



HINDUSTAN

**INSTITUTE OF TECHNOLOGY & SCIENCE
(DEEMED TO BE UNIVERSITY)**

DEPARTMENT OF CIVIL ENGINEERING

CURRICULUM

&

SYLLABUS

2015-16

B. Tech.

CIVIL ENGINEERING

Semester I

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
Theory								
1	ELA101	CF	Technical English	3	0	0	3	3
2	MAA101	CF(BS)	Engineering Mathematics– I	3	1	0	4	4
3	PHA101/ CYA101	CF(BS)	Engineering Physics / Engineering Chemistry	3	0	0	3	3
4	MEA101	CF(ES)	Computer Aided Engineering Drawing	1	1	3	3	5
5	CSA101	CF(ES)	Computer Programming	3	0	0	3	3
Practical								
6	PHA131/ CYA131	CF(BS)	Physics lab/Chemistry Lab*	0	0	3	1	3
7	CSA131	CF(ES)	Computer Programming Lab	0	0	3	1	3
8	ELA131	CF	Communication Skills Lab-I	0	0	3	1	3
9	GEA131	CF(ES)	Engineering Practices Lab-I	0	0	3	1	3
Total							20	30

Semester II

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
Theory								
1	MAA102	CF (BS)	Engineering Mathematics – II	2	1	0	4	4
2	PHA101/ CYA101	CF(BS)	Engineering Chemistry / Engineering Physics*	3	0	0	3	3
3	MEA102	CF(ES)	Engineering Mechanics	3	1	0	4	4
4	CEB101	CC (PC)	Surveying	3	1	0	4	4
5	CEB102	CC(PC)	Construction Materials	3	0	0	3	3
6	ELA102		Personality Development & Soft Skills	3	0	0	3	3
Practical								
7	PHA131/ CYA131	CF(BS)	Physics lab/Chemistry Lab*	0	0	3	1	3
8	GEA132	CF(ES)	Engineering Practices Lab-II#	0	0	3	1	3
9	CEB131	CC (PC)	Survey Laboratory	0	0	3	1	3
Total							24	31

Semester III

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
Theory								
1	MAA211	CF (BS)	Numerical Methods	3	1	0	4	4
2	CEB201	CC	Mechanics of Solids	3	1	0	4	4
3	CEB202	CC	Mechanics of Fluids	3	1	0	4	4
4	CEB203	CC	Construction Techniques, Equipments and Practices	3	0	0	3	3
5	CEB204	CC	Environmental Engineering	3	0	0	3	3
6		EE	Engineering Elective-I	3	0	0	3	3
Practical								
7	CEB231	CC	Computer Aided Building Drawing	0	0	3	1	3
8	CEB232	CC	Construction Materials Laboratory	0	0	3	1	3
9	CEB233	CC	Environmental Engineering Laboratory	0	0	3	1	3
10	SSA231	CF	Aptitude I	1	0	1	1	2
Total							25	32

Semester IV

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
Theory								
1	CEB205	CC	Strength of Materials	3	1	0	4	4
2	CEB206	CC	Mechanics of Soils	3	1	0	4	4
3	CEB207	CC	Design of Concrete Structures - I	3	1	0	4	4
4	CEB208	CC	Hydraulic Engineering	3	1	0	4	4
5		EE	Engineering Elective-II	3	0	0	3	3
6		OE	Open Elective-I	3	0	0	3	3
Practical								
7	CEB234	CC	Geo Technical Laboratory	0	0	3	1	3
8	CEB235	CC	Fluid Mechanics & Machinery Laboratory	0	0	3	1	3
9	CEB236	CC	Survey Project	0	0	6	2	-
10	SSA232	CF	Aptitude II	1	0	1	1	2
Total							27	30

Semester V

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
Theory								
1	CEB301	CC (PC)	Structural Analysis – I	3	1	0	4	4
2	CEB302	CC (PC)	Design of Concrete Structures – II	3	1	0	4	4
3	CEB303	CC (PC)	Transportation Engineering	3	0	0	3	3
4		CC (PE)	Professional Elective-I	3	0	0	3	3
5		EE	Engineering Elective-III	3	0	0	3	3
6		OE	Open Elective-II	3	0	0	3	3
Practical								
6	ELA331	CF	Communication Skills & Personality Development	0	0	2	1	2
7	CEB331	CC (PC)	Strength of Materials Laboratory	0	0	3	1	3
9	CEB332	CC	Design Project-I*	0	0	6	2	-
Total							24	25

Note: * The Design Project by students which does not require contact hours.

Semester VI

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
Theory								
1	CEB304	CC (PC)	Structural Analysis – II	3	1	0	4	4
2	CEB305	CC (PC)	Design of Steel Structures – I	3	1	0	4	4
3		CC (PE)	Professional Elective-II	3	0	0	3	3
4		CC (PE)	Professional Elective-III	3	0	0	3	3
5		EE	Engineering Elective-IV	3	0	0	3	3
6		OE	Open Elective-III	3	0	0	3	3
Practical								
7	CEB333	CC (PC)	Computer Aided Structural Analysis Laboratory	0	0	3	1	3
8	CEB334	CC (PC)	Irrigation & Environmental Engineering Drawing	0	0	3	1	3
9	CEB335	CC (PC)	Comprehension	2	0	0	1	2
10	SSA331		Placement Preparatory Programme	1	0	1	1	2
Total							24	30

Semester VII

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
Theory								
1	CEB401	CC (PC)	Design of Steel Structures - II	3	1	0	4	4
2	CEB402	CC (PC)	Foundation Engineering	3	0	0	3	3
3	CEB403	CC (PC)	Basics of Dynamics and Aseismic Design	3	1	0	4	4
4		CC (PE)	Professional Elective- IV	3	0	0	3	3
5		CC (PE)	Professional Elective-V	3	0	0	3	3
6		EE	Engineering Elective-V	3	0	0	3	3
7		OE	Open Elective-IV	3	0	0	3	3
Practical								
8	CEB431	CC (PC)	Computer Aided Design and Drafting	0	0	3	1	3
9	CEB432	CC (PC)	Design Project II *	0	0	6	2	-
10	CEB433	CC (PC)	Practical Training **	-	-	-	1	-
Total							27	26

Note: * The Design Project by students which does not require contact hours. ** Non CGPA course

Semester VIII

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
Practical								
1	CYA102	CC	Environmental Science and Engineering	3	0	0	3	3
2	CEB441	CC (PC)	Project & Viva-voce	0	0	24	6	24
Total							9	27

PROFESSIONAL ELECTIVES

Semester –V

Sl. No	Course Code	Course classification	Course Title	L	T	P	C	TCH
1	CEC357	CC (PE)	Applied Hydrology	3	0	0	3	3
2	CEC358	CC (PE)	Remote Sensing Techniques and Applications	3	0	0	3	3
3	CEC359	CC (PE)	Housing Planning and Management	3	0	0	3	3
4	CEC360	CC (PE)	Management of Irrigation Systems	3	0	0	3	3
5	CEC361	CC (PE)	Environmental Impact Assessment	3	0	0	3	3
6	CEC362	CC (PE)	Industrial Waste Management	3	0	0	3	3
7	CEC363	CC (PE)	Air Pollution Management	3	0	0	3	3

Semester –VI

Sl. No.	Course Code	Course classification	Course Title	L	T	P	C	TCH
1	CEC364	CC (PE)	Electronic Surveying	3	0	0	3	3
2	CEC365	CC (PE)	Engineering Geology	3	0	0	3	3
3	CEC366	CC (PE)	Building Services	3	0	0	3	3
4	CEC367	CC (PE)	Municipal Solid Waste Management	3	0	0	3	3
5	CEC368	CC (PE)	Modern Construction Materials	3	0	0	3	3
6	CEC369	CC (PE)	Irrigation Engineering	3	0	0	3	3
7	CEC370	CC (PE)	Estimation and Quantity Surveying	3	0	0	3	3

Semester –VII

Si. No	Course Code	Course classification	Course Title	L	T	P	C	TCH
1	CEC451	CC (PE)	Construction Management	3	0	0	3	3
2	CEC452	CC (PE)	Traffic Engineering Management	3	0	0	3	3
3	CEC453	CC (PE)	Prestressed Concrete	3	0	0	3	3
4	CEC454	CC (PE)	Finite Element Analysis	3	0	0	3	3
5	CEC455	CC (PE)	Water Resources Engineering	3	0	0	3	3
6	CEC456	CC (PE)	Pavement Design and Engineering	3	0	0	3	3
7	CEC457	CC (PE)	Ground Improvement Techniques	3	0	0	3	3
8	CEC458	CC (PE)	Design of Steel Skeletal structures	3	0	0	3	3
9	CEC459	CC (PE)	Concrete Technology	3	0	0	3	3
10	CEC460	CC (PE)	Bridge Structures	3	0	0	3	3
11	CEC461	CC (PE)	Storage Structures	3	0	0	3	3
12	CEC462	CC (PE)	Tall Structures	3	0	0	3	3
13	CEC463	CC (PE)	Wind Engineering	3	0	0	3	3
14	CEC464	CC (PE)	Industrial Structures	3	0	0	3	3
15	CEC465	CC (PE)	Prefabricated Structures	3	0	0	3	3
16	CEC466	CC (PE)	Design of Steel Concrete Composite Structures	3	0	0	3	3
17	CEC467	CC (PE)	Repair and Rehabilitation of Structures	3	0	0	3	3

