analyze issues related to conventional fuels and apply the concepts of advanced fuels like bio, nuclear and rocket fuels in energy production.
- CO3: Analyze different types of electrodes and batteries for technological applications..
- CO4: Apply principles of corrosion for design and effective maintenance of various equipments.
- CO5: Identify the important applications of engineering materials like plastics, rubbers and lubricants.

UNIT – I : WATER TECHNOLOGY

Introduction: Sources of water and quality.

Hardness: Hardness of Water - Temporary and permanent hardness, units and their inter relation, problems on hardness and disadvantages of hard water in industries.

Boiler troubles: Reasons, disadvantages and methods of prevention for scale and sludge formation, caustic embrittlement, boiler corrosion and carryover(priming and foaming).

Water softening: Ion- Exchange Process, merits and demerits.

Desalination of brackish water: Electro dialysis and reverse osmosis.

UNIT – II : CONVENTIONAL FUELS

Introduction: Definition and classification of fuels(solid,liquid and gaseous fuels, merits and demerits) and characteristics of a good fuel.

Calorific value: Definition, gross and net calorific values (definition only).

Solid fuels: Coal – Origin, proximate analysis of coal and significance.

Liquid Fuels: Petroleum-origin, types of crude oil and refining of petroleum. Cracking – moving bed catalytic cracking and synthetic petrol –Fischer Tropsch's process.

Gaseous fuels: Natural gas composition and C.N.G - advantages.

ADVANCED FUELS

Bio fuels: Characteristics of bio fuels, sources of bio mass and advantages, - Production of bio diesel from rape seed oil.

Nuclear fuels: Nuclear fission, fusion, differences between chemical and nuclear fuel, Charecterstics of fuel elements.

Rocket propellants: Characteristics of good propellants, classification, examples and mechanism of propulsion.

UNIT – III : ELECTRO CHEMISTRY & BATTERIES

Introduction: Electrode potential, standard reduction and oxidation potentials (S.R.P and S.O.P), E.M.F/cell potential of a cell.

Nernst equation: Derivation and problems.

Reference Electrode: Standard hydrogen electrode (S.H.E), calomel electrode, measurement of electrode potential, electro chemical series and applications.

Types of batteries: Primary, secondary and reserve batteries, dry battery(Leclanche cell), Nickel-Cadmium battery, Magnesium - Copper reserve battery.

Fuel Cells: Hydrogen- Oxygen fuel cells.

UNIT – IV : SCIENCE OF CORROSION

Introduction: Definition, examples.

Dry Corrosion (Direct Chemical corrosion): Types of dry corrosion-oxidative corrosion, Pilling Bed worth rule, corrosion by other gases and liquid metal corrosion.

Wet Corrosion (Electro Chemical corrosion): Mechanism - Oxygen absorption, Hydrogen evolution, Types of wet corrosion, galvanic corrosion, concentration cell corrosion, passivity, galvanic series.

Factors Influencing Corrosion: Nature of metal (purity, position in galvanic series, relative area of cathode and anode, nature of surface film) and nature of environment (temperature, humidity, atmospheric pollution and nature of ions in the medium).

Control of Corrosion: Cathodic protection (sacrificial anode and impressed current methods), electro plating and metal cladding.

UNIT – V : CHEMISTRY OF ENGINEERING MATERIALS

Polymers: Definition, basic terminology, differences between thermosets & thermoplasts, types of polymerization(addition, condensation and co-polymerisation), preparation, properties and engineering applications of Teflon and bakelite, conducting polymers-extinsic and intrinsic conducting polymers.

Rubbers: Definition, processing of natural rubber, draw backs, vulcanization and advantages, preparation, properties and applications of BUNA-S and thiokol.

Lubricants: Characteristics of a good lubricant and properties of lubricants (viscosity, flash and fire points, cloud and pour points, aniline point) and applications.

TEXT BOOKS

1. Shashi Chawla, "A Text book of Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi, 3rd Edition, 2003.
2. Jain, Jain, "A Text book of Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi, 16th Edition, 2015.

REFERENCES

1. Shikha Agarwal, "A text book of Engineering Chemistry", Cambridge University Press, New Delhi, 1st Edition, 2015.
2. S.S. Dara, S.S. Umare, "A Text book of Engineering Chemistry", S. Chand Publications, New Delhi, 12th Edition, 2010.
3. Y. Bharathi Kumari, Jyotsna Cherukuri, "A Text book of Engineering Chemistry", VGS Publications, Vijayawada, 1st Edition, 2009.

B.Tech. (II Sem.)

17CE02 - APPLIED MECHANICS

L	T	P	Cr.
2	2	-	3

Pre-requisites : Physics

Course Educational Objective :

This course provides a basic knowledge of rigid-body mechanics, elasticity and structural analysis. In particular, the principles of statics and their applications in engineering, the methods of static analysis, and techniques of engineering computation are expounded.

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

- CO1: Acquire the knowledge of analyzing force and couple systems with regards to practical applications.
- CO2: Analyze and solve the engineering problems for different types of forces acting on rigid bodies in equilibrium conditions.
- CO3: Solve the problems associated with frictional forces in different applications.
- CO4: Locate centroid and determine moment of inertia for composite areas and various cross sections.
- CO5: Acquire the knowledge to deal with kinematic analysis of particle both in translation and projectile motions.

UNIT – I: BASIC CONCEPTS

RESULTANT OF SYSTEMS OF FORCES : Parallelogram law-forces and components-Resultant of Coplanar Concurrent Forces – Components of forces in Space – Moment of Force-principle of moments-Varignon’s theorem-Application – Couples and Resultant of Force Systems.

UNIT – II: EQUILIBRIUM OF SYSTEMS OF FORCES

Free Body Diagrams- Equations of Equilibrium- Lami’s Theorem - equilibrium of planar systems - Equilibrium of spatial Systems.

UNIT-III: FRICTION

Introduction-Theory of Friction-Angle of friction-Laws of friction-coefficient of friction-cone of friction-impending motion of connected bodies-Ladder friction –Wedge friction

UNIT: IV: CENTROID AND MOMENT OF INERTIA

CENTROID: Centroids of simple figures (from basic principles)– Centroids of Composite Figures.

CENTRE OF GRAVITY: Centre of gravity of simple bodies (from basic principles) - centre of gravity of composite plane figures- Pappus theorem.

AREA MOMENT OF INERTIA: Definition-Polar Moment of Inertia- Transfer Theorem, Moments of Inertia of composite figures.

MASS MOMENT OF INERTIA: Moment of inertia of masses-Transfer formula for mass moment of inertia-simple problems.

UNIT –V: KINEMATICS OF RECTILINEAR TRANSLATION

Introduction,-displacement- velocity and acceleration- Motion with Uniform acceleration, Motion of projectiles.

TEXT BOOKS

1. Ferdinand L. Singer, "Engineering Mechanics" Published by Harper Collins Publishers, Singapore.
2. S. Timoshenko, D.H. Young and J.V. Rao "Engineering Mechanics" TATA McGraw Hill, New Delhi, Revised Fourth Edition.

REFERENCES

1. RK Rajput "Engineering. Mechanics" Dhanpat Rai and Sons, New Delhi
2. S.S. Bhavikatti and K.G. Rajashekarappa "Engineering Mechanics", New Age International Publishers, New Delhi.
3. RK Bansal "Engineering. Mechanics" Laxmi Publishers, New Delhi.

B.Tech. (II Sem.)

17CE03 - SURVEYING

L	T	P	Cr.
2	2	-	3

Pre-requisites : NIL

Course Educational Objective: The course aims to teach the basic principles of surveying and various methods for measuring linear and angular measurements. The coverage of the course enables the students to differentiate the available surveying equipments suitable for a specific purpose.

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

- CO1: Apply the basic principles in surveying for the computations using chain and compass survey.
- CO2: Generate the elevations and contours of different points in the field.
- CO3: Compute the area and volume of a given field.
- CO4: Discriminate the appropriate usage of theodolite and tacheometry in civil engineering applications
- CO5: compute the requirements of a simple curves and acquainted to the basic principles of total station.

UNIT-I

INTRODUCTION: Definition-Types and applications of Surveying- Overview of Plane Surveying (Chain, Compass and Plane Table), Objectives, Principles and Classifications.

LINEAR AND ANGULAR MEASUREMENTS: Linear Measurements Using Tape and Chain- Errors and Corrections to Linear Measurements – Compass Survey-prismatic compass- Bearings, Declination, Local Attraction, Computation of Angle. Traversing - Purpose-Types of Traverse- Traverse Computation - Traverse Adjustments by Bowditch's rule

UNIT II

LEVELING: Concept and Terminology, Temporary and Permanent Adjustments – Height of Instrument Method, Rise and Fall Method.

CONTOURING: Characteristics and applications of Contours- plotting Contours by Grid Method.

UNIT III

COMPUTATION OF AREAS: Area from field notes, Computation of areas along irregular boundaries and Area consisting of regular boundaries.

COMPUTATION OF VOLUMES: Embankments and Cutting for a level section and two level sections with and without transverse slopes, determination of the capacity of reservoir, Volume of borrow pits.

UNIT IV

THEODOLITE: Theodolite, Description, applications – Temporary and Permanent adjustments, Measurement of horizontal and vertical angles.

TACHEOMETRIC SURVEYING: Stadia and Tangential Methods of Tachometry - Distance and Elevation Formulae for Staff Vertical Position.

UNIT V

SIMPLE CURVES: Introduction- Types of Curves- Elements of a simple circular curve; Degree of curve relationship between radius and degree of curve; Calculation of various elements of curve. Introduction to Total Station, Global Positioning System.

TEXT BOOKS

1. Punmia B.C. “Surveying Vol I and II”, Laxmi Publications 16th, 17th Edition, 2005,2016.
2. Arora K R, “Surveying Vol 1, 2 & 3”, Standard Book House, Delhi, 2004

REFERENCES

1. R.Subramanya –“Surveying and Leveling”- Oxford Publication
2. N.N Basak, “Surveying and Leveling”, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1994
3. R. Agor “A Text Book of Surveying and Leveling”, Khanna Publishers, New Delhi, 1998..
4. Kanetkar T.P and S.V. Kulkarni, “Surveying and Leveling- Part I and II”, Vidyarthi Prakasan, Pune, 1997.

B.Tech. (II Sem.)

17FE64 - APPLIED CHEMISTRY LAB

L	T	P	Cr.
-	-	2	1

Pre-requisites : Knowledge of volumetric titration.

Course Educational Objectives:

The primary objective of Applied Chemistry is to make the students analyze water sample for hardness and alkalinity. It makes the students to perform and distinguish different types of volumetric titrations. It also provides them with an overview of preparation of polymers. It makes the students to find important properties of fuels and lubricants for their effective use.

Course Outcomes: After completion of the course, the students will be able to

CO1: Assess quality of water based on the procedures given.

CO2: Distinguish different types of titrations in volumetric analysis after performing the experiments listed in the syllabus.

CO3: Acquire practical knowledge related to preparation of polymers.

CO4: Exhibit skills in performing experiments based on theoretical fundamentals.

Introduction

1. Introduction to Chemistry laboratory – Molarity, Normality, Primary, secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis, etc.
2. Preparation of standard solutions, concept of standardisation of solutions, dilution to get solution of required normality.
3. Model experiment - Determination of amount of HCl using standard Na_2CO_3 solution.

Water analysis

4. Determination of alkalinity of water sample.
5. Determination of total hardness of water by EDTA method.
6. Determination of permanent hardness of water by EDTA method.

Preparation of polymers

7. Preparation of Urea Formaldehyde resin.
8. Preparation of Phenol Formaldehyde resin.

Redox titrations

9. Estimation of Mohr's salt by using potassium permanganate.
10. Estimation of Mohr's salt by using potassium dichromate.
11. Estimation of KMnO_4 by using Oxalic acid.

Demonstration Experiments

12. Determination of pH of the given sample solution/ soil using pH meter.
13. Determination of turbidity of the given sample water.

Fuels

14. Determination of flash and fire points of a given fuel/lubricant.
15. Determination of cloud and pour point of a given fuel/lubricant.
16. Determination of Aniline point of a given lubricant.

REFERENCES

Lab manual

B.Tech. (II Sem.)

**17CE60 - COMPUTER BASED ENGINEERING
DRAWING LAB**

L	T	P	Cr.
-	-	2	1

Pre-requisites: Nil

Course Educational Objective:

The course aims to teach developing and drawing of engineering objects using AutoCAD. The student will be taught the fundamentals of AutoCAD and then asked to develop the projections of objects related to straight lines, planes, solids, orthographic and isometric views, development of surfaces using principles of engineering drawing.

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

CO1: Draw simple objects using functional tools in AutoCAD.

CO2: Develop and draw the positions and views of points, lines, planes and solids using AutoCAD.

CO3: Develop and draw the orthographic and isometric projections of simple objects using Auto-CAD.

CO4: Develop and draw the projections of the solids by developing the surfaces using AutoCAD.

BASIC AUTOCAD COMMANDS

1. Basic drawing commands (line, circle, arc, ellipse, polygon, and rectangle).
2. Edit commands (copy, move, erase, zoom).
3. Array commands (polar array, rectangular array, P-edit, divide, pline, offset).
4. Hatching & line commands (hatching with different angles & different types of lines).
5. Mirror & trim commands (mirror an object, trim, extend a line, chamfer & fillet, explode).
6. Dimensioning & text commands (linear, angular, radius, diameter & text).

PROJECTION OF POINTS, LINES AND PLANES

1. Projection of points (I, II, III, & IV quadrants).
2. Projection of lines parallel to both reference planes.
3. Projection of lines parallel to one reference plane & inclined to other reference plane.
4. Projection of planes: Single stage projections.

PROJECTION OF SOLIDS

1. Projection of solids in simple position and transfer of points.
2. Projection of solids with axes inclined to one reference plane & parallel to other.
3. Sections of solids: Simple sections

ORTHOGRAPHIC PROJECTIONS

1. Conversion of plane figures to orthographic views.
2. Conversion of circular figures to orthographic views.
3. Conversion of combination of plane figures and circular figures to orthographic views.

ISOMETRIC PROJECTIONS

1. Conversion of plane figures to isometric views.
2. Conversion of circular figures to isometric views.
3. Conversion of combination of plane figures and circular figures to isometric views.

DEVELOPMENT OF SURFACES

1. Parallel-line development (prism, cylinder) for objects in simple position.
2. Radial-line development (cone, pyramid) for objects in simple position.

TEXTBOOK

D.M. Kulkarni, A.P Rastogi, and A.K. Sarkar, “Engineering Graphics with AutoCAD”, PHI Learning Private Limited, New Delhi, 2009.

REFERENCE

N. D. Bhatt, “Engineering Drawing”, 51st Revised and Enlarged Edition, Charotar Publishers, 2012.

B.Tech. (II Sem.)

**17CE61 - CIVIL ENGINEERING DRAFTING
TECHNIQUES LAB**

L	T	P	Cr.
-	-	2	1

Pre-requisites : Nil

Course Educational Objective:

The course aims to teach fundamental free hand civil engineering drafting techniques using conventional drawing tools. The student is asked to develop and draw simple geometrical constructions used in engineering drawing. The student is then exposed to ArchiCAD fundamentals and is asked to develop and draw few civil engineering elements.

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

- CO1 : Draw simple objects based on principles of geometry.
- CO2 : Develop the projections of an object based on the angles of projection.
- CO3 : Draft simple objects using ArchiCAD software
- CO4 : Develop, draw and edit simple objects related to civil engineering applications using ArchiCAD.

Part A: BASIC PRINCIPLES OF ENGINEERING DRAFTING

1. **Fundamentals:** Basic tools and instruments used in conventional drawing
2. **Geometrical construction:** Bisection of a line, draw perpendiculars of line, draw parallel lines, divide a line, divide a circle, bisect an angle, trisecting an angle, finding center of an arc, constructing equilateral triangles, polygons, polygons inscribed in circles, draw tangents, length of arcs, circle and lines in contact, inscribed circles.
3. **Curves used in engineering practice:** Ellipse, parabola
4. **Projections:** First and third angle projections, front view, top view, side view of some simple objects

Part B: ARCHICAD FUNDAMENTALS

1. Introduction to ArchiCAD
2. Basic tools (document tools)-line, circle, poly line, dimensional tools, text, fill, etc.
3. Design tools- wall, window, column, beam, slab, stair, roof, sheet, etc.
4. Drawing some simple objects

TEXT BOOKS/REFERENCES:

1. N.D. Bhatt. "Engineering Drawing", Charotar Publications, 53rd edition, 2014.
2. Lecture material prepared by department faculty.
3. Video material based on topics covered.

L	T	P	Cr.
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Pre-requisites : Surveying

Course Educational Objective:

The course teaches the basic principles of surveying, various methods of linear and angles measuring instruments through hands-on practice sessions and enable the students to use surveying equipments.

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

CO1 : Compute linear and angular measurements in the field using chain and compass.

CO2 : Plot a given area using plane table in the field.

CO3 : Determine the elevations of different points in the field.

CHAIN SURVEYING

1. Chaining of a line using chain/tape and recording of details along the chain line.
2. Measurement of area – Cross staff survey.
3. Determination of Obstacle Length.

COMPASS SURVEYING

4. Compass traverse – Plotting and Adjustments of Traverse.
5. Compass Surveying – Distance between Two Inaccessible Points.

PLANE TABLE SURVEYING

7. Radiation method of plane table survey.
8. Intersection method of plane table survey.
8. Two Point Problem
9. Three Points Problem – Trial and error method.

LEVELING

10. Measurement of elevation difference between two points using any levelling Instrument.
11. Elevation difference between two points by Reciprocal levelling method.
12. Profile Levelling – Plotting of Profile- Longitudinal Sectioning and Cross Sectioning.
13. Contouring of a small area by method of blocks.

Text Book/Reference

Laboratory Manual prepared by Civil Engineering Department.

L	T	P	Cr.
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B.Tech. (III Sem.)

17FE07 - NUMERICAL METHODS AND FOURIER ANALYSIS

Pre-requisites : None

Course Educational Objective : The main objective of this course is to enable the students learn Numerical Techniques for solving the equations, interpolation, differential equations and fitting of various curves. They will also learn about the Fourier analysis of single valued functions.

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

- CO1: Compare the rate of accuracy between various methods in approximating the root of the equation and Distinguish among the criteria of selection and procedures of various Numerical Integration Rules.
- CO2: Estimate the best fit polynomial for the given tabulated data using the methods of Newton's Interpolation formulae and Lagrange's Interpolation.
- CO3: Apply various Numerical methods in solving the initial value problem involving the ordinary differential equation.
- CO4: Estimate the unknown dependent variables using curve fitting methods..
- CO5: Generate the single valued functions in the form of Fourier series and obtain the Fourier Transforms

UNIT – I
Solution of Algebraic and Transcendental Equations and Numerical Integration

Solutions of Algebraic and Transcendental Equations – Regula Falsi method and Newton Raphson Method in one variable.

Numerical Integration

Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

UNIT – II
Interpolation and Finite Differences

Interpolation: Introduction – Finite differences- Forward Differences- Backward Differences- Central differences – Symbolic relations and separation of symbols-Differences of a polynomial- Newton's formulae for interpolation – Lagrange's Interpolation formula.

UNIT – III
Numerical solution of Ordinary Differential Equations

Numerical solution of Ordinary Differential equations, Solution by Taylor's series - Picard's Method of successive approximations - Euler's Method - Runge- Kutta Methods.

UNIT – IV
CURVE FITTING

Curve fitting by the principle of Least Squares: Fitting of a straight line – Second degree parabola- other polynomial curves-Fitting of exponential curves –Fitting of a power curve

UNIT – V
Fourier Series and Fourier Transforms

Determination of Fourier coefficients – Fourier series – even and odd functions – Fourier series in an arbitrary interval– Half-range sine and cosine series

Fourier Transforms

Fourier integral theorem (only statement) – Fourier transform – sine and cosine transforms – properties.

TEXT BOOKS

1. S. S. Sastry, "*Introductory Methods of Numerical Analysis*", 5th Edition, PHI, New Delhi, 2005.
2. B. V. Ramana, "*Higher Engineering Mathematics*", 1st Edition, TMH, New Delhi, 2010.

REFERENCES

1. B.S. Grewal , "*Higher Engineering Mathematics*", 42nd Edition, Khanna Publishers, New Delhi, 2012.
2. Steven. C. Chopra, Ra. P. Canale, "*Numerical Methods for Engineers with programming and software application*", 4th Edition, TMH, New Delhi, 2002.
3. M. K. Jain, S. R. K. Iyengar, R.K. Jain, "*Numerical Methods for Scientific and Engineering Computation*", 5th Edition, New Age International Publishers, New Delhi, 2007.

L	T	P	Cr.
3	-	-	3

B.Tech. (III Sem.)

**17EE51 - FUNDAMENTALS OF ELECTRICAL
ENGINEERING**

Pre-requisites : -

Course Educational Objective: This course enables the student to understand the basics of network theory, construction and working principles of AC equipment. It also deals with basics of applied electricity for every engineer.

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

CO1: Analyse AC and DC circuits

CO2: Analyze the performance of AC machines

CO3: Identify the wiring system and safety measures used in a building/ Industry

CO4: Choose illumination schemes based on application

UNIT – I: DC Circuits

Basic definitions, Types of elements-active and passive, Ohm's Law, Kirchhoff's Laws, Network reduction techniques-series, parallel, star to delta, delta to star transformations, source transformations (for resistive networks). Numerical problems.

UNIT – II: AC Fundamentals

Peak, R.M.S, average, instantaneous values, Form factor and Peak factor for Periodic waveforms, Phase and Phase difference-concepts of Reactance, Impedance, Susceptance and Admittance, Real, Reactive and Apparent powers, Power factor. Numerical problems.

UNIT – III: Single Phase Transformers and Induction Motors

Single Phase Transformers: Principle of operation of single phase transformers, E.M.F equation-Losses-Efficiency and Regulations calculation, O.C and S.C tests. Numerical problems.

Induction motor: Principle and operation of Induction Motors- Types of rotors -Slip ring and Squirrel cage motors - Slip - rotor emf and current-torque-starting torque-condition for Maximum Torque –Slip-Torque characteristics.

UNIT – IV: Electrical Installation & Safety

Introduction, systems of distribution of electrical energy-distribution board systems, tree system, Methods of wiring, types of internal wiring-advantages and disadvantages, choice of wiring, industrial wiring, and electrical safety measures.

UNIT – V: Illumination

Introduction, terms used in illumination, laws of illumination, incandescent fluorescent tube, and mercury vapour lamp, neon lamp, Lighting schemes-direct lighting, semi direct, Semi indirect, indirect lighting, Design of Lighting schemes-, methods of lighting calculations, Aviation and transport lighting, lighting for displays and signalling- neon signs, LED, LCD displays beacons and lighting for surveillance .

TEXTBOOKS

1. J. B. Gupta, "Fundamentals of electrical engineering and electronics", S.K.Kataria & Sons Publishers, 9th Edition, 2016.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", TMH Publications, 1st Edition, 2011.

REFERENCES

1. N. V. Suryanarayana, "Utilisation of Electric Power", New Age International Publishers
2. V.K. Mehta, "Principle of Electrical Engineering", S. Chand Publications.
3. K. B. Raina, S. K. Bhattacharya, "Electrical Design Estimation and costing", New Age International Publishers

L	T	P	Cr.
2	2	-	3

B.Tech. (III Sem.)

17CE04 - STRENGTH OF MATERIALS – I

Pre-requisites : **Applied Mechanics, Engineering Mathematics**

Course Educational Objective:

The course teaches about engineering properties of materials such as tensile, compression strength, torsion & bending strength. The behavior of beam/frame elements with different support conditions and loading system will be discussed.

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

CO1 : Assess the stresses and strains in a member subjected to different loadings

CO2 : Analyze the various beams subjected to different loads using shear force and bending moment diagrams.

CO3 : Compute the shear and bending stress distribution in several members of different sections.

CO4 : Compute the twisting moment and shear stress induced in shafts and evaluate the pull component in springs.

CO5 : Interpret the stresses in thick and thin cylindrical and spherical shells under different loads and directions and member forces in a truss.

UNIT-I: STRESSES AND STRAINS

Mechanical Properties of Solids-Stress and Strain-Hooke's Law-Tensile Test Diagram-Bars of Varying Sections and Tapering Sections-Temperature Stresses-Elastic Constants-Poisson's Ratio-Upper Limit of Poisson's Ratio-Complementary Shear Stress-State of Simple Shear-Shear Strain-Relation between Elastic Constants

Strain Energy-Introduction-Resistance Deformation Diagram-Proof Resilience-Gradual-Sudden and Impact Loadings

UNIT-II: SHEAR FORCE AND BENDING MOMENT

Basic Concepts- Shear Force and Bending Moment- SFD and BMD- Relation Between BM and SF- Freely Supported Beam With End Couples- Beam With Intermediate Couple-Loading and BMD from SFD.

UNIT-III: BENDING AND SHEARING STRESSES IN BEAMS

Bending Stresses in a Beam Section: Theory of Simple Bending- Design Criterion and Section Modulus-Strength of Section- Strain Energy Due To Bending

Shearing Stresses in Beams: Introduction-Distribution of Shearing Stresses -Shear Stress Distribution across Rectangular, Triangular and Circular Cross Section.

UNIT-IV: TORSION OF SHAFTS AND SPRINGS

Torsion of Shafts Introduction-Relation between Twisting Moment, Twist and Shear Stress-Design of Shafts-Combined Bending and Torsion-Shafts in Series and Parallel

Springs: Introduction-Closely Coiled Helical Spring under Axial Pull, Axial Couple- Open Coiled Helical Spring under Axial Force and Axial Torque

UNIT-V: THIN AND THICK CYLINDERS

Thin Cylindrical Shells: Introduction-Internal Pressure- Hoop Stress And Longitudinal Stress-Change In Volume-Design-Wire Wound Thin Cylinders- Thin Spherical Shells-internal pressure.