TOTAL CREDITS: 180

Semester wise Credit

Course Category		I	II	III	IV	V	VI	VII	VIII	Total	Grand Total
CF	English	4	3	1	1	1	1	-	-	11	44
	BS	8	8	4	-	-	-	-	-	20	
	ES	8	5	-	-	-	-	-	-	13	
CC	PC (Theory)	-	7	14	16	11	8	11	3	70	109
	PC (Practical)	-	1	3	4	3	3	4	6 [#]	24	
	PE	-	-	-	-	3	6	6	-	15	
EE		-	-	3	3	3	3	3	-	15	15
OE		-	-	-	3	3	3	3	-	12	12
Total		20	24	25	27	24	24	27	9	180	180

Project work

SEMESTER - I
ELA101 TECHNICAL ENGLISH

L	T	P	C
3	0	0	3

GOAL

The goal of the programme is to provide a theoretical input towards nurturing accomplished learners who can function effectively in the English language skills; to cultivate in them the ability to indulge in rational thinking, independent decision-making and lifelong learning; to help them become responsible members or leaders of the society in and around their workplace or living space; to communicate successfully at the individual or group level on engineering activities with the engineering community in particular, and on multi-disciplinary activities in general, with the world at large.

OBJECTIVES

The course should enable the students to:

- I. Widen the capacity of the learners to listen to English language at the basic level and understand its meaning.
- II. Enable learners to communicate in an intelligible English accent and pronunciation.
- III. Assist the learners in reading and grasping a passage in English.
- IV. Learn the art of writing simple English with correct spelling, grammar and punctuation.
- V. Cultivate the ability of the learners to think and indulge in divergent and lateral thoughts.

OUTCOME

The students should be able to:

- I. Have the self-confidence to improve upon their informative listening skills by an enhanced acquisition of the English language.
- II. Speak English at the formal and informal levels and use it for daily conversation, presentation, group discussion and debate.
- III. Read, comprehend and answer questions based on literary, scientific and technological texts.
- IV. Write instructions, recommendations, checklists, process-description, letter-writing and report writing.
- V. Have the confidence to develop thinking skills and participate in brainstorming, mind-mapping, audiovisual activities, creative thinking and also answer tests in the job-selection processes.

UNIT I:-LISTENING SKILL

9

Listening to the sounds, silent letters & stress in English words & sentences - Listening to conversation & telephonic conversation -- Listening for general meaning & specific information -- Listening for positive & negative comments - Listening to technical topics - Listening to prose & poetry reading - Listening exercises.

Embedded language learning: Sentence definition -- Spelling & punctuation -- Imperative form- Sequencing of sentences -- Gerunds -- Infinitives -- 'Wh-'questions

UNIT II:-SPEAKING SKILL

9

Self-introduction - Expressing personal opinion - Dialogue - Conversation - Simple oral interaction -Speaking on a topic -- Expressing views for & against -- Speaking on personal topics like hobbies, topics of interest, present & past experiences, future plans - Participating in group discussions, role plays, debates, presentations, power-point presentations & job-interviews.

Embedded language learning: Adverbs -Adjectives - Comparative and Numerical adjectives -- Nouns & compound nouns -- Prefixes and suffixes.

UNIT III :-READING SKILL

9

Reading anecdotes, short stories, poems, parts of a novel, notices, message, time tables, advertisements, leaflets, itinerary, content page - Reading pie chart & bar chart -- Skimming and scanning -- Reading for contextual meaning - Scanning for specific information -- Reading newspaper & magazine articles - Critical reading -- Reading-comprehension exercises.

Embedded language learning: Tenses -- Words and their function -- Different grammatical forms of the same word.

UNIT IV:- WRITING SKILL

9

Writing emails, notes, messages, memos, notices, agendas, advertisements, leaflets, brochures, instructions, recommendations & checklists -- Writing paragraphs -- Comparisons & contrasts Process description of Flow charts - Interpretation of Bar charts & Pie charts - Writing the minutes of a meeting -- Report writing -- Industrial accident reports -- Letter-writing -- Letter to the editors - Letter inviting & accepting or declining the invitation - Placing orders - Complaints -- Letter requesting permission for industrial visits or implant training, enclosing an introduction to the educational institution -- Letters of application for a job, enclosing a CV or Resume - Covering letter.

Embedded language learning: Correction of errors - Subject-verb Concord -- Articles - Prepositions

UNIT V:-THINKING SKILL

9

Eliciting & imparting the knowledge of English using thinking blocks - Developing thinking skills along with critical interpretation side by side with the acquisition of English -- Decoding diagrams & pictorial representations into English words, expressions, idioms and proverbs.

Embedded language learning: General vocabulary -- Using expressions of cause and effect -Comparison & contrast

REFERENCES

- Norman Whitby. Business Benchmark: Pre-Intermediate to Intermediate - BEC Preliminary. New Delhi: Cambridge University Press, 2008 (Latest South Asian edition).
- Devaki Reddy & Shreesh Chaudhary. Technical English. New Delhi: Macmillan, 2009.
- Rutherford, Andrea J. Basic Communication Skills for Technology. 2nd edition. New Delhi, Pearson Education, 2006.

MAA101 ENGINEERING MATHEMATICS - I

L	T	P	C
3	1	0	4

GOAL

To create the awareness and comprehensive knowledge in engineering mathematics.

OBJECTIVES

The course should enable the students to:

- I. Find the inverse of the matrix by using Cayley Hamilton Theorem and Diagonalisation of matrix using transformation.
- II. Understand the Evolutes and Envelope of the curve.
- III. Learn the solutions of second order linear differential equations of standard types and Legendre's linear differential equation.
- IV. Learn partial differentiations involving two and three variables and expansions of functions using Taylor series.
- V. Learn the expansions of trigonometric, hyperbolic functions and their relations.

OUTCOME

The students will be able to:

- I. Identify Eigen value problems from practical areas and obtain its solutions and using transformation diagonalising the matrix which would render Eigen values.
- II. Find out effectively the geometrical aspects of curvature and appreciates mathematical skills in constructing evolutes and envelopes in mechanics and engineering drawing.
- III. Recognize and to model mathematically and solving, the differential equations arising in science and engineering.
- IV. Understand and model the practical problems and solve it using maxima and minima as elegant applications of partial differentiation.
- V. Acquire skills in using trigonometric and hyperbolic and inverse hyperbolic functions.

UNIT I MATRICES

12

Review: Basic concepts of matrices-addition, subtraction, multiplication of matrices - adjoint -inverse - solving cubic equations.

Characteristic equation - Properties of Eigen values - Eigen values and Eigen vectors - Cayley Hamilton theorem (without proof) - Verification and inverse using Cayley Hamilton theorem. Diagonalisation of matrices - Orthogonal matrices - Quadratic form - Reduction of symmetric matrices to a Canonical form using orthogonal transformation - Nature of quadratic form.

UNIT II DIFFERENTIAL CALCULUS

12

Review: Basic concepts of differentiation - function of function, product and quotient rules.

Methods of differentiation of functions - Cartesian form - Parametric form - Curvature - Radius of curvature - Centre of curvature - Circle of curvature. Evolutes of parabola,

circle, ellipse, hyperbola and cycloid - Envelope.

UNIT III ORDINARY DIFFERENTIAL EQUATIONS

12

Review: Definition, formation and solutions of differential equations.

Second order differential equations with constant coefficients - Particular integrals - , $e^{ax}\cos bx$, $e^{ax}\sin bx$. Euler's homogeneous linear differential equations - Legendre's linear differential equation - Variation of parameters.

UNIT IV PARTIAL DIFFERENTIATION

12

Partial differentiation - differentiation involving two and three variables - Total differentiation - Simple problems. Jacobian - verification of properties of Jacobians - Simple problems. Taylor's series - Maxima and minima of functions of two and three variables.

UNIT V TRIGONOMETRY

12

Review: Basic results in trigonometry and complex numbers - De Moivre's theorem.

Expansions of $\sin n$, $\cos n$, $\tan n$ where n is a positive integer. Expansions of in terms of sines and cosines of multiples of where m and n are positive integers. Hyperbolic and inverse hyperbolic functions - Logarithms of complex numbers - Separation of complex functions into real and imaginary parts - Simple problems.

Note: Questions need not be asked from review part.

TOTAL: 60

TEXT BOOKS

- Erwin Kreyzig, A Text book of Engineering Mathematics, John Wiley, 1999.
- Grewal B.S, Higher Engineering Mathematics, Thirty Eighth Editions, Khanna Publisher, Delhi, 2004.
- Chandrasekaran A, A Text book of Engineering Mathematics I, Dhanam Publications, Chennai, 2010.