Thick Cylindrical Shells: Lamé's Theory-Special Cases-Design-Compound Cylinders-Necessary Difference of Radii for Shrinkage-Thick Spherical Shells.

Analysis of Trusses: Analysis of Trusses by Method of Joints, Method of Sections and Tension Coefficient Method

TEXT BOOKS

1. S.S. Bhavikatti, “Strength of Materials”, Vikas Publishing House (P) Ltd., New Delhi, Second Edition, 2002.
2. B.C. Punmia, A.K. Jain, A.K. Jain, “Strength of Materials and Theory of Structures, Vols. I & II”, XI Edition, Laxmi Publications (P) Ltd, New Delhi, 2002.

REFERENCE

1. R.K.Rajput, “Strength of materials”, S.Chand & Co, New Delhi
2. R.K.Bansal, “Introduction to text book of Strength of Materials”, Laxmi publications 2004.
3. Gere and Timoshenko, Mechanics of Materials, 4th Edition, PWS Publishing Company, 1997
4. S.B.Junarkar and H.J. Shah, Mechanics of Structures, 27th Revised and Enlarged, Charotar Publishing House, 2008.
5. Beer and Johnston, Mechanics of Materials, 4th Edition, McGraw Hill, 2005.

L	T	P	Cr.
2	2	-	3

B.Tech. (III Sem.)

17CE05 - ENGINEERING GEOLOGY

Pre-requisites : Nil**Course Educational Objective:**

The course introduces the concepts of Geology in civil engineering perspective. The student is exposed to properties of different minerals and rocks. The importance of structural geological features and geophysical principles will be addressed for their interpretation in civil engineering designs.

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

- CO1: Demonstrate the importance of geological principles
- CO2: Differentiate minerals based on physical properties
- CO3: Distinguish various types of rocks based on their characteristic features
- CO4: Interpret geological structures
- CO5: Judge geophysical and geological considerations

UNIT – I: GENERAL GEOLOGY

Geology in Civil Engineering – Branches of geology – Earth's structure and composition – Continental drift, Plate tectonics, Weathering – types, products and soil profile,– Geological work of Rivers, Wind and Sea -Seismic zones of India

UNIT – II: MINEROLOGY

Physical properties of Minerals – Crystallographic systems – Silicate structures - Study of following families of rock forming minerals- Quartz, Feldspar, Pyroxene, Amphibole, Mica, Calcite, Gypsum and Clay

UNIT – III: PETROLOGY

Classification of Rocks – Igneous, Sedimentary and Metamorphic Rocks – Origin, Structure, texture and Classification – Study of physical properties, distribution and occurrence of important rock types viz. Granite, Diorite, Gabbro, Dolerite, Basalt, Limestone, Conglomerate, Breccia, Sandstone, Quartzite, Marble, Gneiss, and Schist etc.

UNIT – IV: STRUCTURAL GEOLOGY

Outcrop, Dip and Strike, Study of common structures associated with rocks such as Folds, Faults, Unconformities and Joints, their classification, types, their relevance and importance in civil engineering.

UNIT - V : ENGINEERING APPLICATIONS IN GEOLOGY

Importance of Geophysical studies, Brief introduction of principles of geophysical studies - Gravity method, Magnetic methods, Electrical methods, Seismic methods, Radio metric methods and geothermal method.

Geological considerations in construction of Dam, Reservoir, Tunnel

TEXT BOOKS

1. Parbin Singh., “Engineering and General Geology”, Katson Publication House, 2009.
2. Chenna Kesavulu N., “Text book of Engineering Geology”, Macmillan India Ltd, 2003.

REFERENCES

1. Legget., “Geology and Engineering”, 2nd Edition, McGraw Hill Book Company, 2006.
2. Blyth. “Geology for Engineers”, 7th Edition, ELBS, 1995.
3. KVGK Gokhale, “Principles of Engineering Geology”, B.S Publications, 2005
4. F.G. Bell, “Fundamental of Engineering Geology”, Butterworths Publications, Aditya Books Pvt. Ltd., New Delhi, 1992.
5. Krynine & Judd, “Principles of Engineering Geology & Geotechnics”, CBS Publishers & Distribution, First Edition, 1998.

L	T	P	Cr.
2	2	-	3

B.Tech. (III Sem.)

17CE06 - MECHANICS OF FLUIDS

Pre-requisites : Applied Mechanics**Course Educational Objective:**

The course teaches the fluid properties and fundamental relations based on conservation of mass, energy and momentum in fluid flow. Applications of these basic equations are highlighted for flow measurements through orifice, mouth piece, weirs, Venturimeter, sluice gates etc.

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

- CO1: Exposed to basic principles of fluid properties, pressure measurement for various devices and calculate the hydrostatic forces for submerged conditions.
- CO2: Apply the principles of conservation of mass for fluid flow problems.
- CO3: Apply the momentum and energy equation to fluid mechanics and laminar flow problems and flow measurement applications.
- CO4: Compute the energy losses in pipes, flow parameters in laminar flow conditions and exposed to the basics of boundary layer theory.
- CO5: Apply dimensional analysis as a tool in solving problems in the field of fluid mechanics and apply the laws of similarity.

UNIT – I PROPERTIES OF FLUIDS:

Specific mass-specific weight- specific volume- specific gravity- compressibility- viscosity- surface tension- capillarity- vapour pressure and their influences on fluid motion.

Pressure Measurement: Pressure at a point, Pascal's law- Hydrostatic law - atmospheric, gauge and vacuum pressure- Measurement of pressure- Manometers -Simple and differential manometers.

Hydrostatic Forces: Hydrostatic forces on submerged plane- horizontal, vertical, inclined and curved surfaces-centre of pressure-Derivations and problems.

UNIT-II FLUID KINEMATICS:

Description of fluid flow-Stream line- path line and streak lines and stream tube. Classification of flows: Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two, three dimensional flows – stream and velocity potential functions.

UNIT- III FLUID DYNAMICS:

Euler's equation of motion, Bernoulli's equation, simple applications of Bernoulli's equation, Momentum equation. Kinetic energy and Momentum correction factors.

Measurement of Flow: Pitot tube, Venturi meter and Orifice meter, flow over notches.

UNIT- IV CLOSED CONDUIT FLOW: Reynold's experiment -Laws of Fluid friction – Darcy's equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line.

Laminar Flow: - Laminar Flow through pipes – Hagen – Poiseuille equation for viscous flow – Laminar Flow between parallel stationary and moving plates.

Boundary Layer Theory: Boundary Layer thickness, Displacement thickness, Momentum thickness, Energy thickness, Boundary layer growth and separation.

UNIT-V HYDRAULIC SIMILITUDE: Dimensional analysis-Rayleigh's method and Buckingham's π theorem-study of Hydraulic models – Geometric, kinematic and dynamic similarities-dimensionless numbers – model and prototype relations.

TEXT BOOKS

1. P.N. Modi, and S.M. Seth, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Rajsons Publications Pvt Ltd., Standard Book House, New Delhi, 2009.
2. R.K. Bansal, "A Text book of Fluid Mechanics and Hydraulic Machines", Laxmi Publications (p) Ltd.

REFERENCES

1. K.R. Arora, "Fluid Mechanics, Hydraulic and Hydraulic Machines", Standard Publishers and Distributors, New Delhi, 2005.
2. A.K. Jain, Fluid Mechanics 2nd edition, Khanna Publishers, Delhi.2001 revised edition, Standard Book Home, New Delhi, 2005.
3. R.K. Rajput "Text Book of Fluid Mechanics and Hydraulic Machinery", Revised edition, S. Chand & Company, Ltd., New Delhi, 2005.

L	T	P	Cr.
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B.Tech. (III Sem.)

17CE07 - CONCRETE TECHNOLOGY

Pre-requisites : Building Materials

Course Educational Objective :

This course aims to teach the basic properties of concrete making materials, various tests on concrete and different admixtures to be used in concrete. The course also provides insight on various types of special concrete and their usage, determination of mix proportions as per IS codes.

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

- CO1 : State the concept of concrete and the component materials.
- CO2 : Assess the required properties of concrete.
- CO3 : Know the importance of various tests to determine strength of concrete.
- CO4 : Comprehend the various types of special concrete.
- CO5 : Compute the mix proportions for design as per IS code.

UNIT –I: CONCRETE MAKING MATERIALS

Cement –composition- hydration of cement – types of cement-tests and specifications. Aggregates – size and shape –gradation of aggregate – fineness modulus – bulking of sand-tests and specifications – alkali aggregate reaction-quality of water for concreting and curing.

UNIT – II: PROPERTIES OF CONCRETE

Properties of fresh concrete –workability –slump test –compaction factor test –flow test – segregation – bleeding Properties of hardened concrete –strength development –elastic properties of concrete-durability – impermeability - shrinkage and creep- thermal properties – fire resistance-resistance to abrasion.

UNIT- III: QUALITY CONTROL AND ADMIXTURES IN CONCRETE

Control techniques –storing –batching –mixing – transporting –placing –compacting –finishing-curing–acceptance and rejection criteria –Accelerators – retarders –water proofing compounds - air entraining agents–workability agents –bonding admixtures –pozzolanic admixtures – silica fume – fly ash –blast furnace slag-hyper plasticizer.

UNIT –IV: SPECIAL CONCRETES

Light weight concrete – light weight aggregate concrete –no fines concrete –high density concrete – sulphur infiltrated concrete –fibre reinforced concrete –polymer concrete –ready mixed concrete – high strength concrete –High performance concrete- Self compacting concrete-Bacterial concrete – gunite – shotcrete –vacuum concrete – pre packed concrete-ferrocement.

UNIT- V: CONCRETING PLANT AND MIX DESIGN

Batching plant –mixer –distributing plant –vibrators – repairs in concrete –control of cracks in mass concrete – surface treatment of concrete Concept of mix design –ACI method- Indian Standard method.

TEXT BOOKS

1. M.S. Shetty, "Concrete Technology" S. Chand & Co., Ltd., Revised Edition - New Delhi, 2003
2. M.L. Gambhir, "Concrete Technology", Revised Edition - Tata McGraw Hill Publishing Co., New Delhi 1998.

REFERENCES

1. Rofat Siddique "Special structural Concrete" Galgotia Publishing Pvt. Ltd., New Delhi, 1999.
2. K.T. Krishnaswamy, "Concrete Technology" Dhanpat Rai Publications

Code book: IS 10262-2009 "Concrete Mix Design"

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B.Tech. (III Sem.)

17CE63 - ENGINEERING GEOLOGY LAB

Pre-requisites: Engineering Geology

Course Educational Objective:

This course aims to illustrate the student the physical examination and characterization of the rocks and minerals existing in nature for evaluation and application as civil engineering materials. The students will appropriate the necessary geophysical principles and structural geological features essential for civil engineering designs.

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

- CO1: Demonstrate the importance of geological principles
- CO2: Differentiate minerals based on physical properties
- CO3: Distinguish various types of rocks based on their characteristic features
- CO4: Interpret geological structures
- CO5: Judge geophysical and geological considerations

LIST OF EXPERIMENTS

- 1) Description of Minerals by physical properties.
- 2) Description and Engineering uses of Rocks
- 3) Description and engineering consideration of Structural Models
- 4) Microscopic study of minerals
- 5) Microscopic study of rocks
- 6) Interpretation and drawing of sections for geological maps showing tilted beds, faults, uniformities etc.

LAB EXAMINATION PATTERN

1. Description and identification of FOUR minerals
2. Description and identification of FOUR (including igneous, sedimentary and metamorphic rocks)
3. ONE Interpretation of a Geological map along with a geological section.
4. TWO Simple strike and Dip problems.

TEXT BOOK/REFERENCE

Laboratory manual prepared by Civil Engineering Department.

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B.Tech. (III Sem.)

17CE64 - SOLID MECHANICS LAB

Pre-requisites : Building Materials, Strength of Materials

Course Educational Objective:

The course aims for providing hand on practice to material behaviour subjected to tensile, compressive, torsion and shear loadings. The course also deals with material hardness and impact resistance.

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

CO1: Perform necessary experiments to determine the mechanical properties of materials under different loading conditions.

CO2: Analyze the experimental results for assessment of the strength of the given material

Note: A minimum of 8 experiments to be performed from the following

List of Experiments

1. Study of stress-strain characteristics of mild steel bars by UTM.
2. Study of stress-strain characteristics of HYSD bars by UTM.
3. Determination of modulus of elasticity of the material of the beam by conducting bending test on simply supported beam.
4. Determination of modulus of elasticity of the material of the beam by conducting bending test on Cantilever beam.
5. Determination of modulus of elasticity of the material of the beam by conducting bending test on simply supported beam with one end overhang.
6. Determination of modulus of rigidity by conducting torsion test on solid circular shaft.
7. Determination of hardness of the given material by Brinnel's/Vicker's/
8. Determination of hardness of the given material by Rockwell hardness test.
9. Determination of impact strength of the given material by conducting Charpy/Izod test
10. Determination of ultimate shear strength of steel by conducting direct shear test.
11. Determination of modulus of rigidity of the material of closely coiled helical spring.
12. Determination of compressive strength of wood/ brick with grain parallel / perpendicular to loading.

TEXT BOOK/REFERENCE

Laboratory manual prepared by Civil Engineering Department.

B.Tech. (III Sem.)

17CE65 - ADVANCED SURVEY FIELD WORK LAB

L	T	P	Cr.
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Pre-requisites: Surveying, Survey Field Work Lab

Course Educational Objective:

The course allows the student to gain practical exposure in taking angular measurements, horizontal distances and vertical heights of objects by advanced surveying equipments.

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

CO1 : Obtain angular measurements in the field using theodolite.

CO2 : Determine the elevations of different points in the field using theodolite and total stations.

CO3 : Operate the total station to take out the measurements for desired objectives.

CO4 : Establish the setting out of works in the field.

LIST OF EXPERIMENTS:

THEODOLITE

1. Determining the Horizontal and Vertical Angles by the method of repetition method.
2. Finding the distance between two inaccessible points.
3. Determination of Height and distances – Single plane method & Double plane method.

TACHEOMETRY

4. Tacheometry – Constants of Tacheometer & Stadia Tachometry
5. Tangential Tacheometry
6. Tacheometric contouring – Radial method

TOTAL STATION

7. Study of Instrument – Determination of Distances, Directions and Elevations.
8. Determination of Boundaries of a Field and computation of area.
9. Finding the distance between two inaccessible points.

SETTING OUT

10. Setting of simple circular curve using tape and theodolite.
11. Setting of a simple circular curve using Total Station.
12. Setting out for Building.

TEXT BOOK/REFERENCE

Laboratory Manual prepared by Civil Engineering Department.

B.Tech. (III Sem.) 17PD03 - PROFESSIONAL ETHICS AND HUMAN VALUES

L	T	P	Cr.
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Pre requisite: Basic Sciences and Humanities

COURSE EDUCATIONAL OBJECTIVES:

1. To create an awareness on engineering ethics and human values.
2. To adumbrate the inevitability of different intellectual property rights like patents, copyrights, trademarks, and trade secret.
3. To give an impetus on achieving higher positions in profession, with ethical and human values as a base and support for the growth.
4. To explicate the professional and societal responsibilities of the engineers.
5. To make the student realize the sensitiveness associated with experimentation process

COURSE OUTCOMES: At the end of the course, the student

- CO1 : Acquires the basic concepts of human values & also gain the connotations of ethical theories.
- CO2: Knows the basic concepts of Professional ethics and handling Dilemma in decision making.
- CO3: Knows the duties and rights towards the society in an engineering profession
- CO4: Would realize the importance and necessity of intellectual property rights.
- CO5: Can take all the necessary precautions while conducting the experiments, which may reduce the risk.

UNIT –I: ETHICS

Senses of 'Engineering Ethics' -Variety of moral issues - Types of inquiry -Moral dilemmas Moral autonomy -Kohlberg's theory Gilligan's theory -Consensus and controversy – Models of Professional Roles -Theories about right action- Self interest - Customs and religion -Uses of Ethical theories.

UNIT - II: HUMAN VALUES

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning - Civic Virtue –Respect for Others–Living Peacefully – Caring – Sharing - Honesty – Courage– Valuing Time - Cooperation – Commitment – Empathy – Self Confidence – Character – Spirituality

UNIT – III: ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as experimentation- Engineering Projects VS. Standard Experiments - Engineers as responsible experimenters – Codes of ethics - Industrial Standards - Abalanced outlook on law- The challenger case study.

UNIT – IV: SAFETYAND RESPONSIBILITIES

Safety and risk- Assessment of safety and risk- Risk benefit analysis and reducing risk- Three Mile Island and Chernobyl case study - Collegiality and loyalty -Respect for authority- Collective bargaining – Confidentiality- Conflicts of interest- Occupational crime-Professional Rights- Employee Rights –Intellectual Property Rights(IPR) discrimination.

UNIT – V: GLOBAL ISSUES

Multinational Corporation's -Environmental ethics-computer ethics -weapons development Engineers as managers - consulting engineers-engineers as expert witnesses and advisors, Moral leadership - sample code of Ethics (Specific to a particular Engineering Discipline).

TEXT BOOKS

1. R.S.Nagarajan, a Textbook on “Professional Ethics and Human Values”, New Age Publishers – 2016.
2. Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw Hill, New York 1996.
3. “Professional Ethics and Human Values” by A.Alavudeen, R.Kalil Rahman and M. Jayakumaran- Laxmi Publications.
4. “Ethics in Engineering” by Mike W. Martin and Roland Schinzinger – Tata McGraw- Hill – 2003.

REFERENCES

1. Govindarajan M, Natarajan S, Senthil Kumar V. S, “ Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.
2. Charles D. Fleddermann, "Engineering Ethics", Pearson Education/ Prentice Hall, New Jersey,2004 (Indian Reprint now available)
3. Charles E Harris, Michael S. Protchard and Michael J Rabins, “Engineering Ethics – Concepts and Cases”, Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available).
4. John R Boatright, “Ethics and the conduct of business”, Pearson Education, New Delhi,2003.
5. Edmund G Seebauer and Robert L Barry, “Fundamentals of ethics for scientists and engineers”, Oxford University Press, Oxford, 2001.
6. “Fundamentals of ethics for scientists and engineers” Edmund G Cseebauer and Robert L Barey,Oxford University Press, 2001.
7. “Text book on Intellectual Property rights”, N K Acahrya, Asian Law House, 7th edition,2014.
8. “An Introduction to Intellectual Property Rights”, Dr.J.P.Mishra,Central law House, 3rd edition,2012.

L	T	P	Cr.
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B.Tech. (IV Sem.)

17FE03 - ENVIRONMENTAL SCIENCE

Pre-requisites : None**Course Educational Objective :**

To provide a general background on developing an understanding of systems and cycles on the earth and how individual organisms live together in complex communities.

To enable the students in understanding how human activities influence our air, water and soil and it also helps in developing a right attitude about our use of fossil fuels and effect on climate and sustainable management of natural resources.

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

CO1: Identify environmental problems arising due to engineering and technological activities that help to be the part of sustainable solutions.

CO2: Evaluate local, regional and global environmental issues related to resources and their sustainable management.

CO3: Identify the importance of ecosystem and biodiversity for maintaining ecological balance.

CO4: Acknowledge and prevent the problems related to pollution of air, water and soil.

CO5: Interpret the significance of implementing environmental laws and abatement devices for environmental management.

UNIT – I**Nature and scope of Environmental Problems**

- Introduction, components of Environment
- Scope and importance of environmental studies
- Population explosion, variations among nations
- Resettlement and Rehabilitation - Issues and possible solutions
- Environment and human health
- HIV-AIDS
- Environmental ethics
- Role of Information Technology in environmental management and human health

UNIT – II**Natural Resources and Conservation**

- Introduction and classification of Natural Resources
- Forest resources: Use and over-exploitation, deforestation, Timber extraction, mining, dams and their effects on forests and tribal people
- Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, interlinking of rivers, dams-benefits and problems. Rain water harvesting, watershed management
- Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources
- Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, soil salinity
- Energy resources: Growing energy needs renewable, non-renewable and alternate energy resources

UNIT – III**Ecology and Biodiversity**

- Definition, structure and functions of an ecosystem
- Food chains and Food webs, Ecological succession, Ecological pyramids
- Biogeochemical cycles, Major Types of Ecosystems – Forest, Grassland, Desert Land & aquatic Ecosystem, Ecological Niche and Keystone Species

- Definition and levels of measuring biodiversity - genetic, species, community and ecosystem diversity
- Bio geographical classification of India
- India as a mega diversity nation
- Values of biodiversity- Direct and Indirect values
- Threats to biodiversity; Man and wild life conflicts
- Endangered and endemic species of India
- Conservation of biodiversity: In-situ and Ex-situ conservation methods

UNIT – IV

Environmental Pollution

- Introduction to Environmental Pollution Causes, effects and control measures of:
- Air pollution
- Water pollution
- Soil pollution
- Noise pollution
- Nuclear hazards
- Solid Waste Management – Sources, Classification, effects and control measures of Municipal solid waste, Biomedical waste & Hazardous and e-waste
- Environmental Issues relating to Climate change, global warming, acid rain, ozone layer depletion
- Disaster Management- Floods, Cyclones, Earthquakes, Landslides and Tsunamis.

UNIT – V

Environmental Management

- Sustainable development and unsustainability
- Stockholm and Rio Summit
- Environmental Impact Assessment (EIA)
- Green building
- Consumerism and Waste products
- Carbon credits and carbon trading
- Environmental Law- Air, Water, Wild life, Forest, and Environmental protection act

TEXT BOOKS

1. Anubha Kaushik, C.P.Kaushik, “Perspectives in Environmental Studies”, New age international publishers, Delhi, 5nd edition, 2016.
2. Mahua Basu, S.Xavier, “Fundamentals of Environmental Studies”, Cambridge University Press, Delhi, 1st edition, 2016.

REFERENCES

1. S.Deswal, A. Deswal, “A Basic course in Environmental Studies”, Educational & Technical Publishers, Delhi, 2nd Edition, 2014.
2. R. Rajagopalan, “Environmental Studies (From Crisis to Cure)”, Oxford University Press, New Delhi, 3rd Edition, 2012.
3. De, A.K, “Environmental Chemistry”, New Age International (P) Limited, New Delhi, 5th Edition, 2003.
4. Dr.K.V.S.G. Murali Krishna, “Environmental Studies”, VGS Techno Series, Vijayawada, 1st Edition, 2010.
5. G. Tyler Miller, Scott Spoolman, “Introduction to Environmental Studies”, Cengage Learning, New Delhi, 13th Edition, 2009.

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B.Tech. (IV Sem.)

17FE08 - PROBABILITY AND STATISTICS

Pre-requisites : None

Course Educational Objective : The objective of this course is to introduce the probability and its distributions, sampling methods and estimation. They also learn various tests of hypothesis and evaluation of correlation and regression analysis.

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

- CO1: Predict various probabilistic situations based on the laws of probability and random variables.
- CO2: Distinguish among the criteria of selection and application of Binomial, Poisson, Normal and Exponential distributions.
- CO3: Estimate the point and interval estimators of mean and proportion for the given Sample data.
- CO4: Apply various sample tests like Z-test, t-test, F-test and χ^2 -test for decision making regarding the population based on sample data.
- CO5: Estimate the level of correlation, the linear relationship using the regression lines for the given bivariate data.

UNIT - I :**PROBABILITY AND RANDOM VARIABLES**

Conditional probability – Multiplication theorem-Bayes theorem.

Random variables – Discrete and continuous Random Variables, distribution function. Mathematical Expectation of Univariate Random Variable.

UNIT –II**PROBABILITY DISTRIBUTIONS**

Discrete Probability Distributions: Binomial distribution and Poisson distribution. Continuous Probability Distributions: Normal distribution and Exponential distribution. Related properties, simple applications.

UNIT –III**SAMPLING DISTRIBUTION AND ESTIMATION**

Population and sample, Sampling distribution of mean (with known and unknown variance), and variances. Sampling distribution of sums and differences. Point estimation and interval estimation for mean and proportions.

UNIT –IV**TESTS OF HYPOTHESIS**

Null and Alternative Hypothesis, One tail and two tailed tests, Type I and Type II errors. Testing of hypothesis concerning means, proportions and their differences using Z-test. Tests of hypothesis using Student's t-test, F-test and χ^2 -test.

Applications of decision making using the above tests.

UNIT –V**CORRELATION AND REGRESSION**

Simple Bivariate Correlation: Karl Pearson's coefficient of correlation, Spearman's Rank correlation coefficient. Linear Regression: Regression lines, Regression coefficients, properties of Regression coefficients.

TEXT BOOKS

1. Miller, Freund, "*Probability and Statistics for Engineers*", 8th edition, PHI, New Delhi, 2011.
2. S.C.Gupta, V.K.Kapoor, "*Fundamentals of Mathematical Statistics*", 11th Edition, Sultan Chand and sons, New Delhi, , 2014.

REFERENCES

1. Jay L. Devore, "*Probability and Statistics for engineering and the sciences*", 8th Edition, Cengage Learning India, New Delhi, 2012.
2. William W. Hines, "*Probability and Statistics in Engineering*", 4th edition, John Wiley and Sons, New Delhi, 2003.
3. T.K.V. Iyengar, "*Probability and Statistics*", 4th revised Edition, S. Chand and Company, New Delhi, 2012.
4. B.V. Ramana, "*Higher Engineering Mathematics*", 1st Edition, TMH, New Delhi, 2010.

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B.Tech. (IV Sem.)

17CE08 - STRENGTH OF MATERIALS – II

Pre-requisites: Applied Mechanics, Strength of Materials-1

Course Educational Objective: The student will learn about analysis of compound stress and failure theories. The student will study the behavior of beam/frame elements under loading system using moment distribution method.

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

CO1 : Analyze the compound stresses and failure theories.

CO2 : Analyze and evaluate the stresses in columns.

CO3 : Compute deflections in beams due to different loading conditions.

CO4 : Analyze the fixed beams subjected to different loading three moment equation method.