REFERENCES

- Venkataraman M.K, Engineering Mathematics, Volume I, The National Publishing Company, Chennai, 1985.
- Kandaswamy P, Thilagavathy K and Gunavath K, Engineering Mathematics, Volume I & II, S.Chand and Company, New Delhi, 2005.
- Bali N.P, Narayana Iyengar. N.Ch., Engineering Mathematics, Laxmi Publications Pvt. Ltd, New Delhi, 2003.
- Veerarajan T, Engineering Mathematics (for first year), Fourth Edition, Tata McGraw - Hill Publishing Company Limited, New Delhi, 2005.

PHA101 ENGINEERING PHYSICS

L	T	P	C
3	0	0	3

GOAL

To impart fundamental knowledge in various fields of Physics and its applications.

OBJECTIVES

The course should enable the students to:

- I. Develop strong fundamentals of properties and behaviour of the materials
- II. Enhance theoretical and modern technological aspects in acoustics and ultrasonics.
- III. Enable the students to correlate the theoretical principles with application oriented study of optics.
- IV. Provide a strong foundation in the understanding of solids and materials testing.
- V. Enrich the knowledge of students in modern engineering materials.

OUTCOMES

The students will be able to:

- I. Understand the properties and behaviour of materials.
- II. Have a fundamental knowledge of acoustics which would facilitate in acoustical design of buildings and on ultrasonics and be able to employ it as an engineering tool.
- III. Understand the concept, working and application of lasers and fiber optics.
- IV. Know the fundamentals of crystal physics and non destructive testing methods.
- V. Have an understanding of the production, characteristics and application of the new engineering materials. This would aid them in the material selection stage.

UNIT I PROPERTIES OF MATTER

9

Elasticity - types of moduli of elasticity - Stress-Strain diagram - Young's modulus of elasticity Rigidity modulus - Bulk modulus - Factors affecting elasticity - twisting couple on a wire - Torsional pendulum - determination of rigidity modulus of a wire - depression of a cantilever - Young's modulus by cantilever - uniform and non-uniform bending - viscosity - Ostwald's viscometer - comparison of viscosities.

UNIT II ACOUSTICS AND ULTRASONICS

9

Classification of sound - characteristics of musical sound - intensity - loudness - Weber Fechner law - Decibel - Reverberation - Reverberation time, derivation of Sabine's formula for reverberation time(Jaeger's method) - absorption coefficient and its determination - factors affecting acoustics of building (Optimum reverberation time, loudness, focusing, echo, echelon effect, resonance and noise) and their remedies. Ultrasonics - production - Magnetostriction and Piezoelectric methods - properties - applications of ultrasonics with particular reference to detection of flaws in metal (Non - Destructive testing NDT) - SONAR.

UNIT III LASER AND FIBRE OPTICS

9

Principle of lasers - Stimulated absorption - Spontaneous emission, stimulated emission - population inversion - pumping action - active medium - laser characteristics - Nd-Yag laser - CO₂ laser - Semiconductor laser - applications - optical fiber - principle and propagation of light in optical fibers - Numerical aperture and acceptance angle - types of optical fibers - single and multimode, step index and graded index fibers - applications - fiber optic communication system.

UNIT IV CRYSTAL PHYSICS AND NON- DESTRUCTIVE TESTING

9

Crystal Physics: Lattice - Unit cell - Bravais lattice - Lattice planes - Miller indices - 'd' spacing in cubic lattice - Calculation of number of atoms per unit cell - Atomic radius - coordination number - Packing factor for SC, BCC, FCC and HCP structures.
Non Destructive Testing: Liquid penetrate method - Ultrasonic flaw detection - ultrasonic flaw detector (block diagram) - X-ray Radiography - Merits and Demerits of each method.

UNIT V MODERN ENGINEERING MATERIALS AND SUPERCONDUCTING MATERIALS

9

Modern Engineering Materials: Metallic glasses: Preparation properties and applications. Shape memory alloys (SMA): Characteristics, applications, advantages and disadvantages of SMA. Nano Materials: Synthesis - Properties and applications. Superconducting Materials: Superconducting phenomena - Properties of superconductors - Meissner effect - Type I and Type II superconductors - High T_c superconductors (qualitative) - use of superconductors.

TOTAL : 45

TEXT BOOKS:

- Gaur R.K. and Gupta S.L., "Engineering Physics ", 8th edition, Dhanpat rai publications (P) Ltd., New Delhi 2010.
- P.Mani, "Engineering Physics ", Vol-I, Dhanam Publications, Chennai 2011.
- Rajendran V. an Marikani A., "Applied Physics for engineers" , 3rd edition, Tata Mc Graw -Hill publishing company Ltd., New Delhi,2003.

REFERENCES:

- Uma Mukherji, "Engineering Physics ", Narosa publishing house, New Delhi, 2003.
- Arumugam M., "Engineering Physics ", Anuradha agencies, 2007.
- Palanisamy P.K., "Engineering Physics ", SciTech Publications, Chennai 2007.
- Arthur Beiser, "Concepts of Modern Physics", Tata Mc Graw -Hill Publications, 2007.
- P.Charles, Poople and Frank J. Owens, "Introduction to Nanotechnology", Wiley India, 2007

CYA101 ENGINEERING CHEMISTRY

L	T	P	C
3	0	0	3

GOAL

To impart basic principles of chemistry for engineers.

OBJECTIVES

The course should enable the students to:

- I. make the students conversant with the basics of
- II. Water Technology and
- III. Polymer science.
- IV. To provide knowledge on the requirements and properties of a few important engineering materials.
- V. To educate the students on the fundamentals of corrosion and its control.
- VI. To give a sound knowledge on the basics of a few significant terminologies and concepts in thermodynamics.
- VII. To create an awareness among the present generation about the various conventional energy sources.

OUTCOME

The students will be able to:

- I. The students will gain basic knowledge in water analysis and suitable water treatment method.
- II. The study of polymer chemistry will give an idea on the type of polymers to be used in engineering applications.
- III. Exposure of the students to the common engineering materials will create awareness among the students to search for new materials.
- IV. Knowledge on the effects of corrosion and protection methods will help the young minds to choose proper metal / alloys and also to create a design that has good corrosion control.
- V. Students with good exposure on the important aspects of basic thermodynamics will be able to understand the advanced level thermodynamics in engineering applications.
- VI. A good background on the various aspects of energy sources will create awareness on the need to utilize the fuel sources effectively and also for exploring new alternate energy resources.

UNIT I WATER TECHNOLOGY AND POLYMER CHEMISTRY

9

Hardness (Definition, Types, Units) - problems - Estimation of Hardness (EDTA Method) - Water softening - Carbonate conditioning and Calgon conditioning - Demineralization (Ion-Exchange Method) - Water Quality Parameters - Municipal Water Treatment- Desalination - Reverse Osmosis.

Classification of Polymers - PVC, Bakelite - preparation, properties and applications - Effect of Polymer Structure on Properties - Compounding of Plastics- Polymer Blends and Polymer Alloys - Definition, Examples.

UNIT II ENGINEERING MATERIALS 9

Properties of Alloys - Heat Treatment of Steel - Polymer Composites - types and applications.-Lubricants - Classification, properties and applications - Mechanism of Lubrication - MoS₂ And Graphite - Adhesives - classification and properties - Epoxy resin (Preparation, properties and applications) - Refractories - Classification, Properties and General Manufacture - Abrasives - Classification , Properties and Uses - Carbon nano tubes - preparation, properties and applications.

UNIT III ELECTROCHEMISTRY AND CORROSION 9

Conductometric Titration - HCl vs NaOH and mixture of acids vs NaOH - Electrochemical Series and its applications - Nernst Equation - problems - Polarization, Decomposition Potential, Over-voltage (definitions only) - Galvanic series - Corrosion (Definition, Examples, effects) - Mechanism of Dry Corrosion and Wet Corrosion - Differential aeration Corrosion , examples - Factors Influencing Corrosion - Metal and Environment - Corrosion Control - Design -Cathodic Protection methods - Protective Coatings - Galvanising - Anodising - Electroplating (Cu and Ni) and Electroless plating (Cu and Ni) - Constituents of Paints and varnish.

UNIT IV CHEMICAL THERMODYNAMICS 9

Thermodynamic terminology- First Law of Thermodynamics-Internal energy- enthalpy - heat capacity - work done in isothermal expansion of an ideal gas -problems - second law of thermodynamics - entropy change - phase transformations and entropy change - problems - Work Function & Free Energy Function- Maxwell's Relations- Gibbs Helmholtz equation- van't Hoff Isotherm- van't Hoff Isochore - Problems.

UNIT V FUELS AND ENERGY SOURCES 9

Fuels - classification - Calorific Value - Dulong's Formula - Problems - Determination of Calorific Value by Bomb Calorimeter - Coal - Proximate Analysis - problems - Octane Number - Cetane Number - Diesel Index (Definitions only) - Bio Gas - Producer Gas -Water Gas - Preparation, Properties and Uses - Batteries - Primary Cells - Leclanche Cell -Secondary Cell - Nickel Cadmium Battery - Fuel Cells - Hydrogen -Oxygen Fuel Cell - Solar Battery - Lead Acid Storage Cell - Nuclear Energy - Light water nuclear power plant.