CO5 : Compute stress in unsymmetrical bending and shear centre for a different sections.

UNIT-I: COMPOUND STRESSES AND THEORIES OF FAILURES

Introduction-Stress Components on Inclined Planes-Two Perpendicular Normal Stresses-Biaxial Stress System Accompanied By Shear-Mohr's Circle-Principle Stresses and Principle Planes

Theories of Failure: Introduction-Maximum Principle Stress Theory- Maximum Principle Strain Theory-Maximum Shear Stress Theory-Maximum Strain Energy Theory-Maximum Shear Strain Energy Theory

UNIT-II: COLUMNS-COMBINED DIRECT AND BENDING STRESSES

Columns: Introduction-Modes of Failures of A Column-Elastic Instability-Euler's Theory-Long Columns-The Equivalent Length-Limitations Of Euler's Formula- Rankine's Formula- Secant Formula- Indian Standard Formula

Combined Direct and Bending Stresses: Introduction-Eccentric Loading-Middle Third Rule-Core of A Section

UNIT-III: DEFLECTION OF BEAMS

Introduction-Equation for the Deflected Shape of Axis of Beam-Double Integration and Macaulay's Methods-Moment Area Method- Fixed Beams-Moment Area Method

UNIT-IV: FIXED BEAMS

Analysis of Fixed Beams-Area moment Method-UDL-Central Point Load-Eccentric Point Load-uniformly varying load - effect of Sinking-Effect of Rotation of a Support-Partially Fixed Beam

Three Moment Equation Method: Derivation of Clapeyron's Theorem of Three Moments
Application to Fixed Beams

UNIT-V: UNSYMMETRICAL BENDING AND SHEAR CENTRE

Unsymmetrical Bending: Introduction-Centroidal Principle Axes-MI Referred To Any Set of Rectangular Axes Unsymmetrical Bending Of Beams-Resolution of BM into Any Two Rectangular Axes the Centroid-Location of Neutral Axes

Shear Centre: Definition-Location of Shear Centre for Unsymmetrical I-Section, Channel Section, Rectangular Section and Circular Arc

TEXT BOOKS

1. B.C. Punmia, A.K. Jain, and A. K.Jain, “Strength of Materials and Theory of Structures, Vols. I & II”, XI Edition, Laxmi Publications (P) Ltd, New Delhi, 2002.
2. S.S. Bhavikatti, “Strength of Materials”, Vikas Publishing House (P) Ltd., New Delhi, Second Edition, 2002.

REFERENCE

1. S. B. Junarkar and H. J. Shah, Mechanics of Structures, 27th Revised and Enlarged, Charotar Publishing House, 2008.
2. T. D. Gunneswara Rao, Strength of Materials, 1st Edition, SMS Publishers, 2012.
3. Gere and Timoshenko, Mechanics of Materials, 4th Edition, PWS Publishing Company, May 1997.

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B.Tech. (IV Sem.)

17CE09 - HYDRAULICS AND HYDRAULIC MACHINERY SYSTEMS

Pre-requisites: Mechanics of Fluids

Course Educational Objectives: The course allows the student to get insight into open channel hydraulics, and the various theories dealing with the flow phenomenon of fluid in an open channel. The student is exposed to the basics, components, and working of the hydro machinery, applications of different types of turbines and pumps.

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

CO1: Solve the open channel problems for uniform flows.

CO2: Analyze various forms of non-uniform flows and to estimate formation of hydraulic jump and subsequent energy losses

CO3: Determine the impact force and work done for different types of vanes.

CO4: Analyze suitability of turbines for different types for different applications

CO5: Identify the suitability of centrifugal and reciprocating pumps for different applications and calculate their efficiencies.

UNIT – I: OPEN CHANNEL FLOW:

Uniform Flow: Introduction, Classification of flows and channels; Chezy, Manning's, Bazin, Kutter's Equations; Hydraulically efficient channel sections - Rectangular, Trapezoidal and Circular channels; Hydraulic Design of open channel; Velocity distribution; Pressure distribution.

UNIT – II: NON – UNIFORM FLOW:

Concept of specific energy; Specific energy curves; Critical flow; Critical flow in a rectangular channel; Critical slope; Different slope conditions; Channel transitions; Momentum principle applied to open channel flow, Surges in open channels.

Gradually Varied Flow: Dynamic equation; Surface Profiles; Computation of surface profiles by single step method; Back water Curves and Draw down curves; Examples of various types of water surface profiles; Control section.

Rapidly Varied Flow: Hydraulic jump; Elements and characteristics of hydraulic jump; Types of hydraulic jumps; Location and applications of hydraulic jump; Energy loss in a hydraulic jump.

UNIT-III: BASICS OF TURBO MACHINERY: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency-Angular momentum principle, Applications to radial flow turbines.

UNIT-IV: HYDRAULIC TURBINES:

Layout of a typical Hydropower installation – Heads and efficiencies - classification of turbines - Pelton wheel - Francis turbine - Kaplan turbine - working, working proportions, velocity diagram, work done and efficiency, hydraulic design, draft tube – theory and function efficiency. -Surge tanks - unit and specific turbines - unit speed - unit quantity - unit power - specific speed performance characteristics-geometric similarity- cavitation.

UNIT-V: PUMPS

Centrifugal Pumps: Classification, work done, minimum starting speed, losses and efficiencies, specific speed, multistage pumps, specific speed, characteristic curves, NPSH, Cavitation in pumps.

Reciprocating Pumps: Types, working, Work done, coefficient of discharge and slip, effects of acceleration and frictional resistance, indicator diagrams, separation.

TEXT BOOKS

1. P.N. Modi, and S.M. Seth, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House, New Delhi, 2009.
2. R.K. Bansal, "A Text book of Fluid Mechanics and Hydraulic Machines", Laxmi Publications (p) Ltd.

REFERENCES

1. A.K. Jain, "Fluid Mechanics", Khanna Publishers, Delhi.
2. Das M.M, "Fluid Mechanics and Turbo Machines", Prentice Hall of India (P) Ltd New Delhi, 2008.
3. K.R. Arora, "Fluid Mechanics, Hydraulics and Hydraulic Machines", Standard Publishers and Distributors , New Delhi , 2005
4. D.S. Kumar, Fluid Mechanics & Fluid Power Engineering, Kataria& Sons.
5. J.F. Douglas, J.M. Gasiorek, and J.A. Swaffield, "Fluid Mechanics", 4th Edn., Pearson Education India, 2002.

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B.Tech. (IV Sem.)

17CE10 - STRUCTURAL ANALYSIS – I

Pre-requisites: Applied Mechanics, Strength of materials.

Course Educational Objectives: In this course, the student is exposed about analytical approach, study of different structural components and their structural behaviour due to applied external loads..Kani's method is used to analyze the frames of different end conditions.

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

CO1: Analyze conjugate beams

CO2: Analyze propped cantilevers, fixed beams.

CO3: Analyze continuous beams subjected to different loads

CO4: Perform calculations using slope deflection method for structural analysis

CO5: Analyse different structural components using Castigliano's theorem for indeterminate structures.

UNIT-I: CONJUGATE BEAM METHOD

Introduction-Conjugate Beam-Sign Conventions-Simply Supported Beams-Cantilevers-Propped Cantilevers-End Conditions and Internal Conditions of a Conjugate Beam

UNIT-II: CABLES AND SUSPENSION BRIDGES

Cables: Introduction-General Cable Theorem-Uniformly Loaded Cable-Anchor Cable-Temperature Stresses in Suspension Cable-Three Hinged and Two Hinged Stiffening Girders

UNIT-III: SLOPE DEFLECTION AND MOMENT DISTRIBUTION METHOD

Slope Deflection Method: Introduction-Sign Conventions-Fundamental Equations-Continuous Beams With or Without Sinking Of Supports.

Moment Distribution Method: Introduction- Sign Conventions-Fundamental Propositions-Continuous Beams With or Without Sinking of Supports-Portal Frames with or Without Sway

UNIT-IV: KANI'S METHOD

Introduction-Application to Continuous Beams and Frames without Joint Translation-Symmetrical Frames-Frames with Side Sway

UNIT-V: STRAIN ENERGY METHOD

Castigliano's First Theorem-Application to Statically Determinate Structures

Castigliano's Second Theorem-Application to Statically Indeterminate Beams and Portal Frames

TEXT BOOKS

1. S.S. Bhavikatti, "Strength of Materials", Vikas Publishing House (P) Ltd., New Delhi, Second Edition, 2002.
2. B.C. Punmia, A.K. Jain, and A.K. Jain, "Strength of Materials and Theory of Structures, Vols. I & II", XI Edition, Laxmi Publications (P) Ltd, New Delhi, 2002.

REFERENCES

1. V.N. Vazirani and M.M. Ratwani "Analysis of Structures-Vol I & Vol II", Khanna Publications, New Delhi.
2. V.D. Prasad, "Structural Analysis", Galgotia Publications, 2nd Edition.
3. R.L. Jindal, "Indeterminate Structural Analysis", S.Chand & Co. New Delhi, 3rd Edition, 1997.

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B.Tech. (IV Sem.)

17CE11 - GEO TECHNICAL ENGINEERING – I

Pre-requisites : NIL

Course Educational Objective: The course aims to teach the different properties and classifications of soil. The course coverage includes the various procedures for determining index and engineering properties of soils.

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

CO1 : Compute and analyze different classifications and properties of soil.

CO2 : Determine consistency and compaction parameters of soils.

CO3 : Determine permeability and effective stresses in soil.

CO4 : Analyze shear behavior of soils under different load/ drainage conditions

CO5 : Determine the stress distribution in soils under different loading conditions and analyze consolidation properties of soils.

UNIT –I: TYPES AND PHYSICAL PROPERTIES OF SOIL

Types of soil – Physical properties of soil and their determination – Important definitions related to three phase diagram and relationships – Field identification of soils – Classification of soils based on grain size distribution – Hydrometer analysis.

UNIT –II: CONSISTENCY AND COMPACTION OF SOIL

Consistency and plasticity characteristics of Soil: Determination of consistency limits and their significance to the field behaviour of soil – Classification of soils based on grain size and plasticity characteristics of soils.

Soil Compaction: Concept of compaction – Methods of laboratory compaction of soils – Factors affecting compaction – Zero air voids curve and its significance – Field compaction control.

UNIT –III: PERMEABILITY & EFFECTIVE STRESS OF SOILS

Permeability: Concept-Darcy's Law and its validity – Factors affecting permeability – Laboratory determination of permeability for cohesive and cohesion less soils – Permeability of layered deposits
Concept of effective stress in soils: Terzaghi's effective stress concept for saturated soil deposits – seepage flow and seepage pressure – Quick sand condition and critical hydraulic gradient

UNIT- IV: SHEAR STRENGTH OF SOILS

Shear Strength: Analysis of shear failure – shear and normal stress at a point – Mohr's stress circle – Relationship that can be obtained from Mohr's circle – Mohr's strength theory – Mohr's coulomb failure criterion Laboratory methods of determination of shear strength parameters of cohesive and non-cohesive soils – Direct shear test – Triaxial shear test – Unconfined compression test and Laboratory vane shear test – Advantages of triaxial test over other tests – Classification of shear test based on drainage conditions.

UNIT-V:

STRESS DISTRIBUTION AND COMPRESSIBILITY CHARACTERISTICS OF SOILS

Stress Distribution: Boussinesq and Westergaard theories for point loads and their comparison – Approximate methods of determination of stresses and its validity – Computation of stresses beneath circular and square loaded areas – Concept of pressure bulb – Newmark's chart and its applications. **Compressibility Characteristics of Soils:** Terzaghi's theory of one-dimensional consolidation – Concept of consolidation – Determination of coefficient of consolidation from consolidometer test data by Square root of time method and log time method – Calculation of consolidation settlement.

TEXT BOOKS

1. K.R. Arora, “Soil Mechanics and Foundation Engineering”, Standard Publishers & Distributors, NaiSarak, Delhi, 1987
2. B.C. Punmia, A. K. Jain, and A. Jain. “Soil Mechanics and Foundation Engineering”, Laxmi Publications, 16th edition, New Delhi, 2006.

REFERENCES

1. V.N.S. Murthy, “A Text book of Soil Mechanics and Foundation Engineering”, Kripa Technical Consultants, Bangalore, 1992
2. C. Venkataramaiah, “Geotechnical Engineering”, Wiley Eastern Ltd., Madras, 1993.
3. A. Gopalranjan and A.S.R. Rao. “Basic and Applied Soil Mechanics”, New Age Publications, 2nd Edition, New Delhi, 2000.
4. Joseph E. Bowles, “Physical and Geotechnical Properties of Soils”, McGraw Hill Publishing Co., New York, 1994.

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B.Tech. (IV Sem.)

17CE66 - FLUID MECHANICS LAB

Pre-requisites: Mechanics of Fluids, Hydraulics and Hydraulic Machinery Systems

Course Educational Objective: The student is given hands on training in working on fluid flow hydraulic machinery equipment and performs experiments to verify the principles of fluid mechanics and hydraulics based on laws of conservation of mass, energy and momentum.

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

CO1: Develop knowledge on the fundamental principles of fluid flow

CO2: Apply the laws of conservation of mass, energy and momentum to solve practical problems in fluid mechanics.

CO3: Practically visualize the functioning and performance of hydraulic turbines and pumps

List of experiments

Note: A minimum of twelve (12 No) shall be done and recorded

1. Verification of Bernoulli's theorem.
2. Venturimeter: Determination of Coefficient of discharge.
3. Orificemeter: Determination of Coefficient of discharge.
4. Mouthpieces: Determination of Coefficient of discharge by steady and unsteady flow methods.
5. Characterization of laminar and turbulent flows by Reynold's apparatus.
6. Determination of friction factor of Pipes.
7. Determination of loss of head in pipes due to bend /sudden contraction/ sudden expansion.
8. Determination of Coefficient of discharge for rectangular notch / V – notch.
9. Determination of Manning's and Chezy's coefficients in open channel.
10. Study on Characteristics of Hydraulic Jump
11. Measurement of force due to impact of jets on vanes of different types.
12. Performance studies on Pelton turbine.
13. Performance studies on Kaplan turbine.
14. Performance studies on single stage centrifugal pump.
15. Performance studies on Reciprocating pump.

TEXT BOOK/REFERENCE

Laboratory manual developed by Civil Engineering Department.

L	T	P	Cr.
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B.Tech. (IV Sem.)

17CE67 - CONCRETE TECHNOLOGY LAB

Pre-requisites: Building Materials, Concrete Technology

Course Educational Objective: The course aims to train the students in performing laboratory experiments to find the basic properties of bricks, tiles, concrete materials and concrete.

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

CO1: Find the properties of bricks and cement.

CO2: Determine the properties of aggregates.

CO3: Identify the properties of concrete.

Note: A minimum of twelve (12No) shall be done and recorded

TESTS ON BRICKS AND TILES:

1. Classification of bricks by determination of Water absorption, shape test, soundness, warping, colour and compressive strength.
2. Water absorption, soundness, compressive strength of clay tiles.

TESTS ON CEMENT:

1. Determination of (a) Normal consistency of cement (b) Fineness of cement using 90 microns IS sieve.
2. Determination of Initial setting and final setting time of cement.
3. Determination of (a) Specific gravity of cement (b) soundness of cement.

TESTS ON AGGREGATES:

1. Determination of Fineness modulus of (a) Fine aggregate (b) Coarse aggregate.

TESTS ON CONCRETE:

1. Determination of workability of concrete by conducting Slump cone test.
2. Determination of workability of concrete by conducting Compaction factor/Vee-Bee consistometer test
3. Determination of (a) Cube compressive strength (b) Split tensile strength of concrete.
4. Determination of modulus of elasticity of concrete by conducting compression test on concrete cylinder
5. Determination of Bulk density and Specific gravity of (a) fine aggregate (b) coarse aggregates.
6. Determination of Bulking of fine aggregate.
7. Non-destructive test on concrete using Rebound Hammer / Ultrasonic Tester

TEXT BOOK/REFERENCE

Laboratory manual developed by Civil Engineering Department.

L	T	P	Cr.
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B.Tech. (IV Sem.)

17CE68 - COMPUTER AIDED BUILDING DRAWING LAB

Pre-requisites: Computer based engineering drawing lab and Building materials.

Course Educational Objective: The course aims to draw different types of doors, windows and trusses using AutoCAD. The student is asked to develop and draw plan, elevation and section for different types of buildings. The student will draw a few 3D civil engineering elements.

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

CO1 : Sketch the different sign conventions used in building drawing

CO2 : Draw different views of buildings with a suitable scale

CO3 : Develop 3-D view of building & staircase.

LIST OF EXPERIMENTS

To draw any 10 plates

1. Conventional symbols
2. English bond and Flemish bond
3. Fully Panelled Door & Window
4. Panelled and glazed door with wooden panel
5. King post and Queen post trusses
6. Single floor residential building - Plan, Elevation and Cross section
7. Storied residential building- Plan, Elevation and Cross section
8. Public building- Plan, Elevation and Cross section
9. Institutional building- Plan, Elevation and Cross section
10. Foundations- Footings
11. Steel roof truss
12. 3D view of a single floor residential building
13. 3D view of a dog legged stair case
14. 3D view of a spiral stair case

REFERENCES

1. K. Kumaraswamy and A. KameswaraRao “Building Planning and Drawing”, Charotar Publications, 2014.
2. Shah M.G. Kale C.M. & Patki S.Y., “Building Drawing with an Integrated Approach to Built Environment”, 4th edition, Tata McGraw Hill Publishing Co. Ltd. New Delhi – 2002.

IS Codes

1. IS: 962 – 1967 Code of Practical for Architectural and Building Drawing
2. IS: 4021 – 1983 Specification for Timber Door, Window and Ventilator Frames
3. IS: 6523 – 1983 Specification for Precast Reinforced Concrete Door and Window Frames

B.Tech. (V Sem.)

**17HS01 - ENGINEERING ECONOMICS AND
ACCOUNTANCY**

L	T	P	Cr.
3	-	-	3

Prerequisite: Basic Sciences and Humanities

Course Objective: The objective of this course is to inculcate basic knowledge to students relating to concepts of Engineering Economics and Accountancy to make them effective business decision makers.

Other course educational objectives of this course:

1. To know the concepts of engineering economics and to make them effective business decision makers.
2. To understand the concepts of production and cost for various business decision.
3. To understand the different types of market, market structures & pricing strategies and their applications in business decision making.
4. To explain the strategies of raising and utilization of business capital.
5. To understand the Fundamental of accounting and analysis of accounting statements for managerial decision making.

Course Outcomes: After completion of the course, students will be able to

- CO1: Capable of analyzing fundamentals of economics concepts which helps in effective business administration.
- CO2: Discuss cost- output relationship in business operations.
- CO3: Analyze the features of market structures and present the pricing policies.
- CO4: Identify the types of Business organization of the company and the implementation requirements of each one.
- CO5: Financial position of the company can be analyzing with the help of financial statements.

UNIT - I

Introduction to Engineering Economics: Economics – Definitions- Nature and Scope -Branches economics – Engineering Economics-features & Scope

Demand Analysis: Demand- Types of demand- Determinants- Law of Demand -Elasticity of demand – significance -Types of Elasticity of Demand.

Demand Forecasting-Types- Factor governing - Methods of demand Forecasting.

UNIT - II

Theory of Production and Cost Analysis: Production Function – Isoquant and Isocost, MRTS, Least Cost Combination of Inputs. Laws of Returns, Internal and External Economies of Scale.

Cost Analysis: Cost concepts, Cost & output relationship in short run & long run, Break-even Analysis (BEA)-Determination of Break-Even Point - Significance and limitations.

UNIT – III

Markets & Pricing Policies:

Market structures: Markets-Types of markets - Features and price out determinations under Perfect competition, Monopoly, Monopolistic Competition, oligopoly markets.

Pricing –Pricing polices & its Objectives – Pricing Methods and its applications in business.

UNIT - IV

Capital and Capital Budgeting: Capital and its significance-Types of Capital-Estimation of Fixed and Working capital –working capital -Components of working capital & Factors determining the need of working capital.- Sources of raising capital

Capital budgeting-Significance –Process- Techniques of Capital Budgeting (non-discounted cash flow techniques and discounted cash flow of techniques).

UNIT - V

Financial Accounting and analysis: Accounting –significance -- Book Keeping-Double entry system –Journal- Ledger- Trial Balance- Final Accounts with simple adjustments.

Financial Statement Analysis through ratios: Ratio-analysis of financial statement using different ratios (Liquidity -Profitability- Solvency -Activity ratios).

TEXT BOOK

Aryasri: Managerial Economics and Financial Analysis, MHE, 2014.

REFERENCES

1. Varshney & Maheswari : Managerial Economics, Sultan Chand, 2003.
2. Ambrish Gupta, Financial Accounting for Management, Pearson Education, New Delhi.
3. Lipey & Chrystel, Economics, Oxford University Press.
4. Domnick Salvatore: Managerial Economics in a Global Economy, 4th Edition, Thomson.

B.Tech. (V Sem.)

17CE12 - STRUCTURAL ANALYSIS – II

L	T	P	Cr.
3	-	-	3

Pre-requisites: Applied Mechanics, Strength of materials, Structural Analysis-I

Course Educational Objective: To familiarize students with various methods of analysis of indeterminate structures such as analysis of two hinged arches, moving loads, influence lines for statically indeterminate structures, calculation of deflection for determinate beams and frames by using Portal and Cantilever load method, introduction to matrix methods of structural analysis.

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

CO1: Analyze the three-hinged and two-hinged arches

CO2: Estimate the impact of cables and suspension bridges on structures.

CO3: Assess the impact of moving loads on structures.

CO4: Draw influence lines for analysis purpose and analyse the continuous beams and portal frames

CO5: Describe the basics of stiffness and flexibility methods for structural loads analysis

UNIT - I

ARCHES: Three hinged arches, Elastic theory of arches – Eddy's theorem –Determination of horizontal thrust, bending moment, normal thrust and radial shear– Effect of temperature.

TWO HINGED ARCHES: Determination of horizontal thrust bending moment, normal Thrust and radial shear – Rib shortening and temperature stresses, tied arches –Fixed arches – (No analytical question).

UNIT-II: CABLES AND SUSPENSION BRIDGES

Cables: Introduction-General Cable Theorem-Uniformly Loaded Cable-Anchor Cable-Temperature Stresses in Suspension Cable-Three Hinged and Two Hinged Stiffening Girders

UNIT-III:

MOVING LOADS: Introduction maximum SF and BM at a given section and absolute Maximum S.F. and B.M due to single concentrated load U.D load longer than the span, U.D load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalents uniformly distributed load

UNIT-IV

INFLUENCE LINES: Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section-Load position for maximum BM at a section single point load, U.D.load longer than the span, U.D.load shorter than the span.

BUILDING FRAMES-ANALYSIS:

Introduction-Substitute Frames-Types of Substitute Frames-Analysis for Vertical Loads-Analysis of Frames for Horizontal Forces A) Portal Method B) Cantilever Method

UNIT - V : INTRODUCTION TO MATRIX METHOD

Flexibility methods, Introduction, application to continuous beams including support Settlements. Stiffness method: Introduction, application to continuous beams including support Settlements.

TEXT BOOKS

1. S.S. Bhavikathi “Analysis of Structures” – Vol. I & 2, Vikas Publications, 3rd Edition 2005.
2. R.Vidyanathan and P. Perumal Structural Analysis –I & II, Laxmi Publications, 2nd Edition, 2017.

REFERENCES

1. B.C. Punmia, A.K. Jain, and A.K. Jain, “Strength of Materials and Theory of Structures”, Vol. II, 11th Laxmi Publications, New Delhi, 2002.
2. Jindal, R. L., “Indeterminate Structural Analysis”, S. Chand & Co. New Delhi, 3rd Edition, 1997.
3. R.C. Hibbeler, “Structural analysis”, Pearson Education Ltd. 8th Edition, 2012.
4. Structural Analysis, NPTEL video lectures.

B.Tech. (V Sem.)

**17CE13 - DESIGN OF REINFORCED CONCRETE
STRUCTURES – I**

L	T	P	Cr.
3	-	-	3

Pre-requisites: Applied Mechanics, Strength of Materials-I, Strength of Materials-II, structural analysis.

Course Educational Objectives: Learn the design principles of Working stress and Limit state designs as per IS: 456-2000, Identify the procedures of shear design parameters, Understand the design aspects of beams, slabs and columns as per IS: 456-2000.

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

- CO1: Analyze and design the RCC structures using working stress methods.
- CO2: Design the singly and doubly reinforced RC beams in limit state method.
- CO3: Illustrate the shear reinforcement for different elements of a building. .
- CO4: Design the one way and two way slabs with different end conditions.
- CO5: Design the columns subjected to axial load, uni-axial and bi-axial moments.

UNIT – I: INTRODUCTION TO WORKING STRESS METHOD

Concept of Working Stress Method – analysis and design of flexural member using working stress method – design of singly and doubly reinforced section. Deflection calculation – short term and long term deflection – crack width calculation - Design codes and handbooks, loading standards – Dead, live, wind and earthquake loads, design constants, modular ratio, neutral axis depth and moment of resistance,

UNIT – II: INTRODUCTION TO LIMIT STATE METHOD

Principles of Limit State method of design –characteristic load and strength – Partial safety factor – stress block parameters - Limit State of collapse – flexure – balance and under reinforced – design of singly and doubly reinforced rectangular section– analysis and design of under-reinforced flanged section – L/d ratio for deflection calculation – cover for durability and fire resistance.

UNIT – III: DESIGN OF SHEAR REINFORCEMENT

Limit State of collapse – shear and torsion - design of a rectangular section for shear, shear-torsion and bending-torsion. Design for development length – end anchorages. Reinforcement details in beam for flexure, shear and torsion – serviceability requirements.

UNIT – IV: DESIGN OF SLABS

Design of slabs - one way and two way – simply supported, continuous and restrained, using coefficients given in IS code Reinforcement details in one way and two way slabs – serviceability requirements.

UNIT – V: DESIGN OF COLUMNS

Limit State of Collapse – compression; design of columns for axial load – square, rectangular and circular cross section with lateral and spiral ties– Reinforcement details for columns. Design of short and long columns for uniaxial and biaxial eccentricities using interaction charts – Reinforcement details for columns – serviceability requirements.

TEXT BOOKS

1. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain “Comprehensive RCC Design”, Laxmi Publications (P) Ltd, New Delhi, 2015.
2. N. Krishnaraju, “Advanced Reinforced Concrete design”, CBS Publishers & Distributors, New Delhi, 2005.

REFERENCES

1. P.C. Varghese, “Limit State Design of Reinforced Concrete”, Prentice Hall of India Pvt., Ltd., New Delhi, 2008.
2. P.C. Varghese, “Advanced Reinforced Concrete Design”, Prentice Hall of India Pvt., Ltd., New Delhi, 2002.
3. Design of Reinforced Concrete Structures, NPTEL video lectures.

IS CODES :

IS 456-2000

SP – 16 (Interaction charts- rectangular & circular sections)

NOTE: These codes are permitted in the End Examinations

B.Tech. (V Sem.)

17CE14 - HIGHWAY ENGINEERING

L	T	P	Cr.
3	-	-	3

Pre-requisites: NIL

Course Educational Objective: The course aims to explore the students with elements of highway engineering like geometric elements, sight distances and gradients, properties of various highway materials and construction. The student will be able to design the various types of pavements and can easily control traffic generate on the highways.

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

CO1: Discriminate the studies of highway planning, development, surveys and alignment.

CO2: Design the geometric elements of highway.

CO3: Identify the suitability of appropriate highway materials based on their properties.

CO4: Design the Flexible and Rigid pavement using IRC codes.

CO5: Interpret the elements of traffic management.

UNIT-I: HIGHWAY PLANNING AND ALIGNMENT

History of road development in India – Jayakar committee recommendations - Institutions for Highway planning design and implementation at different levels – Road patterns - Engineering Surveys for Alignment –IRC classification of urban and rural roads –Preparation of detailed Project report-- Highway cross sectional elements – Right of way, Carriage way, Camber, Kerbs, Shoulders and Footpaths.

UNIT-II: GEOMETRIC ELEMENTS

Geometric Standards – Super elevation, widening of pavements and Transition curves – Ruling, Limiting, Exceptional and Minimum Gradients – Sight Distance – Factors affecting Sight Distance – PIEV Theory – Stopping Sight Distance (SSD) – Overtaking Sight Distance (OSD) – Sight Distance at Intersection Geometric Design of Hill Roads.

UNIT-III: HIGHWAY MATERIALS AND CONSTRUCTION

Sub grade soil - Aggregates - Bituminous materials – Desirable properties – California Bearing Ratio Test and Field Density Test for soil – Crushing, Abrasion and Impact Test for aggregates – Penetration, Ductility, Viscosity, Binder content and Softening point Test for bitumen Construction of Earth, Gravel, WBM, Bituminous and Cement Concrete roads as per IRC and MORTH specifications.

UNIT-IV: HIGHWAY DESIGN AND MAINTENANCE

Design principles of Flexible and Rigid Pavements – Design of Flexible pavement (CBR method, IRC Recommendations – Problems) Design of Rigid Pavement (IRC Recommendations – Problems), 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 – special repairs.

UNIT-V: TRAFFIC ENGINEERING AND MANAGEMENT

Basic Parameters of Traffic-Volume, Speed and Density- Traffic Volume Studies- Data Collection and Presentation-Speed studies- Data Collection and Presentation- Parking Studies and Parking characteristics- Road Accidents-Causes and Preventive measures- Accident Data Recording – Condition Diagram and Collision Diagrams - Road Traffic Signs – Types and Specifications – Road markings-Need for Road Markings-Types of Road Markings.

TEXT BOOKS

1. S.K. Khanna, and Justo, “Highway Engineering”, Nem Chand and Bros, Roorkee, 10th edition, 2014.
2. L.R. Kadiyali, “Traffic Engineering and Transport Planning”, Khanna Publishers, 8th Edition, 2013.

REFERENCES

1. Kadiyali,L.R.,“Principles and Practice of Highway Engineering”, Khanna Publishers Ltd. New Delhi, 4th Edition, 2004.
2. G. Venkatappa Rao, “Principles of transportation and Highway Engineering”, Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2000.
3. Introduction to Transportation Engineering, NPTEL video lectures and web notes.

IS Codes permitted in examination: IRC: 37-2001, IRC: 58-2002.

B.Tech. (V Sem.)

17CE15 - HYDROLOGY

L	T	P	Cr.
3	-	-	3

Pre-requisites: Mechanics of Fluids, Hydraulics and Hydraulic Machinery Systems

Course Educational Objective: The course is designed to understand the physical processes in hydrology and know the measurement of rainfall. Learn measurement of water losses and runoff in hydrological process. Understand the Unit Hydrograph theory and its analysis and flood routing. Estimate the ground water potential based on theoretical principles

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

- CO1: Estimate the average rainfall over a basin and identify the various methods to determine the water losses.
- CO2: Compute direct run off from total rain fall.
- CO3: Develop unit hydrograph and storm hydrograph.
- CO4: Assess the flood magnitude and carry out flood routing.
- CO5: Determine aquifer parameters and yield of wells.

UNIT I: HYDROLOGY AND PRECIPITATION

Introduction: Engineering Hydrology and its Applications, Hydrologic Cycle.

Precipitation: Types and Forms of Precipitation, Rainfall Measurement, Types of Rain Gauges, Rain Gauge Network, Average Rainfall over a Basin, Presentation of Rainfall Data.

Abstractions: Evaporation, Factors Affecting Evaporation, Measurement of Evaporation, Evaporation Reduction, Evapotranspiration, Factors Affecting Evapotranspiration, Measurement of Evapotranspiration, Control of Evapotranspiration - Infiltration, Factors Affecting Infiltration, Measurement of Infiltration.

UNIT-II: RUN OFF

Catchment Characteristics, Factors Affecting Runoff, Components of Runoff, Basin Yield, Rainfall Runoff Relationship, SCS-CN Method of Estimating Runoff Volume, Flow Mass Curve and Flow Duration Curve, Reservoir Capacity.

UNIT-III: HYDROGRAPH ANALYSIS

Components of Hydrograph, Separation of Base Flow, Effective Rainfall, Direct Runoff Hydrograph, Unit Hydrograph, Assumptions, Derivation of Unit Hydrograph, Unit Hydrographs of Different Durations, Principle of Superposition and S-Hydrograph Methods, Limitations and Applications of Unit Hydrograph, Synthetic Unit Hydrograph.

UNIT-IV: FLOODS AND FLOOD ROUTING

Floods: Causes and Effects, Frequency Analysis- Gumbel's and Log-Pearson Type III Distribution Methods, Standard Project Flood (SPF) and Probable Maximum Flood (MPF), Flood Control Methods and Management.

Flood Routing: Hydrologic Routing, Channel and Reservoir Routing- Muskingum and Puls Methods of Routing.

UNIT-V: GROUNDWATER HYDROLOGY

Ground Water: Occurrence, Types of Aquifers, Aquifer Parameters, Porosity, Specific Yield, Permeability, Transmissivity and Storage Coefficient, Types of Wells, Darcy's Law, Dupuit's Equation- Steady Radial Flow to Wells in Confined and Unconfined Aquifers, Yield of an Open Well-Recuperation Test.

TEXT BOOKS

1. P. Jayarami Reddy, "Hydrology", Laxmi Publications, New Delhi , 2016
2. K. Subramanya, "Engineering Hydrology", Tata McGraw Hill, New Delhi , 2017

REFERENCES

1. Santosh Kumar Garg, "Hydrology and Water Resources Engineering" Khanna Publisher- Delhi, 1973.
2. Vijay P.Singh, "Elementary Hydrology", Prentice Hall of India, New Delhi, 1991.
3. H.M Ragunath, "Hydrology", New Age International Pvt Ltd, New Delhi, 2015.
4. Ground Water Hydrology and Advanced Hydrology, NPTEL video lectures and web notes.

B.Tech. (V Sem.)

17CE16 - REPAIR AND REHABILITATION OF STRUCTURES

L	T	P	Cr.
3	-	-	3

Pre-requisites: Concrete Technology

Course Educational Objective: The primary objective of this course is to introduce the concept of Rehabilitation as a precise concept, and study how to overcome the defects in regular construction practices, establish their effectiveness in overcoming the problems faced, study their efficiency and memory needs. The course consists of Retrofitting components in addition to adapting new techniques in construction practices

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

CO1: Identify the various cracks in buildings and structures

CO2: Analyse the probable reasons for deterioration of concrete in structures

CO3: Conduct NDT analysis for structural failures

CO4: Categorize the suitable materials for repair and rehabilitation of structures

CO5: Perform physical investigation and suggest the approaches to repair the damaged structure.

UNIT-I: CRACKS AND MAINTENANCE

Introduction: Maintenance, rehabilitation, repair, retrofit and strengthening, need for rehabilitation of structures.

Cracks in R.C. buildings: Various cracks in R.C. buildings, causes and effects

Maintenance: Maintenance importance of maintenance, routine and preventive maintenance.

Damages to masonry structures: Various damages to masonry structures and causes, Damage diagnosis and assessment

UNIT- II: DETERIORATION OF CONCRETE IN STRUCTURES

Physical processes of deterioration like Freezing and Thawing, Wetting and Drying, Abrasion, Erosion, Pitting, Chemical processes like Carbonation, Chloride ingress, Corrosion, Alkali aggregate reaction, Sulphate attack Acid attack, temperature and their causes, Mechanism, Effect, preventive measures. - Cracks: Cracks in concrete, type, pattern, quantification, measurement & preventive measures.

UNIT-III: NON DESTRUCTIVE TESTING

Non destructive test methods for concrete including Rebound hammer, Ultrasonic pulse velocity, Rebar locator, Corrosion meter, Penetration resistance and Pull out test, Core cutting-Corrosion: Methods for corrosion measurement and assessment including half-cell potential and resistivity, Mapping of data.

UNIT-IV: MATERIALS FOR REPAIR AND REHABILITATION

Materials for repair and rehabilitation -Admixtures- types of admixtures purposes of using admixtures- chemical composition- Natural admixtures-Fibres- wraps- Glass and Carbon fibre wraps- Steel Plates-Concrete behaviour under corrosion, disintegrated mechanisms- moisture effects and thermal effects – Visual investigation- Acoustical emission methods

UNIT: V: INVESTIGATION AND REPAIR OF STRUCTURES

Investigation of structures: Distress, observation and preliminary test methods. Case studies: related to rehabilitation of bridge piers, dams, canals, heritage structures, corrosion and erosion damaged structures.

Repair techniques: Grouting, Jacketing, Shotcreting, externally bonded plates, Nailing, Underpinning and under water repair; Materials, Equipments, Precautions and Processes.

TEXT BOOKS:

1. B.L. Gupta and Amit Gupta, 'Maintenance & Repair of Civil Structures', Standard Publication, Edition 2009.
2. P. C. Varghese, 'Maintenance, Repair & Rehabilitation and Minor Works of Buildings', PHI Learning Pvt. Ltd., 2014.

REFERENCES:

1. B. Vidivelli, 'Rehabilitation of Concrete Structures', Standard Publishers, Edition 2009
2. V. K. Raina, 'Concrete Bridge Practice Construction, Maintenance & Rehabilitation', Edition 2012.
3. Poonam I. Modi and Chirag N. Patel, "Repair and Rehabilitation of Concrete Structures", Prentice Hall India Publishers, 2016.
4. "Handbook on Repair and Rehabilitation of Buildings", Published by Central Public Works Department, Govt of India, New Delhi, 2002.
5. "Handbook on seismic retrofit of buildings", CPWD, Indian buildings congress, IIT Madras, Narosa Publishing House.

B.Tech. (V Sem.)

17CE17 - TOWN PLANNING AND ARCHITECTURE

L	T	P	Cr.
3	-	-	3

Pre-requisites: Nil

Course Educational Objectives: The course aims to study the historical background of town planning, and analyze the modern town-planning and zoning system. The principles of planning as per building bye-laws and history of architecture with different ages are addressed. The basic principles of architecture are introduced.

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

- CO1: Enumerate the historical background of town planning
- CO2: Perceive the modern town-planning and zoning system.
- CO3: Describe the principles of planning as per building bye-laws
- CO4: Categorize the history of architecture with different ages
- CO5: Describe the principles of architecture.

UNIT-I: HISTORICAL BACK GROUND OF TOWN PLANNING

Town planning in India – Town plans of mythological Manasa-Town plans of ancient towns: Harappa, Mohenjodaro, Pataliputra, Delhi, Acropolis (Greece), Jerusalem, Mecca, Rome, London.

UNIT-II: MODERN TOWN PLANNING

Zoning- Roads and road traffic- Housing- Slums, Parks, Play grounds- Public Utility Services- Surveys and maps for planning- Neighbour-hood Planning. Standards of Town planning: Planning new towns, planning standards and specifications, national and regional planning, town planning and legislation- planning regulations and limitations.

UNIT-III: PRINCIPLES OF PLANNING

Principles of planning - site selection, site orientation- aspect, prospect, grouping, circulation, privacy, furniture requirements, services and other factors.

Post-classic Architecture: Introduction of post-classic architecture contribution of eminent architects to modern period

UNIT-IV: HISTORY OF ARCHITECTURE

Western Architecture: Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus valley civilization– Buddhist period: Stambas, Stupa, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo Aryan Styles-Temple of Madurai, Bhuvaneshwar,.

UNIT-V: ARCHITECTURAL DESIGN

Principles of designing – Composition of Plan – relationship between plan and elevation- building elements, form, surface texture, mass, line, color, tone- Principles of Composition: Unity, contrast, proportion, scale, balance, circulation, rhythm, character, expression, Smart Cities.

TEXT BOOKS:

1. Rangwala, “Town planning; Charotar Publishing house Pvt .Ltd., 28th revised edition, 2015.
2. Hiranmay Biswas, “Principles of town planning and architecture”; Vayu Education of India”; 1st Edition

REFERENCE:

1. N.Kumaraswamy and A.Kamerwararao, “Building planning and drawing”, Charotar publishing house Pvt .Ltd, 7th revised edition.
2. “Urban and Regional Development Plans Formulation & Implementation Guidelines – 2014”, Ministry of Urban Development, New Delhi.

B.Tech. (V Sem.)

17CE18 - CONSTRUCTION MANAGEMENT

L	T	P	Cr.
3	-	-	3

Pre-requisites: Building Materials and Constructions

Course Educational Objective: This course aims to get exposure to management of various projects and financial facilities, and to plan and organize for any project. The course also provides proper utilization of equipments, materials and labor, the procedure of scheduling, the programming of any project by network analysis.

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

CO1: Identify the key aspects of Project Management

CO2: Plan and schedule the project.

CO3: Utilize both labour and materials effectively.

CO4: Perform detailed network analysis to complete project within schedule.

CO5: Deal contracts and bidding processes.

UNIT-I: CONSTRUCTION PROJECT MANAGEMENT

Introduction – Project Life Cycle – Major Types of construction – Selection of professional services – Construction contractors – Financing of constructed facilities – Legal & Regulatory requirements – Role of project managers

UNIT-II: PROJECT PLANNING & ORGANIZATION

Development of project plan, objective and conception– Programming – Scheduling – Project Organization – Project budget fund flow statement – Controlling system

UNIT-III: LABOUR, MATERIAL & EQUIPMENT UTILIZATION

Introduction – Labour Productivity – Factors affecting job site productivity – Materials Management – Material procurement & Delivery – Inventory control – Plant & Equipment management

UNIT-IV: NETWORK ANALYSIS

Introduction – Basic concepts of network analysis – CPM and PERT – Use of CPM & PERT Techniques – Problems, and prospects and applications of CPM & PERT – Introduction to software applications in project Management

UNIT-V: CONTRACTS

Introduction – Types of Contract – Contract document – Specifications – Important conditions of contract – Tender and tender document – Deposits by the contractor – Arbitration – M. Book, R.A Bills & Advances – Muster Roll – Stores – e-Procurement.

TEXT BOOKS

1. S. Sanga Reddy and Meyyappan, "Construction Management", Kumaran Publications, 2009 Edition.
2. B.C. Punmia, "Project Planning and Control with PERT and CPM", Laxmi Publications, New Delhi, 1987.

REFERENCES

1. K.K. Chitkara, "Construction Project Management", Tata McGraw Hill Publishing Co, Ltd., New Delhi, 1992.
2. L.S. Srinath, "PERT & CPM: Principles and Applications", Affiliated East-West Press, 3rd Edition, 2001.
3. Construction Planning and Management & Construction and Contract Management, NPTEL video lectures and web notes

B.Tech. (V Sem.)

17CE19 - INTERIOR DESIGNS AND DECORATIONS

L	T	P	Cr.
3	-	-	3

Pre-requisites: NIL**Course Educational Objective:**

This course aims to follow a systematic and coordinated methodology, including research, analysis and integration of knowledge into the creative process, whereby the needs and resources of the client are satisfied to produce an interior space that fulfils the project goals.

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

- CO1: Interpret the safety concepts involved in interior designing.
- CO2: Apply the anthropometry study for design development.
- CO3: Design different furniture elements for residential and commercial projects.
- CO4: Recognize different interior services required for any building.
- CO5: Deliberate the different concepts and design elements in interior spaces

UNIT-I: HISTORY OF INTERIOR

Significance of Furniture, Prehistoric and Indigenous design, History of furniture in the Ancient world. History of furniture in the middle ages, Furniture development in 20th century, Eclecticism, Neoclassicism, Recent directions, Late modernism, High loch, Post modernism, Non-European Traditions

UNIT II: ANTHROPOMETRY:

Anthropometric data and special requirements for human needs with relation to movement, functions, furniture and space. - Process of design - Interior accessories design - Design of simple furniture with activities – Seating, Working, Sleeping, Storages. - Design development including case studies

UNIT III: FURNITURE DESIGN

Single items (Residential & Commercial). - Furniture design –group of furniture elements along with the surroundings. - Design of multi activity residential single room, Case study.

UNIT IV: INTERIOR SERVICES

Basic concepts and system components in air conditioning air-conditioning system and applications, fire safety acoustics and sound insulation electrical systems.

UNIT V: INTERIOR SPACE

Space – definition; Interior space – spatial qualities: form, scale, outlook; structuring space with interior design elements; spatial form; spatial dimension – square, rectangle, curvilinear spaces; height of space; spatial transitions – openings within wall planes, doorways, windows, stairways.

TEXT BOOKS:

1. Parmavathy Seetharaman and Parveen Pannu “Interior design and decoration”; CBS Publishers & Distributors Pvt. Ltd, 2013, Edition
2. N. Kumara Swamy and A. Kameswara Rao, “Building Planning and Drawing”, Charotar Publications, 2013.

REFERENCES:

1. Linda o’shea, Chris Grimley “The Interior design reference + speciation Book”; Rockport publication; July 2013.

B.Tech. (V Sem.)

17CE69 - TRANSPORTATION ENGINEERING LAB

L	T	P	Cr.
-	-	2	1

Course Educational Objective: The course aims to identify the properties of different materials used in highway construction and makes students to identify the grades of materials.

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

CO1: Categorize and analyze the properties of road aggregates.

CO2: Determine and analyze the properties of bitumen.

CO3: Determine the suitability of aggregates and bitumen for pavement designs.

Note: A minimum of twelve (12No) shall be done and recorded.

TESTS ON ROAD AGGREGATES:

1. Aggregate Crushing value.
2. Aggregate Impact Test.
3. Specific Gravity and Water Absorption.
4. Attrition Test.
5. Abrasion Test.
6. Shape tests.

TESTS ON BITUMINOUS MATERIALS:

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.
5. Bitumen content by centrifugal extractor
6. Specific gravity of bitumen.
7. Viscosity of bitumen.

TEXT BOOK/REFERENCES

Laboratory Manual developed by Civil Engineering Department.

B.Tech. (V Sem.)

17CE70 - GEO TECHNICAL ENGINEERING LAB

L	T	P	Cr.
-	-	2	1

Pre-requisites: Geo technical Engineering-I

Course Educational Objective: The course focuses on determination of index and engineering properties of soil and other important parameters based on basic principles of soil mechanics.

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

CO1: Determine the index and engineering properties of soils

CO2: Perform field tests for soil investigations.

CO3: Apply field conditions for computing and analyzing the experimental data.

CO4: Analyze the results and infer the validity of the results.

Note: A minimum of twelve (12No) shall be done and recorded

1. Determination of water content by oven drying method.
2. Determination of specific gravity by
 - a) Density bottle method
 - b) Pycnometer method.
3. Gradation analysis
 - a) Mechanical Sieve analysis
 - b) Hydrometer analysis.
4. Determination of Atterberg limits
5. Determination of free swell index
6. Determination of field unit weight by
 - a) Core cutter method.
 - b) Sand replacement method.
7. Determination of permeability by
 - a) Constant head permeameter.
 - b) Variable head permeameter.
8. Direct shear test.
9. Vane shear test.
10. Unconfined compression test
11. IS - Light compaction test
12. IS - Heavy compaction test
13. Triaxial shear test.
14. Consolidation test.
15. California bearing ratio test.

Text Book/Reference Books

Laboratory Manual developed by Civil Engineering Department.

B.Tech. (V Sem.)

17CE90 - GREEN BUILDINGS
(*Add on course – I)

L	T	P	Cr.
3	-	-	3

Pre-requisites: Nil

Course Educational Objective: This course aims to provide study of appropriate materials for constructing a green building and planning for energy and resource conservation in green building. The course also provides the practices of optimum use of the renewable energy resources, the principles of the designing the building using climatic factors and planning for effective green building rating system.

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

- CO1: Categorize the benefits of a green building.
- CO2: Assess the impact of climate in the design of a green building
- CO3: Identify appropriate materials for constructing a green building
- CO4: Plan the various options for energy and resource conservation in a green building.
- CO5: Optimally use renewable energy resources and Plan the building for best green building rating system.

UNIT-I: GREEN BUILDINGS CONCEPT

Definition of Green Buildings, typical features of green buildings, benefits and environmental impacts of Green Buildings, Brown field and green field development, sustainable site selection and planning of buildings to maximize comfort, day lighting, ventilation.

UNIT-II: CLIMATE DESIGN

Local climatic conditions – solar radiation, temperature, humidity, wind speed and direction-impact of deforestation and climate change on built environment, desirable conditions, Fresh air requirements, standards, sick building syndrome and indoor air pollutants.

UNIT-III: GFREEN MATERIALS

Recycling of building materials, Advantages in usage of natural local materials such as bamboo, timber, rammed earth, stabilized mud blocks, hollow blocks, lime & lime-pozzolana cements, materials from agro and industrial waste, ferro-cement and ferro-concrete, alternative roofing systems, various paints reducing the heat gain of the building, etc.

UNIT-IV: ENERGY AND RESOURCE CONSERVATION

Building envelope – its parts and types, Active and passive energy systems, need for energy conservation, Various forms of energy used in buildings, energy used in transportation and construction processes- Building automation and building management systems.

Principles of thermal design - means of thermal –light and lighting-building acoustics- energy efficient lighting, Ventilation and indoor air quality.

Water conservation systems in buildings- planning for storm water drainage, water harvesting in buildings – recycling of sewage, waste to energy management in residential complexes or gated communities, Modular wastewater treatment systems for built environment

UNIT-V: RENEWABLE ENERGY AND GREEN BUILDING RATING SYSTEMS

Wind and Solar Energy Harvesting, Potential of solar energy in India and world, construction and operation of various solar and wind energy based appliances, Geothermal energy usage in buildings, Case studies.

Introduction to Leadership in Energy and Environment Design (LEED), Green rating systems for Integrated Habitat Assessment – GRIHA, IGBC ratings, Salient features of Green buildings constructed in India.

TEXT BOOKS:

1. K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao, “Alternative building materials and technologies”, New Age International, 2014.
2. N. Kumara Swamy and A. Kameswara Rao, “Building Planning and Drawing”, Charotar Publications, 2013.

REFERENCES

1. Abe Kruger and Carl Seville, “Green Building: Principles and Practices in Residential Construction”, Demar Cengage Learning, 2012.
2. G.D. Rai, “Non-Conventional Energy Resources”, Khanna Publishers; 18th edition, 2017.
3. Koenigsberger O H, “Manual of Tropical Housing and Building”, 1st edition, Orient Longman Publishers, Chennai, 2003.
4. Odom P. Eugene, “Ecology and Environment”, 2nd edition, Oxford and IBH Publishers, New Dehi, 2005.

B.Tech. (V Sem.)

17PD05 - EMPLOYABILITY ENHANCEMENT
SKILLS - I

L	T	P	Cr.
1	-	-	0

Prerequisite: NIL

Course Educational Objective (CEO): This course will make students proficient in Quantitative techniques, language & communication skills to qualify in placement tests, demonstrate industry-readiness skills by applying concepts and tools that will serve as building blocks for analytical thinking and professional development.

Course Outcomes (COs): After the completion of this course, student will be able to:

CO1: Apply Quantitative techniques and logical thinking to qualify in recruitment tests and other professional tasks.

CO2: Communicate effectively in various professional and social contexts.

CO3: Apply Verbal skills effectively in Job Interviews as well other professional contexts.

CO4: Demonstrate various principles involved in Quantitative problem solving, thereby reducing the time taken for performing job functions.

CO5: Practice lifelong learning through personal effectiveness as well as leadership.

UNIT – I

Quantitative Aptitude: Numbers, L.C.M & H.C.F of numbers, Decimal Fractions, Simplification, Square root & cube root-Practice tests.

Verbal Ability: Introduction to Vocabulary-Root words (Prefixes, Suffixes) - Practice tests

UNIT – II

Quantitative Aptitude: Averages, Problems on Ages, Problems on Numbers, Surds and Indices-Practice tests.