TOTAL: 45**TEXT BOOKS :**

- S. S. Dara, Text Book of Engineering Chemistry, S. Chand & Company Ltd., New Delhi, 2003
- Murthy, Agarwal & Naidu, Text Book of Engineering Chemistry, BSP, 2003.
- S.Sumathi, Engineering Chemistry, Dhanam Publications, 2008.
- S.Sumathi and P.S.Raghavan, Engineering Chemistry II, Dhanam Publications, 2008.

REFERENCES :

- B. K. Sharma, Engineering chemistry, Krishna Prakasam Media (P) Ltd., 2003
- A 1. Vogel, A text book of Qualitative Inorganic Analysis, ELBS, London, 2004
- Gowarikar, Text Book of Polymer Science, 2002
- Kuriacose & Rajaram, Vols1 & 2,Chemistry in Engineering and Technology, 2004

MEA101 COMPUTER AIDED ENGINEERING DRAWING

L	T	P	C
1	1	3	3

GOAL

To develop graphical skills for communicating concepts, ideas and designs of engineering products and to give exposure to national standards relating to technical drawings using Computer Aided Design and Drafting practice.

OBJECTIVES

The course should enable the students to

1. Introduce drawing standards and use of drawing instruments.
2. Introduce first angle projection.
3. Practice of engineering hand sketching and introduce to computer aided drafting
4. Familiarize the students with different type of pictorial projections.
5. Introduction to Solid modeling
6. Introduce the process of design from sketching to parametric 3D CAD and 2D orthographic drawings to BIS

OUTCOME

The students will be able to

1. Develop Parametric design and the conventions of formal engineering drawing
2. Produce and interpret 2D & 3D drawings
3. Communicate a design idea/concept graphically
4. Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D software.
5. Get a Detailed study of an engineering artifact

Note: Only first angle projection is to be followed

Unit I – BASICS OF ENGINEERING GRAPHICS AND PLANE CURVES 12

Importance of graphics Use of drawing instruments - BIS conventions and specifications - drawing sheet sizes, layout and folding - lettering - Dimensioning- Geometrical constructions - Scales. Introduction to plane curves like ellipse, parabola, cycloids and involutes

Drafting methods - introduction to Computer Aided Drafting – Computer Hardware – Workstation – Printer and Plotter – Introduction to software for Computer Aided Design and Drafting – Exposure to Solid Modeling software – Geometrical Construction-Coordinate Systems/Basic Entities

Unit II – VISUALIZATION, ORTHOGRAPHIC PROJECTIONS AND FREE HAND SKETCHING 15

Visualization concepts and Free Hand sketching: Visualization principles — Representation of Three Dimensional objects — Pictorial Projection methods - Layout of views- Free hand sketching of multiple views from pictorial views of objects. Drafting of simple Geometric Objects/Editing

General principles of presentation of technical drawings as per BIS - Introduction to Orthographic projections - Naming views as per BIS - First angle projection method. Conversion to orthographic views from given pictorial views of objects, including dimensioning – Drafting of Orthographic views from Pictorial views.

Unit III – PROJECTIONS OF POINTS, LINES, SURFACES AND SOLIDS 18

Introduction to Projections of points – Projections of straight lines located in first quadrant using rotating line method only – Projections of plane surfaces when the surface of the lamina is inclined to one reference plane only – Projections of simple solids when the axis of the solid is inclined to one reference plane only – Sectioning of above solids in simple positions – Section Views. Practice includes drafting the projection of lines and solids using appropriate software. 2D drawing commands: Zoom, Picture editing commands, Dimensioning and 2D drafting.

Unit IV GEOMETRICAL MODELING AND ISOMETRIC VIEWS 15

Solid Modeling – Types of modeling - Wire frame model, Surface Model and Solid Model – Introduction to graphic software for solid modeling. Principles of isometric projection and solid modeling. Isometric drawing - IsoPlanes and 3D Modeling commands. Projections of Principal Views from 3-D Models

Unit V COMPUTER AIDED DESIGN AND DRAFTING 15

Preparation of solids of machine components like slide block, solid bearing block, bushed bearing, gland, wall bracket, guide bracket, shaft bracket, jig plate, shaft support (open type), vertical shaft support etc using appropriate modeling software. Introduction to computer aided drafting and dimensioning using appropriate software. Generate 2D drawing from the 3D models – generate and develop the lateral surfaces of the objects. Presentation Techniques of Engineering Drawings – Title Blocks – Printing/Plotting of drawing.

TOTAL PERIODS: 75

TEXT BOOKS

- Jeyapooan T, Engineering Drawing and Graphics Using AutoCAD, Vikas Publishing House Pvt Ltd., New Delhi, 2010.
- Warren J. Luzadder and Jon.M.Duff, Fundamentals of Engineering Drawing, Prentice Hall of India Pvt. Ltd., Eleventh Edition, 2003.

REFERENCE BOOKS:

- Introduction to AutoCAD – 2D and 3D Design, A.Yarmwood, Newnes Elsevier, 2011
- Engineering Drawing and Graphic Technology-International Edition, Thomas E. French, Charles J. Vierck, Robert J. Foster, McGraw-Hill, 1993
- Engineering Drawing and Design-Sixth Edition, C. Jensen, J.D. Helsel, D.R. Short, McGraw-Hill, 2002
- Technical Drawing-Fourteenth Edition, F. E. Giesecke, A. Mitchell, H. C. Spencer, I.L. Hill, J.T. Dygdon, J.E., Novak, Prentice-Hall, 2012,
- Bhatt N.D and Panchal V.M, Engineering Drawing: Plane and Solid Geometry, Charotar Publishing House, 2007.

- Mechanical Engineering Drawing-Self Taught, Jashua Rose, <http://www.gutenberg.org/files/23319/23319-h/23319-h.htm>

Bureau of Indian Standards (BIS) for Engineering Drawing:

- IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing sheets.
- IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation — Lettering.
- IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
- IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.

CSA101 COMPUTER PROGRAMMING

L	T	P	C
3	0	0	3

GOAL

To introduce computers and programming and to produce an awareness of the power of computational techniques that are currently used by engineers and scientists and to develop programming skills to a level such that problems of reasonable complexity can be tackled successfully.

OBJECTIVES

The course should enable the students to:

- I. Learn the major components of a Computer system.
- II. Learn the problem solving techniques.
- III. Develop skills in programming using C language.

OUTCOMES

The students will be able to:

- I. Understand the interaction between different components of Computer system and number system.
- II. Devise computational strategies for developing applications.
- III. Develop applications (Simple to Complex) using C programming language.

UNIT I COMPUTER FUNDAMENTALS 9

Introduction - Evolution of Computers - Generations of Computer - Classification of Computers - Application of Computers - Components of a Computer System - Hardware - Software - Starting a Computer (Booting) - Number Systems.

UNIT II COMPUTER PROGRAMMING AND LANGUAGES 9

Introduction - Problem-Solving Techniques: Algorithms, Flowchart, Pseudocode - Program Control Structures - Programming Paradigms - Programming languages - Generations of Programming Languages - Language Translators - Features of a Good Programming Languages.

UNIT III PROGRAMMING WITH C 9

Introduction to C - The C Declaration - Operators and Expressions - Input and Output in C - Decision Statements - Loop Control Statements.

UNIT IV FUNCTIONS, ARRAYS AND STRINGS 9

Functions - Storage Class - Arrays - Working with strings and standard functions.

UNIT V POINTERS, STRUCTURES AND UNION 9

Pointers - Dynamic Memory allocation - Structure and Union - Files.

TEXT BOOK:

- ITL Education Solution Limited, Ashok Kamthane, "Computer Programming", Pearson Education Inc 2007 (Unit: I to V).

REFERNCES:

- Byron S. Gottfried, "Programming with C", Second Edition, Tata McGraw Hill 2006.
- Yashvant Kanetkar, "Let us C", Eighth edition, BPP publication 2007.
- Stephen G.Kochan, "Programming in C - A Complete introduction to the C programming language" , Pearson Education, 2008.
- T.JeyaPoovan, "Computer Programming Theory and Practice", Vikas Pub, New Delhi.