Verbal Ability: Advanced vocabulary- Model tests for GRE/TOEFL/IELTS

UNIT – III

Quantitative Aptitude: Percentages, Profit and Loss- Practice tests

Verbal Ability: Synonyms & Antonyms, Idiomatic expressions-Practice tests

UNIT – IV

Quantitative Aptitude: Ratio And Proportion, Partnership, Chain rule- Practice tests

Verbal Ability: Words often confused & misused, One-word substitutes & Flash card activity-Practice tests

UNIT – V

Quantitative Aptitude: Number Series, Letter Series, Blood Relations, Coding and Decoding, Direction sense test- Practice tests

Verbal Ability: Phrasal verbs, Word analogies, Reading Comprehension-Practice tests

TEXT BOOKS

1. R.S.AGGARWAL, *Objective Arithmetic*, S. CHAND Publishers.
2. R.S.AGGARWAL, *Verbal & Non-Verbal Reasoning*, S. CHAND Publishers
3. Objective English. Edgar Thorpe, Pearson Education, New Delhi.2009
4. Sanjay kumar, Pushpa Lata: Communication skills. Oxford, Delhi, 2012

REFERENCES

1. Meenakshi Raman, Sangeetha: Technical Communication, Oxford University Press, 2008
2. Baron's Guide on GRE
3. Dinesh Khattar, *The Pearson Guide to Quantitative Aptitude*, Pearson Education
4. M. Tyra, *Magical Book on Quicker Maths*, BSC Publishers
5. Quantitative Aptitude by Arun Sharma
6. Vocabulary Builder for Students of Engineering and Technology (A self – study manual for vocabulary Enhancement) Y.Saloman Raju, Maruthi Publishers

L	T	P	Cr.
2	2	-	3

B.Tech. (VI Sem.)

17CE20 - DESIGN OF STEEL STRUCTURES

Pre-requisites: Strength of Materials-I, Strength of Materials-II, and Structural Analysis

Course Educational Objectives: This course serves as introduction to the concepts of structural steel design through the use of the Indian Standard IS 800 design code. It deals with the design of individual members and connections, such as, the design of tension members, compression members, beams, and beam columns; roof trusses and bolted, welded, and connections. The primary objective is to equip the students with the tools necessary for designing steel structures and to familiarize them with the relevant national design codes.

Course outcomes:

CO1: Identify the different structural steel elements and their connection system

CO2: Design the compression and tension members.

CO3: Analyse and design the beams.

CO4: Design the column bases and built up columns.

CO5: Design the roof trusses.

UNIT- I: DESIGN OF STEEL CONNECTIONS

Introduction: Fundamental Concepts of design of structures, Different types of rolled steel sections available to be used in steel structures. I.S specifications, Stress Strain relationship for steel.

Bolted Connections: Failure of a joint, Strength and efficiency of a joint and Design of Bearing type bolted joints subjected to axial load, Eccentric bolted connections.

Welded Connections: Types of welds, stresses in welds, Design of welded joints subjected to axial load, Eccentric welded connections.

UNIT- II: DESIGN OF TENSION AND COMPRESSION MEMBERS

Design of Tension Members: Introduction, types of tension members, net sectional areas, design of tension members, lug angles and splices.

Design of Compression Members: Introduction, effective length and slenderness ratio, various types of sections used for columns, design of eccentrically loaded compression members.

UNIT- III: DESIGN OF BEAMS

Introduction, types of sections, general design criteria for beams, design of laterally supported and unsupported beams, Design of built up sections, Curtailment of flange plates, web buckling, web crippling.

UNIT- IV: BUILT UP COLUMNS AND COLUMN BASES

Built Up Columns: Necessity, design of built up columns, laced and battened columns including the design of lacing and battens.

Column Bases: Introduction, types of column bases, design of slab base and gusseted base, design of gusseted base subjected to eccentrically loading.

UNIT- V: ROOF TRUSSES

Types of trusses, Economical spacing of roof trusses, loads on roof trusses, Estimation of wind load on roof trusses as per IS:875. Design of members of roof truss and joints, Design of purlins.

TEXT BOOKS

1. N. Subramanian, “Design of Steel Structures”, Oxford University Press, 2nd Edition, 2011.
2. S.K. Duggal, “Design of Steel Structures”, Tata McGraw Hill, New Delhi, 3rd Edition, 2017.

REFERENCES

1. S.S.Bhavikatti, “Design of Steel Structures”, I.K. International Publishing House Pvt. Ltd, 4th Edition, 2014.
2. V.L.Shah and Veena Gore; “Limit State Design of steel structures IS:800-2007”-, Structures Publications, 1st edition.
3. Design of Steel Structures, NPTEL video lectures and web notes

IS CODES

- IS -800 – 2007
- IS -875 (Part-III)
- Steel Tables.

These codes and steel tables are permitted in the examinations.

L	T	P	Cr.
2	2	-	3

B.Tech. (VI Sem.)

17CE21 - IRRIGATION AND WATER RESOURCES ENGINEERING

Pre-requisites : Mechanics of Fluids, Hydraulics and Hydraulic Machinery Systems, Hydrology

Course Educational Objective: The course is designed to know the concepts of analysis and design of Storage and Diversion Head Works and introduce the types of Irrigation Systems. It also addresses the concepts of planning and design of Irrigation water requirements, design methods of erodible and non-erodible canals.

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

- CO1: Analyze the stability of Gravity dams
- CO2: Design the impervious floors for Diversion Head Works.
- CO3: Estimate Irrigation Water Requirements.
- CO4: Design the erodible and non-erodible canals.
- CO5: Interpret the design principles of Cross Drainage Works

UNIT-I: DAMS

Types of dams, selection of type of dam, selection of site for a dam.

Gravity dams: Forces acting on a gravity dam, causes of failure of a gravity dam, elementary profile and practical profile of a gravity dam, limiting height of a dam, stability analysis, drainage galleries, grouting.

UNIT-II : DIVERSION HEAD WORKS

Types of diversion head works, weirs and barrages, layout of diversion head works, components. Causes and failures of weirs on permeable foundations, Bligh's creep theory, Khosla's theory, design of impervious floors for subsurface flow, exit gradient.

Spillways: Types, design principles of Ogee spillways, types of spillways crest gates. Energy dissipation below spillways-stilling basin and its appurtenances.

UNIT III: IRRIGATION

Necessity and Importance of Irrigation, advantages and ill effects of Irrigation, types of Irrigation, methods of application of Irrigation water, water logging and drainage, principal crops and crop seasons, crop rotation. Soil-water-plant relationship, estimation of consumptive use, duty and delta, factors affecting duty, depth and frequency of Irrigation, irrigation efficiencies.

UNIT-IV: CANALS AND REGULATORS

Canals: Classification, design of non-erodible canals - methods of economic section and maximum permissible velocity, economics of canal lining, design of erodible canals -Kennedy's silt theory and Lacey's regime theory.

Regulators: Head and cross regulators, design principles.

UNIT-V: CANAL FALLS AND CROSS DRAINAGE WORKS

Canal Falls: Types and location, design principles of Sarda type fall and straight glacis fall.

Cross Drainage Works: Types, selection, design principles of aqueduct, siphon aqueduct and super passage.

TEXT BOOKS:

1. B C Punmia, B.B Lal, A.K. Jain and A.K. Jain; 'Irrigation and Water Power Engineering', Laxmi Publications Pvt. Ltd., New Delhi. 2015.
2. [Santosh Kumar Garg](#), "Irrigation Engineering and Hydraulic Structures: Water Resources Engineering - Vol. II", Khanna Publishers; 2017.

REFERENCES:

1. Ch. Satyanarayana Murthy, "Water Resources Engineering", New Age International Publishers; 2002.
2. P.N. Modi, "Irrigation Water Resources and Water Power Engineering", Standard Book House, New Delhi; 2008.
3. Water Resources Engineering, NPTEL video lectures and web notes

L	T	P	Cr.
3	-	-	3

B.Tech. (VI Sem.)

17CE22 - WATER AND WASTE WATER ENGINEERING

Prerequisites: Nil

Course Objectives: The course deals with concepts of water demand and water quality parameters, design of water treatment units, sewage quality parameters, sewage treatment units, sludge handling in sewage treatment.

COURSE OUTCOMES:

- CO1: Estimate the water demand for the community and assess the significance of water quality parameters
 CO2: Design the sedimentation based water treatment systems
 CO3: Design the filtration and disinfection based water treatment systems
 CO4: Interpret the importance of sewage quality parameters and design the primary treatment units
 CO5: Design the secondary treatment and sludge handling aspects of sewage treatment plant

UNIT - I: WATER DEMAND AND WATER QUALITY

Water demand: Importance and need for protected water supply - Water demands - Factors affecting per capita demand - Types of demand - fluctuations in demand – Population forecasting- Different methods

Water quality: Sources of water- Quality of water - Physical, chemical and bacteriological parameters of water

UNIT - II: WATER TREATMENT - SEDIMENTATION

Treatment of water: Objectives of water treatment - Methods of treatment - Screening – Concept of aeration of raw water

Sedimentation: Types of settling - Stoke's Law – Design of continuous flow sedimentation tanks - Sedimentation aided with coagulation - Types of coagulants – Flocculator -Flash mixer – Clariflocculator –Design-optimum coagulant dosage - Jar test.

UNIT - III: WATER TREATMENT – FILTRATION & DISINFECTION

Filtration: Filtration mechanism - Slow sand filters - Rapid sand filters –Design and Operation

Disinfection: Objective - Forms of disinfection - Chlorination - Types of chlorination

UNIT - IV: SEWAGE QUALITY & PRIMARY TREATMENT

Sewage quality: Systems of sanitation - Characteristics of sewage - Decomposition cycles- Aerobic and anaerobic decomposition – carbon, nitrogen, sulphur cycles - Physical and chemical quality of sewage – BOD curve – BOD equation - BOD/COD ratio- Problems

Primary Treatment: Treatment of sewage - Primary treatment - Screening - Grit chamber – Design - Skimming tanks - Primary sedimentation tank and its design

UNIT - V: SECONDARY TREATMENT & SLUDGE HANDLING

Secondary treatment of sewage: *Activated sludge process:* Biological growth - Mechanism - Complete mix and Diffused aeration methods of activated sludge process - Design considerations in ASP -Major parameters of design-Designs

Biological filtration of sewage: Trickling filters – Design of low rate and high rate trickling filters

Septic tanks: Objectives- Construction details – Design considerations - Dispersion trenches - Soak pit.

Sludge handling: Sludge characteristics-Sludge digestion –Mechanism – Factors affecting - Design of digester - Disposal of digested sludge- Sludge drying beds

TEXT BOOKS

1. B.C. Punmia B C, A.K. Jain and A.K. Jain, “Water Supply Engineering”, Laxmi Publications.2nd Edition1995, Reprint 2005.
2. B.C. Punmia, A.K. Jain and A.K. Jain, “Wastewater Engineering”, Laxmi Publications, 2nd Edition 1998, Reprint 2014.

REFERENCES

1. S.K. Garg, “Water Supply Engineering”, Khanna Publishers, 26th revised Edition, New Delhi. 2010.
2. S.K. Garg, “Sewage disposal and Air Pollution Engineering”, Khanna Publishers New Delhi. 36th Edition, 2017.
3. H.S. Peavy, D. Rowe, and G. Tchobanoglous, “Environmental Engineering”, McGraw Hill Publishers, New Delhi. 1985.
4. G.S. Birdie and J.S. Birdie, “Water Supply and Sanitary Engineering” Dhanpat Rai Publishing Company New Delhi, 6th Edition, 2002.
5. K.N. Duggal, “Elements of Environmental Engineering”, S.Chand & Company Limited, New Delhi, 2007.
6. P. N. Modi, “Sewage Treatment Disposal & Wastewater Engineering”, Standard Book House, 2016.
7. Manual on sewerage and sewage treatment, CPHEEO, Ministry of urban affairs and employment, Govt. of India, New Delhi, 2001
8. Water and Wastewater Engineering, NPTEL video lectures and web notes

L	T	P	Cr.
3	-	-	3

B.Tech. (VI Sem.)

17CE23 - GEO TECHNICAL ENGINEERING – II

Pre-requisites: Geo technical engineering-1

Course Educational Objective: The course aims to teach the different conditions of site investigation for soil exploration. The course coverage includes the various procedures for determining the bearing capacity of various soils and get acquainted with the principles of soil mechanics in design of retaining walls.

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

CO1: Interpret the principles of soil exploration.

CO2: Design different types of foundations.

CO3: Determine safe bearing capacity for design of buildings.

CO4: Design different types of retaining walls.

CO5: Design the special foundations and perform stability analysis of slopes.

UNIT –I: SITE INVESTIGATION AND SELECTION OF FOUNDATIONS

Objective of site investigation – Methods of investigation – Planning of Site investigation – Depth of soil exploration – Significant depth – Spacing of bore holes – Standard penetration test and its significance in soil exploration – Correction to Standard penetration values –Soil sampling techniques – Sampling Disturbance – Methods of obtaining undisturbed samples – Requirements of an undisturbed sample. Functions and requisites of foundation – Different types of shallow foundations and situations under which they are adopted.

UNIT –II: SHALLOW FOUNDATIONS AND BEARING CAPACITY OF SOILS

Bearing Capacity of soils – Factors affecting Bearing capacity of soil – Terzaghi's and Meyerhof's bearing capacity theories- General principle of Design of Shallow Foundations – Plate bearing test and its limitations –Settlement of foundation – Causes of total and differential settlement of foundations in sand and clays – Methods of controlling settlement – Code provisions – Conventional procedure for proportioning of footing for equal settlement.

UNIT –III: DEEP FOUNDATIONS AND GROUP CAPACITY OF PILES

Deep Foundations: Pile foundation – Consideration leading to the selection of pile foundation – Functions of piles – Types of piles – Friction pile, End bearing pile – Pile grouping – Estimation of individual pile capacity by Static and Dynamic approaches.

Group Capacity of Piles: Pile group efficiency – Downward drag phenomenon on piles and its significance in the design of pile foundations – Pile load test (Constant rate penetration test only) and its interpretation – Impact of pile driving (within the site and neighbouring area)

UNIT- IV: EARTH PRESSURE THEORIES AND RETAINING WALLS

Earth Pressure Theories: Rankine's and Coulomb's earth pressure theories and their comparison – Earth pressure at rest – Active and Passive earth pressures for cohesive and non cohesive soils and their determination by analytical methods only (No graphical procedures)

Retaining Walls: Different types of Retaining Walls – Design principles of Cantilever and Counterfort Retaining walls (Structural Design not included).

UNIT-V: SPECIAL FOUNDATIONS AND STABILITY OF SLOPES

Special Foundations: Caisson Foundation – Necessity of selection – Types of Caisson foundation – Design principles of Caisson foundation (Structural Design not included). Foundation in filled up grounds – Foundation on expansive soil – Use of under-reamed pile foundations – Introduction of Machine foundations

Stability of slopes: Stability analysis of finite earth slopes – Factors of safety – Taylor’s stability number and its significance –Different conditions of slope stability analysis.

TEXT BOOKS

1. K.R. Arora, “Soil Mechanics and Foundation Engineering”, Standard Publishers & Distributors, Nai Sarak, Delhi, 1987
2. B.C. Punmia, A. K. Jain, and A. Jain. “Soil Mechanics and Foundation Engineering”, Laxmi Publications, 16th edition, New Delhi, 2006.

REFERENCES

1. V.N.S. Murthy, “A Text book of Soil Mechanics and Foundation Engineering”, Kripa Technical Consultants, Bangalore, 1992
2. C. Venkataramaiah, “Geotechnical Engineering”, Wiley Eastern Ltd., Madras, 1993.
3. A. Gopalranjan and A.S.R. Rao. “Basic and Applied Soil Mechanics”, New Age Publications, 2nd Edition, New Delhi, 2000.
4. Joseph E. Bowles, “Physical and Geotechnical Properties of Soils”, McGraw Hill Publishing Co., New York, 1994.
5. Geo Technical Engineering-II, NPTEL video lectures.

L	T	P	Cr.
3	-	-	3

B.Tech. (VI Sem.)

17CE24 - MATRIX METHODS IN STRUCTURAL ANALYSIS

Pre-requisites: Strength of Materials-I, Strength of Materials-II, and Structural Analysis

Course Educational Objective: The course familiarizes the students with various methods of analysis of indeterminate structures such as analysis of matrix methods mainly flexibility and stiffness matrix approaches, their applications for simple pin jointed, rigid jointed frames. Development of transformation matrix by force and displacement methods is discussed.

Course Outcomes:

CO1: Identify the basics of matrix methods of analysis

CO2: Generate element stiffness matrix and flexibility matrix

CO3: Generate stiffness matrix for beams and calculate displacements

CO4: Generate stiffness matrix for plane trusses and single bay plane frames and calculate displacements

CO5: Generate flexibility matrix for analysis of beams and plane frames and solve problems

UNIT-I : FLEXIBILITY AND STIFFNESS MATRICES

Flexibility and stiffness-Axial displacement-Transverse displacement-Bending or flexural displacement-Torsional displacement

Flexibility Matrix: Properties

Stiffness Matrix: Properties, relationship between flexibility and stiffness matrix

Development of flexibility and stiffness matrices

UNIT-II: FORCE METHOD AND DISPLACEMENT METHODS

Force method and displacement method – Similarities between them-Applications to two and three span continuous beams with and without sinking of supports

UNIT-III: RIGID JOINTED PLANE FRAMES

Introduction-Force method-Shear equations for rigid jointed plane frames

Stiffness of a rigid joint-rotational stiffness and translational stiffness

Stiffness matrix for rectangular frames-Displacement method

UNIT-IV: PIN JOINTED FRAMES

Introduction-Displacement of pin jointed plane frame-Force method-Stiffness of a pin-joint, Member forces-Displacement method

UNIT-V: TRANSFORMATION MATRICES _ ELEMENT APPROACH

Introduction-Force method-Static analysis by method of joints

Displacement method-Effect of axial deformation of members

TEXT BOOKS :

1. Pundit and Gupta, “Matrix Methods of Structural Analysis”, Tata McGraw Hill Publishing Co, New Delhi, 2nd Edition
2. Weaver and Gere, “Matrix Methods of Structural Analysis”, CBS Publishers, 2nd Edition

REFERENCES:

1. P. Dayaratnam, “Advanced structural analysis”, Tata McGraw Hill publishing company limited, New Delhi. 16th reprint 2007
2. Advanced Structural Analysis, NPTEL Web Notes

L	T	P	Cr.
3	-	-	3

B.Tech. (VI Sem.)

17CE25 - RAILWAYS, AIRPORT PLANNING AND HARBOUR ENGINEERING

Pre-requisites: NIL

Course Educational Objective: The course aims to introduce the different transportation systems available around the world. It further addresses the aspects of analysing the different components of railways, airways and water ways.

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

CO1: Illustrate the rail network development and railway planning in India.

CO2: Analyse different technical aspects of railway junctions.

CO3: Characterise the concepts of railway Interlocking and signalling systems.

CO4: Identify the technical issues related to planning and design of airports

CO5: Describe the technical components of harbour.

UNIT-I: RAILWAY PLANNING AND PERMANENT WAY

Role of Indian Railways in National Development - Alignments – Role of Remote Sensing, GIS and GPS - Permanent way – Specification of Components Gauges - Typical cross sections – Monorail, Embankments and cuttings – Construction, renewal and maintenance of permanent way – Rail joints and welding of rails.

UNIT-II: TRACK JUNCTIONS

Points and crossings – Devices and layouts - Most commonly employed layouts – Special fittings and safety devices – Station and yard – Different types and their typical layouts – General equipments – Track junction – Movable diamond crossing

UNIT-III: SIGNALS AND INTERLOCKING

Signals – Different types and their working – Location of signals – Principles and mechanism of interlocking – Safety devices – Different system of control on movement of trains Introduction to modern trends in Indian railways in the design of high speed tracks.

UNIT-IV: AIRPORT ENGINEERING

Importance of Airports in National Transportation Sector – Airport Planning - Standards for planning of airports as per ICAO – Site selection survey – Airport Zoning – Runway – Orientation – Geometric design – Different types, pattern and layout Taxiways and Aprons – Holding Aprons – Planning and layout of Terminal Buildings, Hangars and Parking area

UNIT-V: HARBOUR COMPONENTS

Harbours and Ports – Requirement and classification – surveys – Breakwaters and pier heads – Docking platforms – Piers, wharves, jetties and quays – Fender mooring accessories – Entrance channels

DOCKS AND NAVIGATIONAL AIDS

Docks – Wet and dry – Marine railways – Offshore docks – Floating docks, temporary docks – Locks Dredgers and dredging – Transit sheds and warehouses – Navigational aids and signals

TEXT BOOKS

1. S.C. Saxena. and S. Arora, “A Text Book of Railway Engineering”, Dhanpat Rai Publications Pvt., Ltd, New Delhi, 2005
2. S.K. Khanna, M.G. Arora, and S.S. Jain, “Airport Planning and Design”, Nem Chand and Bros, Roorkee, 2001.

REFERENCES

1. S.P. Bindra, “A course work in Docks and Harbour Engineering”, Dhanpat Rai Publications Pvt., Ltd, New Delhi, 2003
2. S.P. Bindra, “A course in bridge, tunnel and railway engineering”, Dhanpat Rai Publications Pvt., Ltd, New Delhi, 1996
3. Ahuja and Birdi, “Roads, railways, bridges and tunnels engineering”, Standard Book House, New Delhi, 2000
4. R. Srinivasan, “Dock, Harbour and Tunnel Engineering”, Charotar Publishing House, Anand, 1989
5. S.C. Rangwala, “Principles of Railway Engineering”, Charotar Publishing House, Anand, 2000.
6. Transportation Engineering-II, NPTEL video lectures.

L	T	P	Cr.
3	-	-	3

B.Tech. (VI Sem.)

17CE26 - CONSTRUCTION TECHNIQUES AND EQUIPMENT PLANNING

Pre-requisites: Building materials and Geo-technical Engineering

Course Educational Objective: The course familiarizes students with various construction techniques suitable for different site works. The course also deals with the equipment planning in addition to introducing new techniques in construction practices.

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

- CO1: Identify the best construction equipment for site work and heavy civil projects
- CO2: Choose the construction equipment based on their capabilities
- CO3: Categorize the different types of cranes for field use
- CO4: Classify the pile driving equipment for construction purpose
- CO5: Plan the form work and usage of miscellaneous equipment.

UNIT-I: HISTORY OF CONSTRUCTION EQUIPMENT

History of construction equipment –Construction Industry-safety-Contracting Environment. Planning for earth work construction- Compaction and stabilization equipment- compaction of soil and rocks-types of compacting equipment- roller production estimating-Dynamic compaction-soil stabilization-cement soil stabilization.

UNIT-II: DOZERS- SCRAPERS- EXCAVATORS

Dozers: Performance-blades-dozer production estimating-safety. Land clearing- Operation-types of equipment.

Scrapers: Types-operation-performance chart-production cycle-operation Consideration-scraper safety.

Excavators: Hydraulic Excavators-accidents. Front Shovels –Selecting a front shovel-Production-Hoes-Bucket rating for hydraulic hoes- selecting a Hoe-Loaders- Loaders Buckets-operational specifications-production rates –calculating wheel and Track loader production.

UNIT-III: CRANES

Cranes: Major types-Mobile cranes- crawler cranes-Telescoping – Boom truck- Mounted Cranes- Crane Booms-Lifting capacities of cranes-Tower cranes- classification-selection-safety-crane accidents

UNIT-IV: PILE AND PILE DRIVING EQUIPMENT

Pile and pile-driving equipment-pile types- Driving piles-spudding and preagereing- pile drive safety-Air compressors and pumps-terms- compressed air distribution-gas laws- diversity factor - loss of head due to friction in pipe –safety.

UNIT-V: FORM WORKS AND OTHER EQUIPMENT

Planning for building construction- site layout- lifting and support equipment – Delivery structural components- steel erection- Tilt-Up construction. Control of construction Nuisances- construction noise- noise mitigation- lighting-Forming system- classification – formwork and design of form work- vertical system- horizontal system-combined vertical and horizontal system- shoring towers-safety

TEXT BOOKS

1. R.L. Peurifoy, W.B. Ledbetter, and C. Schexnayder, "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, Singapore, 1995.
2. S.P. Arora and S.P. Bindra, "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 1997.

REFERENCES

1. P.C. Varghese, "Building construction", Prentice Hall of India Pvt. Ltd, New Delhi, 2007.
2. K.S.Jagadeesh, B.V.Venkataramana Reddy "Alternative building materials and technologies", New age international publications; 2008.
3. Leonhard E.Bernold "Construction equipment and methods planning. Innovation, safety", Willey student edition-2007.

L	T	P	Cr.
3	-	-	3

B.Tech. (VI Sem.)

17CE27 - URBAN HYDROLOGY

Pre-requisites : Mechanics of Fluids, Hydraulics and Hydraulic Machinery Systems, Hydrology

Course Educational Objective: The course is designed to know the impact of urbanization on catchment hydrology. It aims to understand the importance of short duration rainfall runoff data for urban hydrology studies to estimate peak flow for storm water drainage system design.

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

CO1: Develop intensity duration frequency curves for urban drainage systems.

CO2: Identify the techniques for peak flow estimation for storm water drainage system design.

CO3: Develop design storms to size the various components of drainage systems.

CO4 : Apply best management practices to manage urban flooding.

CO5: Prepare master drainage plan for an urbanized area.

UNIT I: PRECIPITATION ANALYSIS

Introduction: Urbanisation and its effect on water cycle – trends in urbanisation – Effect of urbanisation on hydrology.

Precipitation Analysis: Importance of short duration of rainfall and runoff data, methods of estimation of time of concentration for design of urban drainage systems, Intensity-Duration - Frequency (IDF) curves, design storms for urban drainage systems.