**PHA131 PHYSICS LABORATORY
(COMMON TO ALL BRANCHES)**

L T P C
0 0 3 1

OBJECTIVE

To expose the students for practical training through experiments to understand and appreciate the concepts learnt in Physics

OUTCOME

Performing the experiments related to the subject will help the students to apply the practical knowledge in industrial applications and for developing or modifying methods

S.No.	List of Experiments	Batch 2 (30)			Batch 1 (30)		
		Week	Periods		Week	Periods	
			allotted			allotted	
		L	P		L	P	
1	Torsional Pendulum - Determination of rigidity modulus of the material of a wire.	1	1	3	2	1	3
2	Non Uniform Bending - Determination of Young's Modulus.	3	1	3	4	1	3
3	Viscosity -Determination of co-efficient of Viscosity of a liquid by Poiseuille's flow	5	1	3	6	1	3
4	Lee's Disc - Determination of thermal conductivity of a bad conductor.	7	1	3	8	1	3
5	Air Wedge - Determination of thickness of a thin wire.	9	1	3	10	1	3
6	Spectrometer - Refractive index of a prism.	11	1	3	12	1	3
7	Semiconductor laser - Determination of wavelength of Laser using Grating.	13	1	3	14	1	3
	TOTAL	7	2	1	7	2	1
					56 Periods		

LIST OF EQUIPMENTS REQUIRED FOR A BATCH OF 30 STUDENTS

1	Torsional Pendulum	(500 gm, wt, 60 cm wire Al-Ni Alloy)	5 nos.
2	Travelling Microscope	(X10)	15 nos.
3	Capillary tube	(length 10cm, dia 0.05mm)	5 nos.
4	Magnifying lens	(X 10)	15 nos.
5	Lee's disc apparatus	(std form)	5 nos.
6	Stop watch	(+/- 1 s)	5 nos.
7	Meter scale	1m length	5 nos.
8	Spectrometer	(main scale 360 deg, ver 30")	5 nos.
9	Grating	(2500 LPI)	5 nos.
10	Laser	(632.8 nm)	5 nos.
11	Semi transparent glass plate	Al coating 65 nm thickness,	5 nos.
12	Equilateral prism	(n = 1.54)	5 nos.
13	Thermometer	+/- 1 deg	8 nos.
14	Screw gauge	(+/- 0.001cm)	12 nos.
15	Vernier caliper	(+/- 0.01 cm)	8 nos.
16	Steam Boiler	1 L	5 nos.
17	Scale	50 cms	5 nos.
18	Cylindrical mass	100 gms	10 sets
19	Slotted wt	300 gms	5 sets
20	Heater	1.5 KW	5 nos.
21	Transformer sodium vapour lamp	1 KW	10 nos.
22	Sodium vapour lamp	700 W	5 nos
23	Burette	50 mL	5 nos
24	Beaker	250 mL	5 nos
25	Spirit level		10 nos

REFERENCES

1. P.Mani, Engineering Physics Practicals, Dhanam Publications, 2011.

CYA131 CHEMISTRY LABORATORY

L T P C
0 0 3 1

OBJECTIVE

To expose the students for practical training through experiments to understand and appreciate the concepts learnt in Chemistry.

OUTCOME

Performing the experiments related to the subject will help the students to apply the practical knowledge in industrial applications and for developing or modifying methods

S.No.	List of Experiments (Any Five)	Batch 2 (30)			Batch 1 (30)		
		Week	Periods		Week	Periods	
			allotted			allotted	
			L	P		L	P
1	Estimation of Commercial soda by acid-base titration	1	1	3	2	1	3
2	Determination of Percentage of nickel in an alloy	3		3	4		3
3	Determination of Temporary, permanent and total hardness of water by EDTA method	5	1	3	6	1	3
4	Determination of Chloride content in a water sample	7		3	8		3
5	Potentiometric Estimation of iron	9	1	3	10	1	3
6	Conductometric Titration of a strong acid with a strong base	11	1	3	12	1	3
7	Conductometric Titration of mixture of acids.	13	1	3	14	1	3
8	Determination of Degree of polymerization of a polymer by Viscometry	15	1	3	16	1	3
	TOTAL		6	24		6	24
						60 Periods	

List of Glassware and Equipments required for a batch of 30 students

1	Burette	(50 mL)	30 nos.
2	Pipette	(20 mL)	30 nos.
3	Conical Flask	(250 mL)	30 nos.
4	Distilled water bottle	(1 L)	30 nos.
5	Standard flask	(100 mL)	30 nos.
6	Funnel	(small)	30 nos.
7	Glass rod	20 cm length	30 nos.
8	Reagent Bottle	(250 mL)	30 nos.
9	Reagent Bottle	(60 mL)	30 nos.
10	Beaker	(100 mL)	30 nos.
11	Oswald Viscometer	Glass	30 nos.
12	Measuring Cylinder	(25 mL)	30 nos.
13	Digital Conductivity Meter	PICO make	8 nos.
14	Conductivity cell	(K=1)	12 nos.
15	Digital Potentiometer	PICO make	8 nos.
16	Calomel Electrode	Glass	12 nos.
17	Platinum Electrode	Polypropylene	12 nos.
18	Burette Stands	Wooden	30 nos.
19	Pipette stands	Wooden	30 nos.
20	Retard stands	Metal	30 nos.
21	Porcelain Tiles	White	30 nos.
22	Clamps with Boss heads	Metal	30 nos.

REFERENCES

1. J.Mendham, R.C. Denney, J.D. Barnes and N.J.K. Thomas, Vogel's Textbook of Quantative Chemical Analysis, 6th Edition, Pearson Education, 2004.
2. C. W. Garland, J. W. Nibler, D. P. Shoemaker, ;"Experiments in Physical Chemistry, 8th ed.," McGraw-Hill, New York, 2009.
3. S. Sumathi, Engineering Chemistry Practicals, Dhanam Publications, 2011

CSA131 COMPUTER PROGRAMMING LABORATORY
(Common to all branches)

L T P C
0 0 3 1

GOAL

To provide an awareness to develop the programming skills using computer languages.

OBJECTIVES

The course should enable the students to:

1. To gain knowledge about Microsoft office, Spread Sheet.
2. To learn a programming concept in C.

OUTCOME

The students should be able to

- Use MS Word to create document, table, text formatting and Mail merge options.
- Use Excel for small calculations using formula editor, creating different types of charts and including pictures etc,
- Write and execute the C programs for small applications.

LIST OF EXPERIMENTS

- | | | |
|-----------|---|-----------|
| a) | Word Processing | 12 |
| | b) Document creation, Text manipulation with Scientific notations. | |
| | c) Table creation, Table formatting and Conversion. | |
| | d) Mail merge and Letter preparation. | |
| | e) Drawing- flow Chart | |
| f) | Spread Sheet | 9 |
| | g) Chart - Line, XY, Bar and Pie. | |
| | h) Formula - formula editor. | |
| | i) Spread sheet - inclusion of object, Picture and graphics, protecting the document | |
| c) | Programming in C | 24 |
| | j) To write a C program to prepare the electricity bill. | |
| | k) Functions | |
| | l) (a) Call by value (b) Call by reference. | |
| | m) To write a C program to print the Fibonacci series for the given number. | |
| | n) To write a C program to find the factorial of number using recursion. | |
| | o) To write a C program to implement the basic arithmetic operations using Switch Case statement. | |
| | p) To write a C program to check whether the given number is an Armstrong number. | |
| | q) To write a C program to check whether the given string is a Palindrome. | |
| | r) To write a C program to create students details using Structures. | |
| | s) To write a C program to demonstrate the Command Line Arguments. | |
| | t) To write a C program to implement the Random Access in Files. | |
| | u) To write C programs to solve some of the Engineering applications | |

TOTAL: 45

HARDWARE/SOFTWARE REQUIRED FOR BATCH OF 30 STUDENTS

HARDWARE

LAN system with 33 nodes (OR) Standalone PCs - 33 Nos Printers - 3 Nos

SOFTWARE

OS - Windows / UNIX

Application package - MS office

Software - C language

ELA131 COMMUNICATION SKILLS LABORATORY 1

L T P C
0 0 3 1

GOAL

The goal of the programme is to provide a practical input towards nurturing accomplished learners who can function effectively in the English language skills.

OBJECTIVES

The course should enable the students to

- a) Extend the ability of the learners to be able to listen to English and comprehend its message.
- b) Enable the learners to have a functional knowledge of spoken English.
- c) Assist the learners to read and grasp the meaning of technical and non-technical passages in English.
- d) Help the learners develop the art of writing without mistakes.
- e) Expand the thinking capability of the learners so that they would learn how to view things from a different angle.

OUTCOME

- a) The students should be able to
- b) Listen to and evaluate English without difficulty and comprehend its message.
- c) Develop a functional knowledge of spoken English so as to use it in the institution and at job interviews.
- d) Read and comprehend the meaning of technical and non-technical passages in English.
- e) Develop the art of writing so as to put down their thoughts and feelings in words.
- f) Think independently and contribute creative ideas.

UNIT I LISTENING SKILL

Listening to conversations and interviews of famous personalities in various fields -- Listening practice related to the TV-- Talk shows - News - Educational programmes -- Watching films for critical comments - Listening for specific information - Listening for summarizing information - Listening to monologues for taking notes - Listening to answer multiple-choice questions.

UNIT II SPEAKING SKILL

Self-introduction -- Group discussion - Persuading and negotiating strategies - Practice in dialogues - Presentations based on short stories / poems -- Speaking on personal thoughts and feelings - academic topics - News reading - Acting as a compere -- Speaking about case studies on problems and solutions - Extempore speeches.

UNIT III READING SKILL

Reading anecdotes to predict the content - Reading for interpretation -- Suggested reading -- Short stories and poems -- Critical reading - Reading for information transfer - Reading newspaper and magazine articles for critical commentary - Reading brochures, advertisements, pamphlets for improved presentation.

UNIT IV WRITING SKILL

At the beginning of the semester, the students will be informed of a mini dissertation of 1000 words they need to submit individually on any non-technical topic of their choice. The parts of the dissertation will be the assignments carried out during the semester and submitted towards the end of the semester on a date specified by the department. This can be judged as part of the internal assessment.

UNIT V THINKING SKILL

Practice in preparing thinking blocks to decode diagrammatical representations into English words, expressions, idioms and proverbs - Inculcating interest in English using thinking blocks. Making pictures and improvising diagrams to form English words, phrases and proverbs -- Picture reading

REFERENCES

1. Raman, Meenakshi, and Sangeetha Sharma. Technical Communication: English Skills for Engineers. 2nd edition. New Delhi: Oxford University Press, 2010.
2. Riordian, Daniel. Technical Communication. New Delhi. Cengage Learning, 2009

Websites for learning English

1. British: Learn English - British Council (Listen & Watch) - <<http://learnenglish.britishcouncil>>
2. American: Randall's ESL Cyber Listening Lab - <<http://www.esl-lab.com/>>
3. Intercultural: English Listening Lesson Library Online <http://www.ello.org/>

GEA131 ENGINEERING PRACTICE LABORATORY - I
(Common to all branches)

L	T	P	C
0	0	3	1

GOAL

To provide the students with hands on experience on various basic engineering practices in Civil and Mechanical Engineering.

OBJECTIVES

The course should enable the students to

1. Relate theory and practice of basic Civil and Mechanical Engineering
2. Learn concepts of welding and machining practice
3. Learn concepts of plumbing and carpentry practice

OUTCOMES

The students will be able to

1. Identify and use of tools, Types of joints used in welding, carpentry and plumbing operations.
2. Have hands on experience on basic fabrication techniques such as carpentry and plumbing practices.
3. Have hands on experience on basic fabrication techniques of different types of welding and basic machining practices.

LIST OF EXPERIMENTS

I. MECHANICAL ENGINEERING PRACTICE

15

1. Welding
2. Arc welding: Butt joints, Tee and lap joints.
3. Basic Machining
4. Facing, turning, threading and drilling practices using lathe and drilling operation with vertical drilling machine.
5. Machine assembly practice
6. Study of centrifugal pump
7. Study on Smithy operations - Productions of hexagonal headed bolt.
8. Foundry operations - Mould preparation for gear and step cone pulley.

II. CIVIL ENGINEERING

12

1. Basic pipe connection using valves, couplings, unions, reducers, elbows in household fitting.
2. Practice in mixed pipe connections: Metal, plastic and flexible pipes used in household appliances.s
3. Wood work: Sawing, Planning and making common joints.
4. Study of joints in door panels, wooden furniture.

TOTAL : 45

Reference:

Jeyapooan T and Saravanapandian M., Engineering practices lab manual, 4th Edition, Vikas publishing House, New Delhi, 2010.

**List equipment and components
(For a Batch of 30 Students)**

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. 15 Sets.
2. Carpentry vice (fitted to work bench) 15 Nos.
3. Standard woodworking tools 15 Sets.
4. Models of industrial trusses, door joints, furniture joints 5 each
5. Power Tools:
 - (a) Rotary Hammer 2 Nos
 - (b) Demolition Hammer 2 Nos
 - (c) Circular Saw 2 Nos
 - (d) Planer 2 Nos
 - (e) Hand Drilling Machine 2 Nos
 - (f) Jigsaw 2 Nos

MECHANICAL

1. Arc welding transformer with cables and holders 5 Nos.
2. Welding booth with exhaust facility 5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc. 5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit. 2 Nos.
5. Centre lathe 2 Nos.
6. Hearth furnace, anvil and smithy tools 2 Sets.
7. Moulding table, foundry tools 2 Sets.
8. Power Tool: Angle Grinder 2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner One each.

SEMESTER- II
MAA102 ENGINEERING MATHEMATICS – II
(Common to All Branches)

L	T	P	C
2	1	1	4

AIM

The course is aimed at developing the basic Mathematical skills of engineering students that are imperative for effective understanding of engineering subject using MATLAB.

OBJECTIVES

- To understand effectively the evaluation of double and triple integrals and their applications
- To know the basics of vector calculus comprising of gradient, divergence, curl, line surface and volume integrals along with the classical theorems involving them
- To have a sound knowledge of Laplace transform and its properties. Solutions of Laplace transform using MATLAB.
- To understand and expand periodic functions as Fourier series using MATLAB

OUTCOME

- To understand effectively the evaluation of double and triple integrals and their applications
- To know the basics of vector calculus comprising of gradient, divergence, curl, line surface and volume integrals along with the classical theorems involving them
- To have a sound knowledge of Laplace transform and its properties. Solutions of Laplace transform using MATLAB.
- To understand and expand periodic functions as Fourier series using MATLAB

UNIT I MULTIPLE INTEGRALS

12(8+4)

Double integration – Cartesian and polar co-ordinates – Change of order of integration. Area as a double integral – Triple integration in Cartesian co ordinates – Volume as a triple integral - Change of variables between Cartesian and polar coordinates.

Lab: Area and Volume of double integration and triple integration.

UNIT II VECTOR CALCULUS

12(8+4)

Gradient, Divergence and Curl – Unit normal vector, Directional derivative – angle between surfaces-Irrotational and solenoidal vector fields.

Green's theorem - Gauss divergence theorem and Stoke's theorem (without proof) – Verification and evaluation of the above the theorems - Simple applications to regions such as square, rectangle, triangle, cuboids and rectangular parallelopipeds.

Lab: Green's theorem - Gauss divergence theorem and Stoke's theorem

UNIT III LAPLACE TRANSFORM 12(8+4)

Laplace transform – Conditions of existence – Transform of elementary functions – properties - Derivatives and integrals of transforms – Transforms of derivatives and integrals – Initial and final value theorems – Transform of periodic functions. Inverse Laplace transforms using partial fraction and convolution theorem. Solution of linear ODE of second order with constant coefficients.

Lab: Solutions of differential equations using Laplace transform

UNIT IV FOURIER SERIES 12(8+4)

Dirichlet's Conditions – General Fourier Series – Odd and even functions – Half range sine and cosine series – Harmonic Analysis.

Lab: Solutions of Fourier series and Harmonic Analysis.

UNIT V COMPLEX VARIABLES 12(8+4)

Functions of a complex variable – Analytic function - Cauchy - Riemann equations (Statement only) – Properties of analytic function (Statement only) – Construction of Analytic functions by Milne – Thomson method.

Lab: Cauchy - Riemann equations, Milne – Thomson method

TOTAL: 60

TEXT BOOK:

- Venkatraman M.K, Mathematics, Volume – II & Volume -III, National Publishin Company, Chennai, 1985.
- A.P.Santhakumaran, P.Titus, Engineering Mathematics - II, NiMeric Publications, Nagercoil, 2012

REFERENCE:

- Kandasamy P, Engineering Mathematics Volume II, S. Chand & Co., New Delhi, 1987.
- Grewal B.S, "Engineering Maths – II", Sultan Chand, New Delhi, 1993.
- Bali N.P, Manish Goyal, Text book of Engineering Mathematics, 3rd Edition, Lakshmi Publications, 2003.
- Chandrasekaran A, Engineering Mathematics, Volume – II, Dhanam Publication, 2008.

PHA101 ENGINEERING PHYSICS

L	T	P	C
3	0	0	3

GOAL

To impart fundamental knowledge in various fields of Physics and its applications.

The course should enable the students to :

1. Develop strong fundamentals of properties and behaviour of the materials
2. Enhance theoretical and modern technological aspects in acoustics and ultrasonics.
3. Enable the students to correlate the theoretical principles with application oriented study of optics.
4. Provide a strong foundation in the understanding of solids and materials testing.
5. Enrich the knowledge of students in modern engineering materials.

OUTCOME

The students will be able to:

1. Understand the properties and behaviour of materials.
2. Have a fundamental knowledge of acoustics which would facilitate in acoustical design of buildings and on ultrasonics and be able to employ it as an engineering tool.
3. Understand the concept, working and application of lasers and fiber optics.
4. Know the fundamentals of crystal physics and non destructive testing methods.
5. Have an understanding of the production, characteristics and application of the new engineering materials. This would aid them in the material selection stage.

UNIT I PROPERTIES OF MATTER

9

Elasticity - types of moduli of elasticity - Stress-Strain diagram - Young's modulus of elasticity Rigidity modulus - Bulk modulus - Factors affecting elasticity - twisting couple on a wire - Torsional pendulum - determination of rigidity modulus of a wire - depression of a cantilever - Young's modulus by cantilever - uniform and non-uniform bending - viscosity - Ostwald's viscometer - comparison of viscosities.

UNIT II ACOUSTICS AND ULTRASONICS

9

Classification of sound - characteristics of musical sound - intensity - loudness - Weber Fechner law - Decibel - Reverberation - Reverberation time, derivation of Sabine's formula for reverberation time(Jaeger's method) - absorption coefficient and its determination - factors affecting acoustics of building (Optimum reverberation time, loudness, focusing, echo, echelon effect, resonance and noise) and their remedies. Ultrasonics - production - Magnetostriction and Piezoelectric methods - properties - applications of ultrasonics with particular reference to detection of flaws in metal (Non - Destructive testing NDT) - SONAR.