UNIT II: APPROACHES TO URBAN DRAINAGE

Time of concentration, peak flow estimation approaches, rational method, NRCS curve number approach, runoff quantity and quality, wastewater and storm water reuse, major and minor systems.

UNIT III: ELEMENTS OF DRAINAGE SYSTEMS

Open channel, underground drains, appurtenances, pumping, and source control.

UNIT IV: ANALYSIS AND MANAGEMENT

Storm water drainage structures, design of storm water network- Best Management Practices– detention and retention facilities, swales, constructed wetlands, models available for storm water management.

UNIT V: MASTER DRAINAGE PLANS

Issues to be concentrated upon – typical urban drainage master plan, interrelation between water resources investigation and urban planning processes, planning objectives, comprehensive planning, and use of models in planning.

TEXT BOOKS

1. Martin P. Wanielista, Robert Kersten, Ron Eaglin, “Hydrology – Water Quantity and Quality Analysis”, John Wiley and Sons; 1996.
2. Barry J. Adams, Fabian Papa “Urban Storm water Management Planning with Analytical Probabilistic Models” Wiley, 2000.

REFERENCES

1. Martin P. Wanielista, Yousef A. Yousef, “ Stormwater Management” JVG Books LLC (Westfield, NJ, U.S.A.)1992.
2. A.O Akan and R.L. Houghtalen, “Urban Hydrology, Hydraulics and Stormwater Quality: Engineering Applications and Computer Modelling”, Wiley International Edition, 2003

L	T	P	Cr.
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B.Tech. (VI Sem.)

17FE61 - PRESENTATION SKILLS LAB

Pre-requisites: Students should have fundamental knowledge in making Conversations in English and be with readiness to speak

Course Educational Objective: To help students make oral presentations, power point presentations, participate in group discussions and Write project/research reports/technical reports/ formal letters by gathering information and organizing ideas relevantly and coherently.

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

CO1: Make power point presentations and oral presentations.

CO2: Use standard vocabulary contextually.

CO3: Manage skilfully through group discussions.

CO4: Negotiate skilfully for better placement.

Syllabus: English Communication Skills Lab (ELCS) shall have two parts:

- **Computer Assisted Language Learning (CALL) Lab** for 60 students with 60 systems, LAN facility and English language software for self- study by learners.
- **Interactive Communication Skills (ICS) Lab.** with movable chairs and audio-visual aids with a P.A System, a T. V., a digital stereo – audio & video system and camcorder etc.

Exercise – I

CALL Lab:

Understand: synonyms and antonyms, one-word substitutes, analogy, idioms and phrases.

ICS Lab:

Practice: Ice-Breaking Activity and JAM Session – Introducing Oneself – Extempore - Public Speeches.

Exercise – II

CALL Lab:

Understand: Features of Good Conversation – Strategies for Effective Communication.

ICS Lab: Group Discussion

Exercise – III

CALL Lab:

Understand: Data collection – Organizing data - Making Poster – Making slides.

ICS Lab:

Practice: Poster Presentation – Power Point Presentations.

Exercise – IV

CALL Lab:

Understand: Types of Résumé – Letter Writing.

ICS Lab:

Practice: Writing Résumé & Letters

Exercise – V

CALL Lab:

Understand: Reading comprehension – Listening Comprehension – scanning, skimming, reading between lines and critical reading.

ICS Lab:

Practice: Reading comprehension - Listening Comprehension – scanning, skimming, reading between lines and critical reading.

Exercise - VI

CALL Lab:

Understand: Interview Skills

ICS Lab:

Practice: Mock Interviews

Lab Manual:

Board of Editors, "ELCS Lab Manual – A Workbook of CALL and ICS Lab Activities", Orient Black Swan Pvt. Ltd., Hyderabad, 2016.

SUGGESTED SOFTWARE:

1. Digital Mentor: Globarena, Hyderabad, 2005
2. Sky Pronunciation Suite: Young India Films, Chennai, 2009
3. Mastering English in Vocabulary, Grammar, Spelling, Composition, Dorling Kindersley, USA, 2001
4. Dorling Kindersley Series of Grammar, Punctuation, Composition, USA, 2001
5. Oxford Talking Dictionary, The Learning Company, USA, 2002
6. Learning to Speak English - 4 CDs. The Learning Company, USA, 2002
7. Cambridge Advanced Learners English Dictionary (CD). Cambridge University Press, New Delhi, 2008

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B.Tech. (VI Sem.)

17CE71 - ENVIRONMENTAL ENGINEERING LAB

Prerequisites: Nil

Course objectives: This course deals with the laboratory approaches of determining certain major parameters related to water and wastewater quality and analyzing the laboratory data with respect to permissible limits and field conditions.

COURSE OUTCOMES

CO1: Perform the different laboratory techniques for examining the water quality parameters.

CO2: Perform the different laboratory techniques for examining the wastewater quality parameters.

CO3: Analyze the laboratory data and comment with respect to permissible limits and field conditions.

List of Experiments

Note: A minimum of twelve (12No) shall be done and recorded

The following tests are to be performed on a water/wastewater sample.

1. Determination of pH value and Conductivity.
2. Determination of Turbidity of water sample.
3. Determination of TDS in water sample.
4. Determination of Total, temporary and permanent hardness of water sample.
5. Determination of Total, Calcium and Magnesium hardness of water sample.
6. Determination of Chloride concentration of water sample.
7. Determination of Acidity of water sample.
8. Determination of Alkalinity of water sample.
9. Determination of Fluorides in water sample.
10. Determination of Sulphates in water sample.
11. Determination of Residual chlorine in water sample.
12. Determination of Dissolved Oxygen of water sample.
13. Determination of Optimum dose of coagulant.
14. Determination of Settleable solids using Imhoff cone in sewage sample.
15. Determination of Suspended, fixed and volatile solids in sewage sample.
16. Determination of Total, fixed and volatile solids in sewage sample.
17. Determination of Biochemical Oxygen Demand (BOD) of sewage.
18. Determination of Chemical Oxygen Demand (COD) of sewage.

TEXTBOOK/REFERENCES

Laboratory Manual developed by Civil Engineering Department.

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B.Tech. (VI Sem.)

17CE72 - COMPUTER AIDED ANALYSIS AND DESIGN LAB

Pre-requisites: Reinforced concrete structures, Design of steel structures, Auto CAD

Course Educational Objective: To impart hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice.

Course outcomes:

CO1: Apply structural analysis software to analyze and design the beams, 2D and 3D frames.

CO2: Design of retaining walls and foundations using STAAD Pro

CO3: Analyze, design and draw the details of RCC and steel structural elements.

EXCERCISES

Part-A

SOFTWARE: STAAD Pro or Equivalent

Note: A minimum of 6 no. shall be done and recorded

1. Analysis and Design of different beams.
2. 2-D Frame Analysis and Design
3. 3-D Frame Analysis and Design
4. Design and analysis of multi-storied building
5. Analysis of plane/space truss
6. Design of a different types of Retaining Walls
7. Foundation Design
8. Wind Analysis of tall towers / buildings.

Part-B

Any four experiments using AutoCAD (2 from DRCS, 2 from DSS)

DRCS

1. Reinforcement particulars of T-beams and L-beams.
2. Reinforcement detailing of continuous beams.
3. Reinforcement particulars of columns.
4. Detailing of One way, Two way and continuous slabs.

DSS

5. Detailing of Compound beams including curtailment of flange plates.
6. Detailing of Column including lacing and battens.
7. Detailing of steel roof trusses including particulars at joints.
8. Detailing of beams including curtailment of flange plates.

TEXT BOOKS

1. N. Subramanian, Design of Steel Structures, Oxford University Press, 2016.
2. Varghese, “**Limit State Design of Reinforced Concrete**”, Prentice Hall of India Pvt., Ltd., New Delhi, 2002

REFERENCES

1. S.K.Duggal, Design of Steel Structures –Tata McGraw Hill, New Delhi, 2017.
2. Unni Krishnan Pillai and Devdas Menon, “**Reinforced concrete design**”, Tata McGraw Hill Publishing company Ltd, New Delhi, 1998

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B.Tech. (VI Sem.)

**17CE91 - LOW COST AND ECO-FRIENDLY
BUILDING TECHNOLOGY
(Add on course – II)**

Pre-requisites: Nil

Course Educational Objectives: The course focuses on study of available traditional and eco-friendly materials, Eco friendly and cost effective technologies, Eco-friendly building materials, rural housing approaches in disaster prone areas.

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

CO1: Select appropriate traditional materials for construction.

CO2: Select appropriate eco-friendly materials for construction.

CO3: Analyze the eco friendly technologies for low cost construction.

CO4: Describe prefabrication techniques and assess the wind effects on low rise buildings.

CO5: Categorize the approaches followed in disaster prone areas.

UNIT-I: TRADITIONAL BUILDING MATERIALS

Traditional Building Materials: Introduction-housing scenario in India, Traditional building materials-stabilized soil bricks, improved mud and thatch, burnt and un burned bricks, laterite-lime bricks, sand-lime blocks, stone block masonry units, bamboo, hollow cement blocks, light weight concrete blocks, wood-cement products, fly ash bricks, cementitious binder from rice husk, lime based binders.

UNIT-II: ECO-FRIENDLY BUILDING MATERIALS

Basics and practical applications of locally available building materials- Soil, Fly ash, Ferrocement, Lime, Fibres, Stone Dust, Red mud, Gypsum, Alternate Wood, Polymer-ADOBE, Light Clay, Straw-Bale, Bamboo, Agro-Industrial Waste, Innovative materials developed by CBRI, SERC, Structural Properties of Alternate Building Materials, Earthen Finishes, Earth Plasters, Earth Floors.

UNIT-III: IMPROVED BUILDING TECHNOLOGIES

Foundations: Introduction, types of soli, types of foundations, permissible settlements, soil investigations.

Walls: Introduction, stabilized earth wall construction, building blocks (lato blocks) from lateritic soil, brick masonry walls, cellular concrete blocks, hallow concrete blocks, shell type houses made of hallow clay blocks, pre cast concrete panels.

Roofs: Introduction, catenary hollow clay blocks/brick shell roofs, pre cast reinforced concrete-channel units-cored units, roofing system with cellular unit, cellular light weight concrete roofing system.

UNIT-IV: PRE-FABRICATION AND WIND EFFECTS

Pre-fabrication: Introduction, advantages of pre-fabrication, areas where prefabrication techniques can be introduced, joints in pre cast concrete structures.

Wind effects on low rise buildings: Introduction, wind structure interaction concepts, codal provision, housing in cyclone prone areas, cyclone resisting core units.

UNIT-V: RURAL HOUSING AND HOUSING IN DISASTER PRONE AREAS

Rural housing: Introduction, traditional practice of rural house construction, appropriate rural housing technology, mud housing technology, mud roofs, characteristics of mud, fire retardant treatment for trench roof.

Housing in disaster prone areas: Introduction, traditional houses in disaster prone areas, types of damages failures of non engineered buildings, repair and rehabilitation of earthquake damaged non engineered buildings, recommendations for feature construction.

TEXT BOOKS:

1. A.G.Madhavrao, D.S.Ramachandramurthy –Appropriate technologies for low cost housing-oxford & IBH Publishing, 1996.
2. A K Lal, “Hand Book of Low Cost Housing”, New Age Publishing, 1995

REFERENCES:

1. N. Kumara Swamy and A. Kameswara Rao, “Building Planning and Drawing”, Charotar Publications, 2013.
2. S K Duggal, “Building materials”, New Age International Publishers. 2012.

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B.Tech. (VI Sem.)

17PD08 - EMPLOYABILITY ENHANCEMENT SKILLS

– II

Prerequisite: NIL

Course Educational Objective (CEO): This course will make students proficient in Quantitative techniques, language & communication skills to qualify in placement tests, demonstrate industry-readiness skills by applying concepts and tools that will serve as building blocks for analytical thinking and professional development.

Course Outcomes (COs): After the completion of this course, student will be able to:

CO1: To identify, analyze and apply quantitative techniques related to qualify in Placement tests.

CO2: To effectively utilize verbal ability & communication skills to qualify in Placement tests.

CO3: To effectively communicate in professional as well as social contexts.

CO4: To apply key soft skills effectively in Job Interviews as well in other professional contexts

CO5: Inculcate lifelong learning through personal effectiveness as well as leadership.

UNIT – I:

Verbal Ability: Tenses & Conditional Clauses

Quantitative Aptitude: Alligation or Mixture, Simple Interest and Compound Interest

UNIT – II:

Verbal Ability: Sentence Completions

Quantitative Aptitude: Time and work, Pipes and Cistern, Permutations and Combinations, Probability

UNIT – III:

Verbal Ability: Spot the Errors

Quantitative Aptitude: Time and Distance, Problems on trains, Boats and Streams, Races and Games of Skill

UNIT – IV:

Verbal Ability: Jumbled Sentences, Cloze Tests

Quantitative Aptitude: Area, Volume and Surface Areas, Progressions

UNIT – V:

Verbal Ability: Advanced Reading Comprehension

Quantitative Aptitude: Clocks and Calendars, Cubes and Dice

TEXT BOOKS:

- Objective Arithmetic, S. CHAND Publishers.
- R.S.AGGARWAL, *Verbal & Non-Verbal Reasoning*, S. CHAND Publishers.
- Objective English. Edgar Thorpe, Pearson Education, New Delhi.2009.
- Sanjay Kumar, Pushpa Lata: Communication skills. Oxford, Delhi, 2012.
- Vocabulary Builder for Students of Engineering and Technology (A self – study manual for vocabulary Enhancement) Y.Saloman Raju, Maruthi Publishers

REFERENCES:

1. Meenakshi Raman, Sangeetha: Technical Communication, Oxford University Press, 2008
2. Baron's Guide on GRE
3. Dinesh Khattar, *The Pearson Guide to Quantitative Aptitude*, Pearson Education
4. M. Tyra, *Magical Book on Quicker Maths*, BSC Publishers
5. Quantitative Aptitude by Arun Sharma
6. Vocabulary Builder for Students of Engineering and Technology (A self – study manual for vocabulary Enhancement) Y.Saloman Raju, Maruthi Publishers

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B.Tech. (VII Sem.) 17CE28 - ESTIMATION AND QUANTITY SURVEYING

Pre-requisites: Construction Management, DRCS-I, DRCS-II, Transportation Engineering-I, Transportation Engineering-II, Building Materials and Construction, and Foundation Engineering.

Course Educational Objective: This course aims to deal with the basic principles of estimating the quantities in building, roads and canals. The course also provides details about the procedures and practices for writing specifications, preparation of analysis of rates and procedural aspects of valuating the property.

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

- CO1: Estimate the quantities for various types of structures.
- CO2: Calculate the quantities of different items in buildings and roads.
- CO3: Compute the quantity estimate for canals.
- CO4: Prepare and write specifications and rate analysis.
- CO5: Perform valuation of the property as per the prevailing regulations.

UNIT-I: ESTIMATE OF BUILDINGS

Methods of estimating; Main items of work; Deduction for openings; Degree of accuracy; Units of measurement.

METHODS OF BUILDING ESTIMATES

Individual wall method; Centre line method; Arch masonry calculation; Estimate of steps.

ESTIMATE OF RESIDENTIAL BUILDING

Estimate of a building from line plan.

UNIT-II: ESTIMATE OF RCC WORKS AND ROADS

Standard hooks and cranks; Estimate of RCC slab; RCC beam; RCC T-beam slab and RCC column with foundation.

ROAD ESTIMATING: Estimate of earthwork; Estimate of pitching of slopes; Estimate of earthwork of road from longitudinal sections; Estimate of earthwork in hill roads.

UNIT-III: CANAL ESTIMATE

Earthwork in canals—different cases; Estimate of earthwork in irrigation channels.

SPECIFICATIONS: Purpose and method of writing specifications; General specifications. Detailed Specifications for Brick work; R.C.C; Plastering; Mosaic Flooring; R.R.Stone Masonary.

UNIT-IV: ANALYSIS OF RATES

Task or out – turn work; Labour and materials required for different works; Rates of materials and labour; Preparing analysis of rates for the following items of work: i) Concrete ii) RCC Works iii) Brick work in foundation and super structure iv) Plastering v) CC flooring vi) White washing. Standard Schedule of Rates.

PWD ACCOUNTS AND PROCEDURE OF WORKS

Organization of Engineering department; Work charged establishment; Contract; Tender; Tender notice; Tender Schedule; Earnest money; Security money; Measurement book; Administrative approval; Technical sanction; Plinth area; Floor Area; Carpet area; Approximate Estimate; Plinth area estimate; Revised Estimate; Supplementary estimate.

UNIT-V: VALUATION

Cost; Price & value; Methods of valuation; Out goings; Depreciation; Methods for estimating cost depreciation; Valuation of building.

Miscellaneous Topics: Gross income; Net income; Scrap value; Salvage value; Obsolescence; Annuity; Capitalized value; Years purchase; Life of structures; Sinking fund; Standard rent; Process of fixing standard rent; Mortgage.

TEXT BOOKS

1. B.N. Dutta “Estimating & Costing in Civil Engineering”, U. B. S. Publishers & Distributors, New Delhi. 2002
2. S . C. Rangwala “Valuation of Real properties”, Charotar Publishing House, 9th Edition, 2015.

REFERENCES

1. M Chakraborty, “Estimating, Costing Specification and Valuation”, 2006

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B.Tech. (VII Sem.)

17CE29 - REMOTE SENSING AND GIS APPLICATIONS

Pre-requisites: Nil

Course Educational Objective:

The course is designed to understand the techniques of Remote Sensing and GIS Technology for civil engineering applications.

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

- CO1: Interpret the concepts of Photogrammetry and its applications such as determination of heights of objects on terrain.
- CO2: Illustrate the Electromagnetic spectrum and utilize the energy interactions of EMR with atmosphere and earth surface features for GIS data generation.
- CO3: Analyze the methods of map projections and understand coordinate systems on GIS Software packages to produce high resolution thematic maps.
- CO4: Apply the concepts of vector and raster data model for representation of topological earth features and its importance.
- CO5: Apply the RS & GIS techniques for solving civil engineering applications

UNIT-I: INTRODUCTION TO PHOTOGRAMMETRY

Principle and types of aerial photograph, Geometry of vertical aerial photograph, scale and height measurement on single vertical aerial photograph, height measurement based on relief displacement, fundamentals of stereoscopy, fiducial points, parallax measurements using fiducial points.

UNIT-II: REMOTE SENSING

Basic concept of remote sensing, data and information, remote sensing data collection, remote sensing advantages and limitations, remote sensing process; electromagnetic spectrum, energy interactions with atmosphere and with earth surface features(soil, water, vegetation), Indian satellites and sensors characteristics, resolution, map and image and false color composite, Introduction to digital data, elements of visual interpretation techniques.

UNIT-III: GEOGRAPHIC INFORMATION SYSTEM

Introduction to GIS, Components of a GIS, Geospatial data: Spatial data, attribute data, joining spatial and attribute data; GIS operations: Spatial data input, attribute data management, data display, data exploration, data analysis.

COORDINATE SYSTEMS: Geographic coordinate system: Approximation of the earth, datum; map projections: types of map projections, map projection parameters, commonly used map projections, projected coordinate systems.

UNIT-IV: VECTOR AND RASTER DATA MODEL

VECTOR DATA MODEL: Representation of simple features, topology and its importance; coverage and its data structure, shape file; geometric representation of spatial feature and data structure, topology rules.

RASTER DATA MODEL: Elements of the raster data model, types of raster data, raster data structure, data conversion, integration of raster and vector data. Data Input: Metadata, conversion of existing data, Creating new data; Remote sensing data, fields data, text data, digitizing, scanning, on screen digitizing, importance of source map, data editing.

UNIT-V: CIVIL ENGINEERING APPLICATIONS

Surface water mapping and inventory, rainfall runoff relations, watershed management for sustainable development, reservoir sedimentation, ground water targeting, and identification for groundwater recharge, Waste Management Facilities, Water Quality Modeling and Mapping.

TEXT BOOK

1. S S Manugula, "Photogrammetry, GIS & Remote Sensing" Ebooks2go Inc, 2018.
2. Kang – Tsung Chang, "Introduction to geographic information system", Tata McGraw- Hill Education Private Limited, 2007.

REFERENCES

1. **Sujit Choudhury, Deepankar Chakrabarti, Suchandra Choudhury**, "An Introduction to Geographic Information Technology" I.K. International Publishing House Pvt. Ltd. 2009.
2. **Shivangi Somvanshi, Maya Kumari**, "A Introduction to Remote Sensing and Its Applications", S.K. Kataria & Sons 2014.
3. Basudeb Bhatta, "Remote sensing and GIS" Oxford University press, 2011.
4. S. Kumar, "Basics of Remote sensing and GIS", Laxmi Publications, 2016.
5. K Elangovan, "GIS Fundamentals, Applications and Implementations" New India Publishing Agency, 2006.
6. Remote sensing and Geographical Information Technology, NPTEL video lectures and web notes

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B.Tech. (VII Sem.)

17CE30 - DESIGN OF REINFORCED CONCRETE STRUCTURES - II

Pre-requisites: Applied Mechanics, Strength of Materials-I, Strength of Materials-II, Structural analysis and Design of Reinforced Concrete Structures-I.

Course Educational Objectives: This course deals with design of shallow and deep foundations, different types of slabs along with stair case and retaining walls.

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

- CO1: Design the footings
- CO2: Design the piles.
- CO3: Design different slabs.
- CO4: Design the stair cases
- CO5: Design cantilever type retaining walls

UNIT- I: DESIGN OF SHALLOW FOUNDATIONS

Design of shallow foundation – square – rectangular isolated footing of uniform thickness and sloped footing – combined footing.

UNIT-II DESIGN OF PILE FOUNDATIONS

Pile Foundation- Introduction- Types- IS-Code Provisions- Pile Design and Pile grouping.

UNIT-III DESIGN OF SLABS

Yield line theory – Design of circular, flat and grid slabs with different boundary conditions subjected to UDL.

UNIT-IV DESIGN OF STAIRS

Design of stairs spanning horizontally – Design of dog legged stair.

UNIT-V DESIGN OF CANTILEVER RETAINING WALLS

Types of retaining walls, Forces on retaining walls; Stability requirements; Design and detailing of cantilever type retaining wall.

TEXT BOOKS

1. Punmia B.C, Ashok Kumar Jain, Arun Kumar Jain “Comprehensive RCC Design” Laxmi publications (P) Ltd, New Delhi, 1998
2. Krishnaraju. N, “Advanced Reinforced Concrete design”, CBS Publishers & Distributors, New Delhi, 1988.

REFERENCES

1. P.C Varghese, “Limit State Design of Reinforced Concrete”, Prentice Hall of India Pvt., Ltd., New Delhi, 2008
2. P.C Varghese, “Advanced Reinforced Concrete Design”, Prentice Hall of India Pvt., Ltd., New Delhi, 2005.
3. Ashok K. Jain, “Reinforced Concrete Limit State Design”, 4th Edition Nem Chand & Bros, Roorkee,2012.
4. Advanced Structural Design and Design of Concrete Structures, NPTEL web notes.

IS CODES:

- IS 456-2000: Plain and reinforced concrete
- IS 2911: Pile Foundation- Under reamed piles

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B.Tech. (VII Sem.)

17CE31 - PRE-STRESSED CONCRETE

Pre-requisites: DRCS-I.

Course Educational Objective: The course deals with the analysis and design of prestressed concrete structural elements. The primary topics include the concept and principles of prestressing, methods of prestressing concrete, stress limits, losses of prestress, selection of section, serviceability and strength requirements. Students will also be familiar with the analysis and design procedure of simply supported prestressed concrete non-composite and composite beams.

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

CO1: Identify the different methods of pre-stressing.

CO2: Compute the effective pre-stress including the short and long term losses.

CO3: Analyze the different losses of pre-stressing

CO4: Design prestressed concrete beams under flexure.

CO5: Design prestressed concrete beams under shear and torsion and interpret the relevant IS code provisions for prestressed concrete.

UNIT-I: BASIC CONCEPTS OF PRESTRESSING

Advantages and Applications of Prestressed Concretes, High Strength Concrete- Permissible Stresses, Shrinkage, Creep, Deformation Characteristics, High strength Steel- Types, Strength-Permissible Stresses- Relaxation of Stress, Stress Corrosion- Durability, Fire Resistance, Cover Requirements.

UNIT-II: PRE-STRESSING SYSTEMS:

Introduction, Tensioning devices, Pre-tensioning Systems, Post tensioning Systems, Basic Assumptions in Analysis of prestress and design, Analysis of prestress, Resultant Stresses at a section- pressure line- Concepts of load balancing- Stresses in Tendons, Cracking moment.

UNIT-III: LOSSES OF PRE-STRESSING

Loss of Pre-stress in pre-tensioned and post tensioned members due to various causes -Elastic shortening of concrete, shrinkage of concrete, creep of concrete, Relaxation of steel, slip in anchorage, differential shrinkage- bending of members and frictional losses-Total losses allowed for design.

UNIT-IV: DESIGN FOR FLEXURAL RESISTANCE

Types of flexural failure – Code procedures-Design of sections for flexure- Control of deflections- Factors influencing-Prediction of short term and long term deflections.

UNIT-V: DESIGN FOR SHEAR AND TORSION

Shear and Principal Stresses- Design of Shear reinforcements- Codal Provisions- Design for Torsion, Design for Combined bending, shear and torsion.

TRANSFER OF PRESTRESS IN PRE TENSIONED MEMBERS:- Transmission length- Bond stresses- end zone reinforcement- Codal provisions- Anchorage zone Stresses in Post tensioned members- Stress distribution in end block- Anchorage Zone reinforcement.

TEXT BOOKS

1. N. Krishnaraju, "Prestressed Concrete", Tata McGraw Hill Publishing Co.,Ltd., New Delhi, 2015.
2. N.Rajagopalan, "Prestressed Concrete", Narosa Publishing House, New Delhi, 2010.
3. M.C Sinha and S.K Roy. "Fundamentals of Prestressed Concrete", S.Chand & Company Ltd, New Delhi, 2011.

REFERENCES

1. P Dayaratnam, "Prestressed Concrete Structures", Oxford and IBH, New Delhi, 2017.
2. James R.Libby, "Modern Prestressed Concrete", Design principles and Construction methods Van Standard Rainford Co., New York, 2007.
3. Lin.T.Y, and Ned.H.Burns, "Design of Prestressed Concrete Structures", John Wiley & Sons, New York, 2010.
4. Arthur H.Nilson, "Design of Prestressed Concrete", John Wiley & Sons, New York, 1978.
5. Prestressed Concrete Structures, NPTEL video lectures.

IS Codes

1. IS 1343: 2012 Code of Practice for Pre Stressed Concrete
2. IS 3370(Part 3): 2013 Code of Practice for Concrete Structures for the Storage of Liquids-Part 3 Pre stressed Concrete
3. IS 3370(Part 4): 2013Code of Practice for Concrete Structures for the Storage -Part 4

NOTE : These codes are permitted in the End Examinations

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B.Tech. (VII Sem.)

17CE32 - PAVEMENT ANALYSIS DESIGN ENGINEERING

Pre-requisites: Highway Engineering

Course Educational Objective: The course aims to teach the design principles, factors and various methods of designing the pavements using IRC recommended codes. The course helps the students to evaluate the pavement performance and stabilise the pavement by adopting various techniques.

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

CO1: Analyse the factors affecting the various types of pavements under application of loads.

CO2: Design of flexible pavement by theoretical and empirical methods.

CO3: Design of rigid pavement by IRC method and Westergaard approach.

CO4: Evaluate the pavement performance and maintenance as per IRC recommendations.

CO5: Applications of Geo-synthetics in stabilisation of highway pavements.

UNIT-I: FACTORS AFFECTING PAVEMENT DESIGN

Variables considered in Pavement Design, Types of pavements, Functions of individual layers, Classification of axle types of rigid chassis and articulated commercial vehicles, legal axle and gross weights on single and multiple units, tire pressure, contact pressure, EAL and ESWL concepts, traffic analysis, ADT, AADT, truck factor, growth factor, lane, directional distributions & vehicle damage factors.

UNIT-II: DESIGN OF FLEXIBLE PAVEMENTS

Flexible pavement design - Empirical - Semi empirical and theoretical Methods – Design procedure as per latest IRC guidelines – Design and specification of rural roads.

UNIT-III: DESIGN OF RIGID PAVEMENTS

Cement concrete pavements - Modified Westergaard approach - Design procedure as per latest IRC guidelines - Concrete roads and their scope in India.

UNIT-IV: MAINTENANCE AND EVALUATION OF PAVEMENTS

Need for Highway Maintenance- Pavement Failures- Failures in Flexible Pavements-Types and Causes-Rigid Pavement Failures- Types and causes- Pavement Evaluation techniques- Benkelman Beam method- Strengthening of Existing Pavements- Overlays.

UNIT-V: STABILISATION OF PAVEMENTS

Stabilisation with special reference to highway pavements - Choice of stabilisers -Testing and field control –Stabilisation for rural roads in India -use of Geo-synthetics (geo-textiles & geo-grids) in roads.

TEXT BOOKS

1. L.R Kadiyali, “Principles and Practice of Highway Engineering”, Khanna tech. Publications, New Delhi, 2000.
2. E.J Yoder and M.W Witzak, “Principles of Pavement Design”, Wiley India Pvt Ltd, 2011.

REFERENCES

1. D Croney, “Design and Performance of Road Pavements”, HMO Stationary Office, 1979.
2. Design and Specification of Rural Roads (Manual), Ministry of rural roads, Government of India, New Delhi, 2001
3. Guidelines for the Design of Flexible Pavements, IRC: 37-2001, The Indian roads Congress, New Delhi.
4. Guideline for the Design of Rigid Pavements for Highways, IRC: 58-1998, The Indian Roads Congress, New Delhi.
5. Pavement Design, NPTEL video lectures and web notes.

IS CODES

1. IRC Standards
2. Bureau of Indian Standards (BIS) Publications on Highway Materials
3. MORTH Guidelines for Highway Engineering.

Codes Permitted in Examination : IRC :37-2001, IRC :52-2002.

L	T	P	Cr.
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B.Tech. (VII Sem.)

17CE33 - GROUND WATER ENGINEERING AND MANAGEMENT

Pre-requisites: Mechanics of Fluids, Hydraulics and Hydraulic Machinery Systems, Hydrology.

Course Educational Objective: The course is designed to understand the principles involved in design and construction of wells and create awareness on improving the groundwater potential using various recharge techniques. Learn groundwater management using advanced tools.

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

CO1: Apply the Principles involved in design of wells.

CO2: Identify the well construction practices.

CO3: Apply suitable techniques for groundwater recharge.

CO4: Interpret geophysical exploration data for systematic exploration of groundwater.

CO5: Develop and apply the groundwater models for prediction of relevant parameters.

UNIT I: INTRODUCTION

Ground water utilization and historical background, ground water in hydrologic cycle, ground water budget, ground water level fluctuations and environmental influence, Origin and age of ground water, rock properties affecting groundwater, groundwater column, zones of aeration & saturation, aquifers and their characteristics / classification, groundwater basins and springs, Ground water flow rates and flow directions.

UNIT II: WELL CONSTRUCTION AND DEVELOPMENT

Water wells, drilling methods-rotary drilling, percussion drilling, well construction-installation of well screens-pull-back method, open- hole, bail- down and wash-down methods, well development-mechanical surging using compressed air, high velocity jetting of water, over pumping and back washing, well completion, well disinfection, well maintenance.

UNIT III: ARTIFICIAL RECHARGE AND QUALITY ANALYSIS OF GROUND WATER

Concept and methods of artificial ground water recharge, recharge mounds and induced recharge, wastewater recharge for reuse, water spreading. Sources and causes of pollution, potential evaluation of pollution, analysis of ground water quality, water quality for irrigation engineering, Ghyben-Herzberg relation between fresh & saline waters, shape & structure of the fresh and saline water interface, saline water intrusion control.

UNIT IV: INVESTIGATION TECHNIQUES OF GROUND WATER

Geological, geophysical exploration, remote sensing, electric resistivity, seismic refraction based methods for surface investigation of ground water, test drilling and ground water level measurement, sub-surface ground water investigation through geophysical, resistivity, spontaneous potential, radiation, temperature, caliper, fluid conductivity, fluid velocity, miscellaneous logging.

UNIT V: MODELING AND MANAGEMENT OF GROUND WATER

Ground water modeling through porous media, general flow equations through porous media, analog, electric analog, digital computer models, ground water basin management concept, hydrologic equilibrium equation, ground water basin investigations, data collection & field work, dynamic equilibrium in natural aquifers, management potential & safe yield of aquifers, stream-aquifer interaction.

TEXT BOOKS

1. Raghunath H M 'Groundwater', New Age International Publishers, 2007.
2. David K. Todd, Larry W. Mays "Groundwater Hydrology", Wiley India Pvt Ltd., 2011.

REFERENCES

1. K R Karanth "Groundwater Assessment and Management", Tata McGraw Hill Publishing Co., 2017.
2. A.L Ramanathan, "Assessment of Groundwater Resources and Management" I K International Publishing House, 2009.
3. H. Bouwer , 'Groundwater Hydrology', McGraw Hill education, 2013.
4. Ground Water Hydrology, NPTEL video lectures and web notes.

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B.Tech. (VII Sem.)

17CE34 - EARTHQUAKE RESISTANT DESIGN

Pre-requisites: Reinforced Concrete Design

Course Educational Objective: The course aims to teach the fundamentals of response of dynamic load on structures, vibrations due to dynamic loads. The course further deals with design principles of earth quake resistant design and various design forces to be considered.

Course Outcomes:

- CO1: Illustrate the basics of dynamic loads and seismology
- CO2: Interpret the different earthquake vibrations of structures
- CO3: Deduce the principles of earth quake resistant design
- CO4: Choose appropriate forces for design of buildings
- CO5: Design the structures based on ductility considerations

UNIT – I: DYNAMIC LOADS AND SEISMOLOGY

Introduction to Dynamic Loads - Static Load v/s Dynamic Load, Types of Dynamic forces.

Engineering seismology- Earthquake phenomenon cause of earthquakes, Faults-Plate Tectonics- Seismic waves-Terms associated with earthquakes-Magnitude/Intensity of an earthquake, scales, Energy Released, Earthquake measuring instruments Seismoscope, Seismograph, accelerograph, Characteristics of strong ground motions, Seismic zones of India as per IS 1893-2002.

UNIT – II: FUNDAMENTALS OF EARTHQUAKE VIBRATIONS OF STRUCTURES

Equation of Motion (By Newton's Law and By D'Alembert's Principle), Degrees of Freedom, Simplified Single Degree of Freedom, Mathematical Modeling, Equation of Motion for Free Vibration for Damped and Un damped System (Single Degree of Freedom System), Equation of Motion for Forced Vibration for Damped and Un damped System (Single Degree of Freedom System), Logarithmic Decrement.

UNIT – III: INTRODUCTION TO EARTHQUAKE RESISTANT DESIGN

Seismic Design Requirements and Methods. RC Buildings – IS Code based Method. - Vertical Irregularities – Mass Irregularity Torsional Irregularity - Plan Configuration Problem - Design Lateral Force, Base Shear Evaluation – Lateral Distribution of Base Shear – Structural Walls Strategies and the Location of Structural Walls – Sectional Shapes – Behaviour of Unreinforced and Reinforced Masonry Walls.

UNIT –IV: DESIGN FORCES FOR BUILDINGS

Equivalent static method, Determination of lateral forces as per IS 1893 (Part 1), Modal analysis using response spectrum.

UNIT–V: DUCTILITY CONSIDERATIONS IN EARTHQUAKE RESISTANT DESIGN OF RC BUILDINGS

Introduction, Impact of Ductility, Requirements for Ductility, Assessment of Ductility, Factors affecting ductility, Ductile detailing considerations as per IS 13920-1993.

TEXTBOOKS

1. Pankaj Agarwal & Manish Shrikhande ,”Earthquake Resistant Design of Structures”, PHI Publications, New Delhi, 2006.
2. S. K. Duggal ,”Earthquake Resistant Design of structures”, Oxford University Press, 2nd Edition, 2013.

REFERENCES

1. Anil K. Chopra, “Dynamics of Structures Theory and Applications to Earthquake Engineering” Prentice Hall of India (P) Ltd., New Delhi 2016.
2. T Pauley and M.J.N Priestley, “Seismic Design of Reinforced Concrete and Masonry Buildings”, John Wiley & Sons, New York, 1992.

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B.Tech. (VII Sem.)

17CE35 - ENVIRONMENTAL ENGINEERING

Prerequisites: Environmental Studies

Course Objectives: This course deals with importance of meteorology on air pollution and dispersion of air pollutants, air pollution control techniques, impacts of noise pollution on society and study the principles for reduction of noise pollution, solid waste management in the society, impacts of hazardous waste flow in society and application of environmental management principles to develop solutions to major environmental problems.

COURSE OUTCOMES

CO1: Evaluate the impacts of air pollution due to meteorology and estimate the ground level concentrations of pollutants at any location using available air quality models

CO2: Design the air pollution control equipment

CO3: Apply appropriate measures to estimate and reduce noise pollution

CO4: Apply appropriate techniques for management of solid waste in the society

CO5: Analyze the impacts of hazardous waste flow in society and apply the principles of environmental management to develop solutions to major environmental problems

UNIT-I: AIR POLLUTION – METEOROLOGY & DISPERSION

Air pollution: Concept – Primary and secondary pollutants, Properties, Units of measurement- Simple problems

Meteorology and Dispersion: Effect of Pressure, Temperature, Wind, Heat Island, Valley effect, Sea-land effect, Wind rose, Lapse rates, Inversion, Plume behaviour - Determination of stack height-Simple problems for estimation of stack height, Plume rise and dispersion-Gaussian plume dispersion model – Calculations.

UNIT-II: AIR POLLUTION CONTROL TECHNIQUES

Control techniques: *For particulate air pollutants:* Dry collection – Gravity chamber, Cyclone, ESP, Bag Filter, Wet Collection – Venturi scrubber, Spray tower, Cyclone scrubber-Simple problems. *For gaseous air pollutants:* Absorption, Adsorption, Combustion, Condensation - Ambient Air quality standards.

UNIT-III: NOISE POLLUTION

Noise Pollution – Sound and Noise, Sources of Noise, Basic definitions – Power, Intensity, Decibels, Equivalent Noise levels, Sound Intensity Level, Sound Pressure level, Weighting Networks, Octave band, Impacts of Noise, Noise rating systems, Noise level Standards-Simple calculations for - estimating equivalent noise levels, Addition of sound levels, Averaging Sound pressure levels, Simple control methods.

UNIT-IV: SOLID WASTE MANAGEMENT

Solid Waste Management – Regulations in India, Sources, Composition and Properties of solid waste, Collection and Handling, Door to door collection services, Principles of separation and processing, Concept of recycling and recovery of solid wastes, Solid Waste Disposal methods – Composting, Incineration, Land filling, Gas generation and Leachate Control - Simple calculations for estimation of moisture content, density, Energy content, methane generation, landfill area.

UNIT V: HAZARDOUS WASTE & ENVIRONMENTAL MANAGEMENT

Regulations in India of - Hazardous Waste, Biomedical Waste, Plastic Waste, E-Waste-
Classification, Control and Disposal methods - Indian Scenario

Treatment Storage and Disposal Facility (TSDF) concept-Concept of Common Effluent Treatment
Plants

Environmental Impact Assessment & Environmental Audit – Necessity, Objectives, Advantages
and Limitations, Case studies.

TEXT BOOKS

1. S.K. Garg, “Sewage Disposal and Air Pollution Engineering”, Khanna Publishers, 29th Edition, New Delhi, 2014.
2. Suresh K. Dhameja, “Environmental Science and Engineering”, S.K. Kataria & Sons Publications, New Delhi; 2009.

REFERENCES

1. K.V.S.G. Muralikrishna, “Air Pollution and Control”, University Science Press, 2015.
2. H.S. Peavy, D.R. Rowe and G. Tchobanoglous, “Environmental Engineering”, McGraw Hill Publications, Singapore, 1985.
3. Environmental Management & Impact Assessment, NPTEL Video Lectures.
4. Solid & Hazardous Waste Management, NPTEL Video Lectures
5. Environmental Air Pollution, NPTEL Video lectures and web notes

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B.Tech. (VII Sem.)

17CE36 - RURAL ROAD TECHNOLOGY

Pre-requisites: Highway Engineering

Course Educational Objective: The course aims to teach the importance of planning, selection of alignment and providing good road network in the rural road development process. The coverage of this course enables the students to design a pavement and various materials. The concept of using waste materials in pavement design and approaches how can construct a quality pavement and maintenance after construction

COURSE OUTCOMES

CO1: Describe the major concepts of planning and alignment of rural roads.

CO2: Identify appropriate materials required for design a pavement.

CO3: Design flexible and rigid pavements.

CO4: Categorize the ways of usage of waste material for pavement construction.

CO5: Illustrate the quality control aspects involved in the construction and maintenance of pavements.

UNIT-I: PLANNING AND ALIGNMENT

Planning of Rural Roads, Concept of Network planning, rural roads planning, road alignment and surveys, governing factors on route selection, factors considered for alignment.

UNIT-II: MATERIALS

Introduction, Soil ,material surveys, embankment and subgrade materials, stabilized Soils, Road aggregates, aggregate for base courses, new materials as stabilizers, materials for desert areas, materials for bituminous constructions and surfacing; materials for rigid pavements, special pavement, climatic suitability of concrete materials.

UNIT-III: PAVEMENT DESIGN:

Introduction: design procedure, pavement components and general criteria for road drainage, system of drainage, surface and subsurface systems.

UNIT-IV: WASTE MATERIAL FOR PAVEMENT CONSTRUCTION

Introduction, fly ash for road construction, design & construction, design & construction of fly ash embankment lime fly ash and stabilized soil, lime fly ash pavements, control of compaction, concrete stabilized fly ash with admixtures.

UNIT-V: QUALITY CONTROL IN CONSTRUCTION AND MAINTENANCE

Introduction, Pre-requirements, organizational setup, specification and code of practice, Laboratory equipment, Earth and granular layers, bituminous courses, semi- rigid and rigid pavements, special requirements, recovered of quality control data.

Distresses/Defects in Pavements, Definitions of Maintenance Activities, Inventory of Road and Inspection, Types of Maintenance, Classification of Maintenance Activities, Maintenance, Norms of Maintenance Cost.

TEXT BOOKS:

1. 'Indian Road Congress' Manual for rural roads. Special publication – 20 (2002)
2. S.K.Khanna & C.E.G.Justo, "Highway Engineering:, Nemchand & Bros., 7th edition, 2000.
3. L.R. Kadiyali, "Traffic Engineering and Transport Planning", Khanna publishers, 8th edition, 2013.

REFERENCES:

1. IRC related code books.
2. National Rural Roads Development Agency-guidelines and code books.

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B.Tech. (VII Sem.) 17CE37 - GROUND IMPROVEMENT TECHNIQUES

Pre-requisites: Geo Technical Engineering-I and Geo Technical Engineering-II

Course Educational Objective: The course aims to teach the ground improvement techniques suitable for different soils. The course coverage includes the principles of drainage and dewatering of soils under various conditions and the principles for the in-situ treatment of soils.

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

- CO1: Identify the ground improvement techniques suitable for different soils.
- CO2: Assess the process of drainage and dewatering of soils under various conditions.
- CO3: Evaluate the suitable procedure for the in-situ treatment of soils.
- CO4: Select the suitable grouting techniques for the soils in different conditions.
- CO5: Recognize the appropriate application of geosynthetics in soils.

UNIT –I: INTRODUCTION

Role of ground improvement in foundation engineering – Ground improvement methods – Geotechnical problems in lateritic, alluvial and black cotton soils – selection of Ground improvement techniques based on soil conditions-use of piezometers-inclinometers in field-Ground anchors

UNIT –II: DRAINAGE AND DEWATERING

Well point system – Vacuum dewatering system – Electro-osmotic method – Seepage analysis for two dimensional flow – fully penetrating slots in homogeneous deposits (simple cases only).

UNIT –III: INSITU TREATMENT OF SOILS

Insitu densification of Granular and consolidation of cohesive soils – Dynamic compaction – Vibrofloatation – Sand pile compaction – Stone Column - Preloading with sand drains and fabric drains.

UNIT- IV: GROUTING TECHNIQUE AND STABILISATION

Grouting technique: Suspension grouts – solutions grouts – Grouting equipment and method – Grouting with soil, Bentonite – cement mixes and asphalt – Grout monitoring schemes.

Stabilisation: Methods of stabilization-mechanical-cement- lime-bituminous-chemical stabilization with calcium chloride, sodium silicate and gypsum.

UNIT-V: GEOSYNTHETICS APPLICATIONS

Types of Geosynthetic materials- Geotextile – Types – Geotextiles in Filtration, Drainage, Separation and Reinforcement – Geomembranes – Containments and barriers – Application to Landfills, Highways etc.

TEXT BOOKS

1. P Purusothamaraj, “Ground Improvement Techniques”, Laxmi Publication (P) Ltd., New Delhi, 2016.

REFERENCES

1. M.P Moseley, "Ground Improvement", Blackie Academic and Professional, Chapman and Hall, Glassgow, 1993.
2. Manfred R.Hausmann, "Engineering Principles of Ground Modification", McGraw Hill Publishing Company, New york, 1990.
3. R.M Koerner, "Construction and Geotechnical Methods in Foundation Engineering", McGraw Hill Publishing Company, New York, 1984.
4. N.W.M John, "Geotextiles", John Blackies and Sons Ltd., London, 1987.
5. Ground Improvement Techniques, NPTEL video lectures.

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B.Tech. (VII Sem.)

17CE38 - SAFETY ENGINEERING

Pre-requisites: Nil

Course Educational Objective: The course focuses on developing the detailed knowledge about the safety measures to be taken at construction field and industrial areas. It also aims to provide fundamentals of ergonomics for a better workplace and impacts and mitigation of fire accidents.

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

CO1: Illustrate various concepts of safety measures undertaken in a manufacturing organization.

CO2: Analyze and implement various safety measures in project construction.

CO3: Demonstrate safety and control measures for industries.

CO4: Apply the concepts of Ergonomics for improvement in workplace

CO5: Analyze different controlling measures and apply during fire accidents.

UNIT-I: SAFETY BASICS

Concepts: Safety background, principles of safety management, development and growth of safety movement, safety principles, policy, safety inspection, planning, safety measures in manufacturing industry, Employees participation in safety, safety and productivity, regulatory agencies and statutory bodies dealing with safety in India and abroad, safe rigging practice and standard crane signals.

UNIT II: CONSTRUCTION SAFETY

Safety appliances- in transport, road safety, ladder- types, safety practices and checklist; scaffoldings approaches, excavations, road work, machinery, hoists, Electricity- checklist for temporary electrical connections, shuttering and shoring, , hazards of construction site, Personal Protective Equipment (PPE), safety with lifting machines, safety procedures for working at height, checklist for working at height, construction safety management checklist

UNIT III: INDUSTRIAL SAFETY

Types of accidents in Industry, effects of accidents on human body, accident prevention Environmental factors in industry

Industrial hazards- classification of hazards, hazard management program, Machine Guarding

Industrial Fatigue- types of fatigue, effects of fatigue, circadian rhythms, factors affecting fatigue, managing and mitigation of fatigue

UNIT IV: ERGONOMICS

Origin and development of ergonomics, Boundaries for ergonomics, ergonomics considerations, principles, objectives, role of an ergonomist, identification of ergonomics problems, ergonomics and workplace- workplace contributing factors, ergonomic improvement, identify poor posture and risks, ergonomics education and training.

UNIT V: FIRE SAFETY

Stages of fire, fire triangle, fire tetrahedron, smouldering, ignition process, fire properties of materials used in construction, testing for resistance to fire, passive fire protection, fire escapes routes and refuge, detectors types based on effects, Selection of detectors, alarm systems, fire alarm systems and control panels, principles of operations, types of fire extinguishers, water based fixed fire protection systems.

TEXT BOOKS:

1. A.K Gupta “Industrial safety and Environment”; University science press publication 2nd Edition.
2. Akhil Kumar Das “Principles of Fire safety Engineering”; PHI learning Private limited publications; 2016
3. R.K Mishra “ Construction Safety”; AITBS Publishers, 2nd Edition, 2017

REFERENCES:

1. L.M. Deshmukh” Industrial safety management”; Publishers: Tata Mcgraw Hill ,New Delhi; 1st Edition.
2. Brendra Mohan “Fire Protection and Prevention”, UBS Publishers & Distributors Pvt Ltd. 2011 Edition.

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B.Tech. (VII Sem.)

**17CE73 - GIS AND COMPUTER APPLICATIONS IN
CIVIL ENGINEERING LAB**

Pre-requisites: Remote Sensing and GIS applications, Core Civil Engineering Subjects

Course Educational Objective: The course is designed to introduce GIS software and apply GIS software to simple problems in civil engineering problems. It also involves in developing coding in C language for civil engineering problems and analyzing results.

Course Outcomes:

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

CO1: Digitize and create thematic map and extract important features using GIS software.

CO2: Analyze and Interpret the maps created using GIS for specific applications.

CO3: Develop coding for civil engineering problems and analyze the results.

List of experiments

Note: A minimum of twelve (10 No) shall be done and recorded.

Any 3 from Part A and 7 from Part B.

PART-A: EXERCISES IN GIS

1. Digitization of Map/Topo sheet
2. Creation of thematic maps.
3. Estimation of features and interpretation
4. Developing Digital Elevation model
5. Simple applications of GIS in Civil Engineering.

GIS SOFTWARES:

1. Arc GIS 9.0
 2. ERDAS 8.7
 3. Map info 6.5
- Any one or Equivalent.

PART-B: EXERCISES IN COMPUTER APPLICATIONS

1. Design of sedimentation tank.
2. Determination vertical stress distribution in soil.
3. Design of Triangular-, Rectangular- and trapezoidal notch.
4. Design of Open Channel.
5. Determination of engineering properties of soils.
6. Design of singly reinforced beam.
7. Design of doubly reinforced beam.
8. Design of T beam.
9. Design of Tension/Compression Members.
10. Design of pavement.

TEXT BOOK/REFERENCES

1. Laboratory manual developed by Civil Engineering Department.

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B.Tech. (VII Sem.)

**17CE74 - QUANTITY ESTIMATION AND PROJECT
MANAGEMENT LAB**

Prerequisite: Estimation and Quantity Surveying

Course Educational Objective: The course deals with usage of software tools for calculating the quantities and estimating the cost of different structures. It also deals with managing the project by using software tools.

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

CO1: Estimate the quantities for different items of civil engineering using software tools.

CO2: Prepare the estimate of different items of RCC elements.

CO3: Control the project for execution of civil engineering projects through systematic planning.

Note: A minimum of twelve (12No) shall be done and recorded.

CYCLE-1: Quantity Surveying (At least **SIX** of the following using software such as MS Excel/ Qty./Road Estimate/Super Rate analysis etc.)

1. Quantity estimation of a single storey residential building (different items).
2. Cost estimation of a single storey residential building.
3. Quantity estimation of a B.T.Road (different items).
4. Cost estimation of a B.T.Road.
5. Quantity estimation of a Canal (different items).
6. Cost estimation of a Canal.
7. Find out the labour requirement and preparing the Rate Analysis for different items of work.
 - a) C.C b) R.C.C c) Brick work d) Flooring

CYCLE-2: (At least **THREE** of the following by using software such as MS Excel)

1. Quantity estimation of RCC roof slab and preparing schedule of bars
2. Quantity estimation of RCC beam and preparing schedule of bars
3. Quantity estimation of RCC Column with foundation footing and preparing schedule of bars
4. Quantity estimation of RCC retaining wall and preparing schedule of bars.