UNIT III LASER AND FIBRE OPTICS

9

Principle of lasers - Stimulated absorption - Spontaneous emission, stimulated emission - population inversion - pumping action - active medium - laser characteristics - Nd-Yag laser - CO2 laser Semiconductor laser - applications - optical fiber - principle and propagation of light in optical fibers Numerical aperture and acceptance angle - types of optical fibers - single and multimode, step index and graded index fibers - applications - fiber optic communication system.

UNIT IV CRYSTAL PHYSICS AND NON- DESTRUCTIVE TESTING

9

Crystal Physics: Lattice - Unit cell - Bravais lattice - Lattice planes - Miller indices - 'd' spacing in cubic lattice - Calculation of number of atoms per unit cell - Atomic radius - coordination number Packing factor for SC, BCC, FCC and HCP structures.

Non Destructive Testing: Liquid penetrate method - Ultrasonic flaw detection - ultrasonic flaw detector (block diagram) - X-ray Radiography - Merits and Demerits of each method.

UNIT V MODERN ENGINEERING MATERIALS AND SUPERCONDUCTING MATERIALS 9

Modern Engineering Materials: Metallic glasses: Preparation properties and applications. Shape memory alloys (SMA): Characteristics, applications, advantages and disadvantages of SMA. Nano Materials: Synthesis -Properties and applications.

Superconducting Materials: Superconducting phenomena - Properties of superconductors - Meissner effect - Type I and Type II superconductors - High T_c superconductors (qualitative) - uses of superconductors.

TOTAL : 45

TEXT BOOKS

1. Gaur R.K. and Gupta S.L., "Engineering Physics ", 8th edition, Dhanpat rai publications (P) Ltd., New Delhi 2010.
2. P.Mani, "Engineering Physics", Vol-I, Dhanam Publications, Chennai 2011.
3. Rajendran V. an Marikani A., "Applied Physics for engineers" , 3rd edition, Tata Mc Graw -Hill publishing company Ltd., New Delhi,2003.

REFERENCES

1. Uma Mukherji, Engineering Physics , Narosa publishing house, New Delhi, 2003.
2. Arumugam M., Engineering Physics , Anuradha agencies, 2007.
3. Palanisamy P.K., Engineering Physics, SciTech Publications, Chennai 2007.
4. Arthur Beiser, Concepts of Modern Physics, Tata Mc Graw -Hill Publications, 2007.
5. P.Charles, Poole and Frank J. Owens, Introduction to Nanotechnology, Wiley India,

CYA101 ENGINEERING CHEMISTRY

L	T	P	C
3	0	0	3

GOAL

To impart basic principles of chemistry for engineers.

OBJECTIVES

The course should enable the students to

1. Make the students conversant with the basics of
2. (a) Water technology And (b) Polymer science
3. Provide knowledge on the requirements and properties of a few important engineering materials.
4. Educate the students on the fundamentals of corrosion and its control.
5. Give a sound knowledge on the basics of a few significant terminologies and concepts in thermodynamics.
6. Create an awareness among the present generation about the various conventional energy sources.

OUTCOME

The students will be able to

1. Gain basic knowledge in water analysis and suitable water treatment method.
2. Get an idea on the type of polymers to be used in engineering applications.
3. Get awareness about new materials
4. Get knowledge on the effects of corrosion and protection methods will help the young minds to choose proper metal / alloys and also to create a design that has good corrosion control.
5. Get exposure on the important aspects of basic thermodynamics will be able to understand the advanced level thermodynamics in engineering applications.
6. Get a good background on the various aspects of energy sources will create awareness on the need to utilize the fuel sources effectively and also for exploring new alternate
7. energy resources.

UNIT I WATER TECHNOLOGY AND POLYMER CHEMISTRY

9

Hardness (Definition, Types, Units) - problems - Estimation of Hardness (EDTA Method) - Water softening - Carbonate conditioning and Calgon conditioning - Demineralization (Ion-Exchange Method) - Water Quality Parameters - Municipal Water Treatment- Desalination - Reverse Osmosis.

Classification of Polymers - PVC, Bakelite - preparation, properties and applications - Effect of Polymer Structure on Properties - Compounding of Plastics- Polymer Blends and Polymer Alloys Definition, Examples

UNIT II ENGINEERING MATERIALS

9

Properties of Alloys - Heat Treatment of Steel - Polymer Composites - types and applications. Lubricants - Classification, properties and applications - Mechanism of Lubrication - MoS₂ And Graphite - Adhesives - classification and properties - Epoxy resin (Preparation, properties and applications) - Refractories - Classification, Properties and General Manufacture - Abrasives Classification , Properties and Uses - Carbon nano tubes - preparation, properties and applications.

UNIT III ELECTROCHEMISTRY AND CORROSION

9

Conductometric Titration - HCl vs NaOH and mixture of acids vs NaOH - Electrochemical Series and its applications - Nernst Equation - problems - Polarization, Decomposition Potential, Over-voltage (definitions only) - Galvanic series - Corrosion (Definition, Examples, effects) - Mechanism of Dry Corrosion and Wet Corrosion - Differential aeration Corrosion , examples - Factors Influencing Corrosion - Metal and Environment - Corrosion Control - Design -Cathodic Protection methods - Protective Coatings - Galvanising - Anodising - Electroplating (Cu and Ni) and Electroless plating (Cu and Ni) Constituents of Paints and varnish.

UNIT IV CHEMICAL THERMODYNAMICS

9

Thermodynamic terminology- First Law of Thermodynamics-Internal energy- enthalpy - heat capacity work done in isothermal expansion of an ideal gas -problems - second law of thermodynamics entropy change - phase transformations and entropy change - problems - Work Function & Free Energy Function- Maxwell's Relations-Gibbs Helmholtz equation- van't Hoff Isotherm- van't Hoff Isochore - Problems.

UNIT V FUELS AND ENERGY SOURCES

9

Fuels - classification - Calorific Value - Dulong's Formula - Problems - Determination of Calorific Value by Bomb Calorimeter - Coal - Proximate Analysis - problems - Octane Number - Cetane Number - Diesel Index (Definitions only) - Bio Gas - Producer Gas -Water Gas - Preparation, Properties and Uses - Batteries - Primary Cells - Leclanche Cell -Secondary Cell - Nickel Cadmium Battery Fuel Cells - Hydrogen -Oxygen Fuel Cell - Solar Battery - Lead Acid Storage Cell - Nuclear Energy Light water nuclear power plant.

TOTAL : 45

TEXT BOOKS

1. S. S. Dara, Text Book of Engineering Chemistry, S. Chand & Company Ltd., New Delhi, 2003
2. Murthy, Agarwal & Naidu, Text Book of Engineering Chemistry, BSP, 2003.
3. S.Sumathi, Engineering Chemistry, Dhanam Publications, 2008.
4. S.Sumathi and P.S.Raghavan, Engineering Chemistry II, Dhanam Publications, 2008.

REFERENCES

1. B. K. Sharma, Engineering chemistry, Krishna Prakasam Media (P) Ltd., 2003
2. A 1. Vogel, A text book of Qualitative Inorganic Analysis, ELBS, London, 2004
3. Gowarikar, Text Book of Polymer Science, 2002
4. Kuriacose & Rajaram, Vols. 1 & 2, Chemistry in Engineering and Technology, 2004
5. Puri, Sharma and Pathania, Principles of Physical Chemistry, Vishal Publishing Co. Jalandar, 2004.

MEA102 ENGINEERING MECHANICS

L	T	P	C
3	1	0	4

GOAL

To provide an understanding of the effects of forces, torques and motion on a variety of structures and vehicles.

OBJECTIVES

The course should enable the students to

1. Impart knowledge on the vector and scalar representation of forces and moments
2. Impart knowledge on static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions.
3. Understand the principle of work and energy.
4. Comprehend on the effect of friction on equilibrium, the laws of motion, the kinematics of motion and the interrelationship.
5. Write the dynamic equilibrium equation.

All these should be achieved both conceptually and through solved examples.

OUTCOME

The students will be able to

1. Apply the law of forces and Newton's 2nd law in determining motion and The dynamics of particles and vehicles
2. Implement vectors in mechanics problems and Know about Energy and momentum conservation
3. Know the dynamics of a rigid body and its rotation and Do the calculation and motion of the centre of mass of a system of particles
4. Use vectors to solve mechanics problems and Develop particle and vehicle trajectory equations
5. Calculate the motion of rigid bodies and Solving problems on engineering mechanics that arise on other modules of the course.

UNIT I BASICS & STATICS OF PARTICLES

12

Introduction - Units and Dimensions - Laws of Mechanics - Lame's theorem, Parallelogram and triangular Law of forces - Vectors - Vectorial representation of forces and moments - Vector operations : addition, subtraction, dot product, cross product - Coplanar Forces - Resolution and Composition of forces - Equilibrium of a particle - Forces in space - Equilibrium of a particle in space - Equivalent systems of forces - Principle of transmissibility - Single equivalent force.