CYCLE-3: Project Management (Any **THREE** of the following using software such as MS Project / Primavera etc.)

1. Preparing the Project management report for a single storey residential building/Road/Canal by using the Bar Chart/Mile stone chart.
2. Preparing the Project management report for a single storey residential building by using the network technique (PERT/CPM).
3. Preparing the Project management report for a B.T.Road by using the network technique (PERT/CPM).
4. Preparing the Project management report for a Canal by using the network technique (PERT/CPM).

TEXT BOOK:

Laboratory Manual developed by Civil Engineering Department.

L	T	P	Cr.
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B.Tech. (VII Sem.)

17CE92 - ENVIRONMENTAL SANITATION
(Add on course – III)

Pre-requisites: Environmental Studies

Course Educational Objective: This course teaches the basic terminology of Environmental sanitation, different methods for control of Communicable and non-communicable diseases, the control techniques for rodent and vectors, sanitation measures that are required in few Institutions, sanitation management aspects due to rural and refuse wastes.

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

- CO1: Recognize the basic terminology of Environmental sanitation
- CO2: Interpret the control approaches of Communicable and non-communicable diseases
- CO3: Identify and assess the control approaches for rodent and vectors
- CO4: Classify the appropriate sanitation measures for several institutions.
- CO5: Categorize the sanitation aspects for rural and refuse management

UNIT-I: ENVIRONMENTAL SANITATION BASICS

Introduction, History and evolution of sanitation practices, Role of Sanitary Engineer, Sanitation management aspects for liquid and solid wastes, Basic Definitions, Transmission of infectious agents, Types of diseases – Communicable, Non-communicable, Water borne diseases, Different modes of communicating diseases, Mortality rates.

UNIT-II: CONTROL OF COMMUNICABLE AND NON-COMMUNICABLE DISEASES

Communicable Diseases: Impacts, Control of Source (Agent Factors), Control of Mode of Transmission or Contributing Factor (Environmental Factors), Control of Susceptibles (Host Factors), Epidemic Control,

Non-Communicable Diseases:

Respiratory Diseases: Types, Impacts, Control approaches,

Water- and Food borne Diseases: Types, Impacts, Characteristics and Control of Water- and Food borne Diseases

UNIT-III: INSECT VECTOR AND RODENT CONTROL

Mosquitoes as carriers of diseases – Mosquito control – Drainage, subsurface drainage – Man made mosquito breeding centres – outdoor control of mosquitoes – Housefly as disease carrier Fly control – Rodent control, Control Diseases transmitted from Animals.

UNIT-IV: INSTITUTIONAL SANITATION

Sanitation measures in Hotels/restaurants, Public bathing ghats, Schools, Hospitals, Swimming pools, Prisons.

UNIT-V: RURAL AND REFUSE SANITATION

Rural sanitation: Aqua privy, Septic tank, Soak pit and sulabh mode of sanitation, Appropriate low cost rural sanitation techniques, Biogas generation from toilet.

Refuse Sanitation: Municipal garbage – sources, generation, collection, recovery and disposal options, Sanitation problems with regard to: Dumping and sanitary landfilling, mass firing of waste and incineration, Mosquito breeding, Leachate, Management issues.

Ecological Sanitation: Principle, Eco-sanitation as a sustainable approach

Occupational health hazards: Concept, Types, Safety aspects of sanitation workers

TEXT BOOKS

1. Joseph. A. Salvato, Nelson N. Nemerow, Frankiln J. Agardy, “Environmental Engineering”, John Wiley & Sons, 5th Edition, 2003.
2. I.M. Prahlad Edited, “Environmental Sanitation - Reflections from Practice, A Module for Community Health Practitioners”, Society For Community Health Awareness Research and Action, 2015.

REFERENCES

1. S.K. Garg, “Sewage Disposal and Air pollution engineering”, Khanna Publishers, New Delhi, 2009.
2. K.V.S.G. Muralikrishna, “Environmental Sanitation”, Reem Publications, Kakinada, 2003.

B.Tech. (VIII Sem.)

17CE39 - TRAFFIC ENGINEERING AND TRANSPORT PLANNING

L	T	P	Cr.
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Pre-requisites: Highway Engineering

Course Educational Objective: The course aims to teach the fundamental parameters of traffic flow. The coverage of this course aims to give knowledge about various traffic control devices, road safety, and importance of highway capacity and transport system planning. It deals with effect of traffic on environment and presents a basic idea about tunneling.

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

CO1: Identify different parameters of traffic flow.

CO2: Interpret the different technical aspects of traffic control and design signals.

CO3: Describe the various techniques adopted in highway safety and capacity.

CO4: Categorize the transport system planning.

CO5: Review the impact of traffic on environment and exposed to fundamentals of tunnelling.

UNIT-1: FUNDAMENTAL PARAMETERS OF TRAFFIC FLOW

Traffic stream characteristics: Introduction to traffic engineering: Road user characteristics, human and vehicle characteristics

Fundamental parameters of traffic flow: Speed, density, volume, travel time, headway, spacing, time-space diagram, time mean speed, space mean speed and their relation, relation between speeds, flow, density, fundamental diagrams;

UNIT-II: TRAFFIC CONTROLS

Traffic signs- Importance of traffic signs, types of traffic signs

Road markings and regulation - functions, types of road markings, basic principles of regulation, regulation of speed, vehicles and parking

Traffic signals- advantages and disadvantages of traffic signals, Number and location of signals faces, warrants for signals, Signal Design by Webster Method – Signal Phasing and Timing Diagrams, delays at signalised intersection.

UNIT -III: HIGHWAY SAFETY AND CAPACITY

Collection of accident data, statistical methods for analysis of accident data, Causes –Engineering Measures to reduce Accidents- Enforcement Measures –Educational Measures- Road Safety Audit-Principles of Road Safety Audit-Importance of Highway capacity and level of service of rural highways and urban roads -Types of intersections and channelization

UNIT -IV: TRANSPORT SYSTEM PLANNING

Introduction to Transport Systems Planning, Definition and examples of System, Objectives of transport planning, components of Transport systems planning, Classification of Transit Systems

UNIT-V: ENVIRONMENT AND TUNNELLING

Highway and The Environment- Detrimental effect of traffic on environment – Air Pollution – Pollutants due to Traffic – Measures to reduce Air Pollution due to Traffic- Noise Pollution – Measures to reduce Noise Pollution.

Tunnelling-Necessity of tunnels, advantages and disadvantages of tunnelling, tunnelling shapes and sizes, tunnelling methods tunnel lining, drainage and ventilation.

TEXT BOOKS:

1. L.R. Kadiyali, “Traffic engineering and transport planning”, Khanna publishers, 8th edition, 2016.
2. R.Srinivasan, “Harbour, Dock and Tunnel Engineering”, Charotarpublishing , 26th edition, 2016.

REFERENCES:

1. P. Chakroborty and A. Das, “Principles of Transportation Engineering”, Prentice Hall of India Pvt. Ltd., 2017.
2. C.S. Papacostas and P.D. Prevedouros, “Transportation Engineering and Planning”, Prentice Hall India, 2015.
3. R.S. Hamilton (Editor), R.M. Harrison (Editor) 'Highway Pollution' (Studies in Environmental Science 44), Elsevier science publishing company inc.

B.Tech. (VIII Sem.)

**17CE40 - ENVIRONMENTAL HYDRAULICS AND
ADVANCED WASTE WATER TREATMENT**

L	T	P	Cr.
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Prerequisites: Environmental studies, Water and Wastewater Engineering

Course Objectives: This course deals with the designing of water distribution systems, hydraulic design of sewers and sewer appurtenances, sewage disposal and self purification streams, advanced water and wastewater treatment techniques.

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

CO1: Design the water distribution systems.

CO2: Design sewerage systems and differentiate the several sewer appurtenances and plumbing system used in sewerage system.

CO3: Evaluate and analyze the natural purification and disposal options of sewage.

CO4: Apply the basic principles of advanced water treatment techniques for real life problems.

CO5: Apply the basic principles of advanced waste water treatment techniques for real life problems.

UNIT-I: WATER DISTRIBUTION SYSTEM

Distribution of water: Objectives - Methods of distribution, Layouts of distribution networks, Distribution reservoirs, Storage capacity of reservoir, Design and calculation of hydraulic parameters of pipe flow, Nomogram, Analysis of pipe networks –Pipes in series, Pipes in parallel, Equivalent Pipe method, Hardy Cross method (one loop simple flows) - Appurtenances in distribution system – Pipe laying and testing

Pumps: Pumps for lifting water and sewage – Necessity, Locations, Principles, Working, efficiency - Problems.

UNIT-II: SEWER DESIGN & SEWER APPURTUNANCES

Sewer design: Estimating quantity of sewage - Factors affecting - Dry weather flow - Estimating storm runoff by rational formula - Systems of sewerage - Separate, combined and partially separate system – Hydraulic design of sewers, storm sewers.

Sewer appurtenances: Types, Precautions while entering sewers, Ventilation of sewers, Plumbing system, Traps and Pipes, Types of traps, Systems of plumbing -Single stack system - One pipe system -Two pipe system - Sanitary fittings, Sewer materials.

UNIT-III: DISPOSAL OF SEWAGE AND SELF PURIFICATION OF STREAMS

Sewage disposal: Options- Disposal in water bodies-Sewage Disposal in lakes, sea – Disposal on land – Effluent irrigation and sewage farming - Sewage sickness.

Self purification of natural streams: Zones of pollution in a river, Oxygen deficit, Deoxygenation and reoxygenation, Oxygen Deficit curve, Streeter - Phelps equation, Problems

UNIT-IV: ADVANCED WATER TREATMENT

Advanced water treatment: Ion balance diagram- Water Softening – Lime soda process, Zeolite process-DM process, Activated carbon treatment, Fluoridation – Defluoridation.

Desalination: Reverse osmosis process, Electro dialysis, Solar Evaporation

UNIT-V: ADVANCED WASTEWATER TREATMENT

Advanced wastewater treatment: Modifications in ASP - Ponds and lagoons- Oxidation ponds, aerated lagoon, stabilization ponds, oxidation ditches, Rotating biological contactors, UASB, Nitrification-Denitrification, Ammonia stripping, Phosphorous removal, Activated carbon applications..

Industrial wastewater treatment: Necessity-Basic terminology and purposes of – Equalization, Neutralization, Volume reduction, Strength reduction – Physical, chemical, biological treatment options- Pollutants from industry and their impacts - Case study – Treatment plant layout options for Dairy/Sugar/Paper industry – anyone.

TEXT BOOKS

1. B.C. Punmia, A.K. Jain and A.K. Jain, Water Supply Engineering, Laxmi Publications. 2nd Edition 1995, Reprint 2005
2. B.C. Punmia, A.K. Jain and A.K. Jain, Waste water Engineering, Laxmi Publications; 2nd Edition 1998, Reprint 2014.

REFERENCES

1. S.K. Garg, “Water Supply Engineering”, Khanna Publishers, Eleventh Edition, New Delhi. 1999.
2. S.K. Garg, “Sewage disposal and Air Pollution Engineering”, Khanna Publishers New Delhi. 2001
3. G.S. Birdie and J.S. Birdie, “Water Supply and Sanitary Engineering” Dhatpat Rai Publishing Company New Delhi, 1998.
4. K.N. Duggal, “Elements of Environmental Engineering”, S.Chand & Company Limited, New Delhi, 2000.
5. P N Modi, “Sewage treatment disposal & Waste water treatment”, Standard Book House, 2016.
6. Manual on sewerage and sewage treatment, CPHEEO, Ministry of urban affairs and employment, Govt. of India, New Delhi, 2001
7. Water and Wastewater Engineering, NPTEL video lectures and web notes

L	T	P	Cr.
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B.Tech. (VIII Sem.)

17CE41 - PRE-FABRICATED STRUCTURES

Pre-requisites: Building materials

Course Educational Objectives: The course provides need of prefabrication and the design principles for abnormal loading conditions. This course also provides the knowledge on joints in structural members and behavior of various structural members.

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

CO1: Comprehend the need of pre fabrication

CO2: Distinguish the structural connections and behavior of components

CO3: Identify the appropriate design principles

CO4: Characterize the joints in structural members

CO5: Design the members for abnormal loads

UNIT-I: INTRODUCTION

Need for prefabrication, Principles, Materials, Modular coordination, Standardization, Systems, Production, Transportation, Erection.

UNIT-II: PREFABRICATED COMPONENTS

Behaviour of structural components, Large panel constructions, Construction of roof and floor slabs, Wall panels, Columns, Shear walls

UNIT-III: DESIGN PRINCIPLES

Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

UNIT-IV: JOINT IN STRUCTURAL MEMBERS

Joints for different structural connections – Dimensions and detailing – Design of expansion Joints

UNIT-V: DESIGN FOR ABNORMAL LOADS

Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

TEXT BOOKS

1. CBRI, “Building Materials and Components”, India, 1990
2. Lecture notes developed by department faculty members.

REFERENCES

1. Koncz T., “Manual of precast concrete construction”, Vols. I, II and III, Bauverlag, GMBH, 1971.
2. Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.
3. Gerostiza C.Z., Hendrikson C. and Rehat D.R., “Knowledge based process planning for construction and manufacturing”, Academic Press Inc., 1994

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B.Tech. (VIII Sem.)

17CE42 - BRIDGE ENGINEERING

Pre-requisites: Structural Analysis I &II, Reinforced Concrete Design

Course Educational Objective: The objective is to equip the students with a thorough understanding of the behavior and design of bridges. Various applied loads, such as truck load, impact, horizontal braking/centrifugal forces, wind and seismic loads are discussed thoroughly. Background to design equations for different types of bridges and relevant modern research will also be discussed to provide the students with solid understanding of the topics covered.

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

CO1 : Identify the various components of Bridges and their site selection

CO2: Design RC slab culverts

CO3: Design T Beam bridges

CO4: Design the pier and abutments

CO5: Design the foundations for bridges

UNIT-I: INVESTIGATION FOR BRIDGES

Components of a Bridge; Classification; Standard Specifications; Need for Investigation; Selection of Bridge Site; Preliminary Data to be Collected; Preliminary Drawings; Determination of Design Discharge; Economical Span; Location of Piers and Abutments; Vertical clearance above HFL; Scour depth; Traffic Projection; Choice of Bridge type; Importance of Proper Investigation.

UNIT-II: CONCRETE BRIDGES AND CULVERTS

Various types of bridges; I. R. C. Specifications for road bridges.

Culverts Design of R. C. slab culvert.

UNIT-III: T – BEAM BRIDGE

Pigeaud's method for computation of slab moments; Courbon's method for computation of moments in girders; Design of simply supported T – beam bridge.

UNIT-IV: SUB STRUCTURE FOR BRIDGES

Pier and abutment caps; Materials for piers and abutments; Design of pier; Design of abutment; Backfill behind abutment; Approach slab.

UNIT-V: INSPECTION AND MAINTENANCE OF BRIDGES :

Procedure and methods for inspection, Testing of bridges, Maintenance of Sub structures and super structures, Maintenance of bearings, Maintenance schedules

TEXT BOOKS

1. N Krishna Raju, "Design of Bridges" , Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 4th Edition, 2005.
2. M.G. Aswani, V.N. Vazirani and M.M. Ratwani. "Design of Concrete Bridges" Khanna Publications 2004

REFERENCES

1. Jagadeesh and Jayaram, "Design of bridge structures", PHI Learning Publication 2004
2. Johnson Victor, "Essentials of Bridge Engineering", Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 6th Edition, 2008.
3. Bridge Engineering, NPTEL video lectures and web notes.

B.Tech. (VIII Sem.)

17CE43 - ADVANCED STRUCTURAL DESIGN

L	T	P	Cr.
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Pre-requisites: Applied Mechanics, Strength of Materials-I, Strength of Materials-II, Structural analysis, Design of Reinforced Concrete Structures-I and Design of Reinforced Concrete Structures-II.

Course Educational Objectives: This course provides the knowledge on the principles involved in the design of the counter fort retaining wall, bunkers, silos and chimneys. The course also gives the complete information regarding the design of gantry girder and steel water tanks.

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

CO1: Design the counter-fort retaining wall.

CO2: Design the bunkers, silos and Chimneys.

CO3: Design the overhead RCC water tanks.

CO4: Design the gantry girder.

CO5: Design the steel water tanks.

UNIT-I: RETAINING WALLS

Types of retaining walls, Forces on retaining walls; Stability requirements; Design and detailing of counter fort retaining wall.

UNIT-II: BUNKERS, SILOS AND CHIMNEYS

Introduction, concepts of loading and design.

UNIT-III: RCC TANKS

Introduction – RCC water tanks –surface and underground, Design and detailing of overhead circular and Intze RCC tanks including staging.

UNIT-IV: GANTRY GIRDERS

Introduction, various loads, specifications, design of gantry girder.

UNIT-V: STEEL WATER TANKS

Design of steel water tanks.

TEXT BOOKS

1. S.S. Bhavikatti, “Advanced RCC Design”, New age international (P) Limited, Publishers; 2016.
2. S.K Duggal, ‘Design of Steel Structures’, Tata Mc. grahill, New Delhi; 2017.

REFERENCES

1. B.C. Punmia, Ashok K. Jain and A.K. Jain. “Reinforced concrete structures Vol-2”, Laxmi Publications Pvt. Ltd., New Delhi, 2015.
2. P.C. Varghese, “Advanced Reinforced Concrete Structures”, Prentice Hall of India Pvt. Ltd; 2nd Edition, 2005.
3. P. Dayaratnam, “Design of Steel Structures”, S. Chand Publishers, 2012.
4. Advanced Structural Design, NPTEL web notes.

IS CODES:

IS 456-2000 plain and reinforced concrete

IS 800-2007, IS 3370, IS 4995-1974 and Any other relevant IS Codes

IS 456, IS 3370, IS 800 and SP-16 Interaction charts are permitted in the Exam

B.Tech. (VIII Sem.)

**17CE44 - FINITE ELEMENT METHODS IN CIVIL
ENGINEERING**

L	T	P	Cr.
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Pre-requisites: Engineering Mechanics, Structural Analysis, Matrix Methods of Analysis.

Course Educational Objective: The aim of this course is to introduce basic principles of numerical methods and it is further extended to cover the application of finite element method by the inclusion of 1-D bar elements, truss elements, beam elements, and 2-D elements like CST, ring elements. The objective of the course is determination of structural deformations, strains, element stress and heat transfer problems.

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

CO1: Idealize given structure with mathematical modelling and boundary conditions.

CO2: Apply the one-dimensional approach of Finite element modelling

CO3: Analyze the trusses using Finite element approach

CO4: Apply the two-dimensional approach of Finite element modelling

CO5: Solve multi-nodal problems

UNIT – I: FUNDAMENTAL CONCEPTS

Introduction - Stresses and equilibrium - Boundary conditions - Strain displacement relations - Stress strain relations - Potential energy and equilibrium – Weighted Integral and Weak Formulations – Variation Approach – Rayleigh Ritz Method

UNIT – II: ONE - DIMENSIONAL PROBLEMS

Introduction - Modelling - Co-ordinates and shape functions - Potential energy approach - Galerkin Approach - Assembly of global stiffness matrix and load vector - Properties of K - FE Equations - Treatment of Boundary conditions - Quadratic shape functions.

UNIT – III: TRUSSES

Introduction – Plane trusses – Local and Global coordinate systems – Element Stiffness Matrix – Stress Calculations – Introduction to three dimensional trusses

UNIT – IV: TWO DIMENSIONAL PROBLEMS

Introduction – Finite element modelling – Constant Strain Triangle – Iso-parametric representation – Potential energy approach - Element Stiffness – Force vector – Stress calculations – Introduction to beam element.

UNIT – V: TWO DIMENSIONAL ISOPARAMETRIC ELEMENTS AND NUMERICAL INTEGRATION

Introduction – Four node quadrilateral – Shape functions – Element stiffness matrix – element force vectors – Higher order elements and Applications – Nine node quadrilateral – Eight node quadrilateral – Numerical Integration – One point formula – Two point formula - Two dimensional integrals

TEXT BOOKS

1. S.S. Bhavakatti, “Finite element analysis”, New Age International publishers, 2015.
2. S Rajasekaran, “Finite Element Analysis in Engineering Design”, A.H. Wheeler Publishing, 1993.
3. Daryl L.Logan “Finite element analysis”; C L Engineering publications; 5th Edition,

REFERENCES

1. Reddy.J.N, “An Introduction to the Finite Element Method”, M/s. Tata McGraw Hill Publishing Co., Ltd., New Delhi, 2003.
2. Zienkiewics.O.C, “The finite element method” fourth edition, Tata McGraw Hill Publishing Co. Ltd. New Delhi, 2000.
3. Tirupati.R. Chandrepata and Ashok D. Belegundu, “Finite Elements Methods in Engineering”, Pearson Education Publications.3rd edition
4. David V Hutton, “Finite element analysis”, Tata McGraw Hill, New Delhi; 1st Edition
5. S.S.Rao, The finite element method in civil engineering; Butterworth Heinmann Ltd; 3rd Edition.
6. Finite Element Analysis, NPTEL video lectures.

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B.Tech. (VIII Sem.)

17CE45 - WATERSHED MANAGEMENT

Pre-requisites: Hydrology, Irrigation and Water Resources Engineering

Course Educational Objective: The course is designed to understand the concept of watershed management, watershed characteristics and concepts of watershed modelling.

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

- CO1: Determine watershed parameters and analyse watershed characteristics to take appropriate management action.
 CO2: Quantify soil erosion and design control measures
 CO3: Suggest suitable harvesting techniques for better watershed management
 CO4: Apply land grading techniques for proper land management
 CO5: Apply appropriate models for watershed management.

UNIT-I: WATERSHED CHARACTERISTICS

Introduction: Concept of watershed development, objectives of watershed development, need for watershed development, Integrated and multidisciplinary approach for watershed management.

Characteristics of Watersheds: Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

UNIT-II: PRINCIPLES OF EROSION

Types and causes of erosion, factors affecting erosion, estimation of soil loss due to erosion- Universal soil loss equation. Measures to Control Erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, check dams, rock-fill dams, brushwood dam, Gabion.

UNIT-III: WATER HARVESTING

Techniques of rain water harvesting- rain water harvesting from roof top, surface flow harvesting, subsurface flow harvesting, stop dams, farm ponds and dugout ponds, percolation tanks.

UNIT-IV: LAND MANAGEMENT

Land use and Land capability classification, management of forest, agricultural, grassland and wild land, land grading operation, Reclamation of saline and alkaline soils.

UNIT-V: WATERSHED MODELLING

Data of watershed for modelling, application and comparison of watershed models, model calibration and validation, advances of watershed models.

TEXT BOOKS:

1. M.M Das and M.D Saikia, "Watershed Management", PHI Learning Pvt. Ltd, 2012.
2. JVS Murthy, "Watershed Management", New Age International Publishers, 2017.

REFERENCES:

1. VVN Murthy, Madan K. Jha "Land and Water Management Engineering", Kalyani Publications, 2013.
2. R. Suresh, "Watershed Hydrology" Standard Publishers, 1997.
3. Watershed Management, NPTEL video lectures and web notes.

L	T	P	Cr.
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B.Tech. (VIII Sem.)

17CE46 - BUILDING TECHNOLOGY

Pre-requisites: Building materials

Course Educational Objective:

This course aims to learn bye-laws, NBC regulations and basic principles of planning using the concepts of Vastu-Shastra. It also covers the materials required for construction and concept of efficient intelligent buildings and low cost housing aspects.

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

CO1: Identify the building bye laws and NBC regulations.

CO2: Analyze the basic principles of architectural planning in construction practice using basic rules of Vastu Shastra.

CO3: Select suitable materials required for construction of buildings

CO4: Compare the modern concepts of green buildings, smart buildings, pre-fabricated construction.

CO5: Justify the importance of low cost and energy efficient housing.

UNIT-I: BUILDING BYE LAWS AND NBC REGULATIONS

Introduction: Types of buildings, criteria for location and site selection, site plan and its detail, Components of building.

Building Bye Laws and NBC Regulations: Objective of bye-laws, Regulation regarding; means of access, lines of building frontages, covered area, floor area ratio, open spaces around buildings, height & sizes of rooms, plinth regulation and sanitation provisions

UNIT-II: PRINCIPLES OF PLANNING&CONCEPT OF VAASTUSHASTRA

Different factors affecting planning viz-aspect, prospect, furniture requirement, roominess, grouping, circulation, elegance, privacy, Principles of Anthropometry- Planning for residential buildings and non residential buildings.

Vaastu: Concept- Fundamentals-Basic rules of Vaastusastra-Relevance of Vaastu today

UNIT-III: BUILDING MATERIALS&MAINTENANCE ASPECTS

Characteristic properties and selection of different building materials such as bricks, stones, tiles, wood, cement, concrete, steel, asbestos sheets, types of masonry –Role in building technology, Alternate materials for building construction- Deterioration of buildings-Preventive maintenance in buildings-planning, Handling of cracks, dampness, corrosion

UNIT-IV: NEW APPROACHES IN BUILDING TECHNOLOGY

Green buildings-Benefits-Design Criteria-Site selection- Environmental conservation approaches – Important materials – Intelligent buildings-Development-Components-Benefits-Design aspects- Prefabricated construction- Case studies

UNIT-V: LOW COST HOUSING

Low cost housing-Concept-Rural housing-Housing in disaster prone areas-Low cost infra structural options-Social housing-Prefabricated housing-Energy efficient construction – case studies.

TEXT BOOKS:

1. N. Kumara Swamy and A. Kameswara Rao, "Building Planning and Drawing", Charotar Publications, 2013.
2. A K Lal, "Hand Book of Low Cost Housing", New Age Publishing, 1995

REFERENCES / SITES:

1. S K Duggal, "Building materials", New Age International Publishers
2. Andrew J Charlett, Maybery-Thomas, Craig, "Fundamental Building Technology", Routledge Publications, 2006.