UNIT II EQUILIBRIUM OF RIGID BODIES

12

Free body diagram - Types of supports and their reactions - Requirements of stable equilibrium Static determinacy - Moments and Couples - Moment of a force about a point and about an axis Vectorial representation of moments and couples - Scalar components of a moment - Varignon's theorem - Equilibrium of Rigid bodies in two dimensions - Equilibrium of Rigid bodies in three dimensions - Examples.

UNIT III FRICTION

12

Frictional force - Laws of Coulomb friction - Simple contact friction - Belt friction - Transmission of power through belts - Wedge Friction - Screw Jack - Rolling resistance.

UNIT IV PROPERTIES OF SURFACES AND SOLIDS**12**

Determination of Areas and Volumes - Determination of first moment of area Centroid of sections, Second and product moments of plane area - Rectangle, circle, triangle, T section, I section, Angle section, Hollow section- Parallel axis theorem and perpendicular axis theorem - Polar moment of inertia -Product moment of inertia.

UNIT V DYNAMICS OF PARTICLES**12**

Displacements, Velocity and acceleration, their relationship - Relative motion - Curvilinear motion Newton's law - Work Energy Equation of particles - Impulse and Momentum - Impact of elastic bodies.

TOTAL : 60**TEXT BOOKS**

1. Kottiswaran, Engineering Mechanics Static and Dynamics, Sri Balaji Publication Erode, 2014.
2. Beer, F.P and Johnson Jr. E.R, Vector Mechanics for Engineers, Vol. 1 Statics and vol. 2 Dynamics, McGraw-Hill International 10th Edition, 2017
3. Rajasekaran, S, Sankarasubramanian, G., Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt., Ltd., 2003.
4. Bedford and N. Fowler, Engineering Mechanics Statics & Dynamics, Pearson, 2007

REFERENCES

1. Hibbeler, R.C., Engineering Mechanics, Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., 2013.
2. Ashok Gupta, Interactive Engineering Mechanics - Statics - A Virtual Tutor (CDROM), Pearson Education Asia Pvt., Ltd., 2002.Hill, 2001.

CEB101 SURVEYING

L **T** **P** **C**
3 **1** **0** **4**

GOAL

To impart the students with the knowledge about the different types of surveying and levelling.

OBJECTIVES:

The course should enable the students to:

1. Understand the principles of surveying.
2. Know about compass surveying, plane table surveying and Traversing.
3. Understand the concepts of levelling and its applications.
4. Understand the concepts of Tachometric surveying,
5. Get exposed to measurements using Electronic Instruments.

OUTCOME:

The students will be able to:

1. Survey the fields using basic survey instruments.
2. Describe the bearing systems and the instruments used in compass surveying, plane table surveying and Surveying using Theodolite.
3. Describe the various methods of levelling and take field measurements using contouring.
4. Carry out Tachometric surveying
5. Measure angles and distance using Total Station and GPS.

UNIT I INTRODUCTION AND LINEAR MEASUREMENTS 9

Definition - Principles - Classification Scales - Conventional signs - Survey instruments, their care and adjustment - Ranging and chaining - Reciprocal ranging - well conditioned triangles - Traversing - Enlarging and reducing figures.

UNIT II COMPASS SURVEYING, PLANE TABLE SURVEYING AND THEODOLITE 9

Prismatic compass - Surveyor's compass - Bearing - Systems and conversions - Local attraction - Magnetic declination – Dip – Correction of errors. Plane table instruments and accessories - Merits and demerits - Methods - Radiation - Intersection - Resection - Traversing. Theodolite – Fundamental and Desired lines – Uses – Adjustments – Angle Measurements.

UNIT III LEVELLING AND CONTOURING 9

Level line - Horizontal line - Levels and Staves - Spirit level - Sensitiveness - Bench marks - Temporary and permanent adjustments - Fly and check levelling - Booking - Reduction - Curvature and refraction - Reciprocal levelling - Longitudinal and cross sections - Plotting - Calculation of areas and volumes - Contouring - Methods - Characteristics and uses of contours - Plotting - Earth work volume - Capacity of reservoirs.

UNIT IV TACHEOMETRIC SURVEYING 9

Tachometric systems - Tangential, stadia and sub tense methods - Stadia systems - Horizontal and inclined sights - Vertical and normal staffing - Fixed and movable hairs - Stadia constants - Anallactic lens

UNIT V ADVANCED SURVEYING 9

Introduction and fundamental concepts of electronic measuring instruments - EDM, Total Station, Geographic Information System and Global Positioning System

TUTORIAL: 15

TEXT BOOKS:

1. Surveying and Levelling, Basak N N, McGraw-Hill Book Company, 2017.
2. Dr.B.C.punmia,Ashok K Jain, Arun K Jain, Surveying Vol.I, Laxmi Publications, 2016.
3. Surveying and leveling . S.C.Rangwala and P. S. Rangwala, Charotar Publishing House Pvt. Ltd, 2014

REFERENCES:

1. Clark D., Plane and Geodetic Surveying for Engineers, Vols. I and II, C.B.S. Publishers and Distributors, Delhi, Sixth Edition, 2004..
2. James M.Anderson and Edward M.Mikhail, Surveying Theory and Practise, McGraw-Hill Book Company, 2012

CEB102 CONSTRUCTION MATERIALS

L	T	P	C
3	0	0	3

GOAL

To introduce the student to various materials that are commonly used in civil engineering construction and their properties.

OBJECTIVES

The course should enable the students to:

1. Gain knowledge on properties of stones
2. Be familiar with the manufacturing and uses of bricks in construction.
3. Acquire knowledge on properties of lime and cement.
4. Be familiar with the properties and applications of concrete in construction.
5. Gain knowledge of modern materials like Timber, glass and aluminium.

OUTCOME

The students will be able to:

1. Describe the properties and uses of stones in construction.
2. Describe the properties and uses of bricks in construction.
3. Demonstrate the properties of lime and cement.
4. Describe the applications of concrete in building construction
5. Select suitable materials for various applications.

UNIT I STONES

9

Stone as building material - Criteria for selection - Tests on stones - Deterioration and Preservation of stone work

UNIT II BRICKS

9

Bricks - Classification – manufacturing of clay bricks- Tests on bricks - Compressive Strength - Water Absorption - Efflorescence - Bricks for special use - Refractory bricks - Cement and Concrete hollow blocks - Lightweight concrete blocks.

UNIT III LIME AND CEMENT

9

Cement, Ingredients - Types and Grades - Properties of cement and Cement mortar - Hydration - Compressive strength - Tensile strength - Soundness and consistency - Setting time.

UNIT IV AGGREGATES - MORTAR – CONCRETE

9

Aggregates - Natural stone aggregates - Industrial by products - Crushing strength - Impact strength - Flakiness - Abrasion Resistance - Grading - Sand - Bulking
Concrete - Ingredients - Manufacture - Batching plants - Ready Mix Concrete -Hollow concrete blocks.

UNIT V TIMBER GLASS AND ALUMINIUM

9

Timber - Industrial timber - Plywood – Types of glass – application in building industry – Uses of aluminium in construction industry

TOTAL: 45

TEXT BOOKS:

1. R.K. Rajput, Engineering Materials, S. Chand & Company Ltd., 2000.
2. M.S. Shetty, Concrete Technology (Theory and Practice), S. Chand & Company Ltd., 2006
3. S.K. Duggal, Building Materials, 4th edition New age Publication, 2012
4. S Christian Johnson, Concrete Technology, Dipti Press (OPC), 2017

REFERENCE:

1. P. C Varghese, Building Materials, Prentice Hall of India ca-print-prentice_hall, 2005
2. G.C Sahu and JayagopalJena, Building Materials and Construction, McGrawhill Publication, 2017.

ELA102 Personality Development and Soft Skills

L	T	P	C
3	0	0	3

GOAL

- To enhance holistic development of students and improve their employability skills.
- To nurture the language skills and cultivate in them the ability to indulge in rational thinking, independent decision-making and lifelong learning
- To help them become responsible members or leaders of the society in and around their workplace or living space
- to communicate successfully at the individual or group level on engineering activities with the engineering community in particular, and on multi-disciplinary activities in general, with the world at large.

OBJECTIVES

The course should enable the students to

- Develop inter personal skills and be an effective goal oriented team player.
- Develop professionals with idealistic, practical and moral values.
- Develop communication and problem solving skills.
- To face the challenges in the world and enable the students excel in the world of work and life.

OUTCOME

The students should be able to:

- Articulate the ideas, concepts, perceptions with apt pronunciation in speeches and using persuasive, negotiation skills in discussions and debates
- Analyse grammatical rules and construct appropriate sentences embedding the language skills
- Analyse the people skills and apply it in real life situations
- Interpret and comprehend the English Language by enhancing listening and reading skills
- Apply the knowledge of personality traits and strengthen the interpersonal skills

Personality Development and Soft Skills

Subject Code: ELA102

L	T	P	C
3	0	0	3

UNIT I SPEAKING SKILLS

9 hours

Art of Speaking- Body Language and speaking- Non Verbal communication- -Vocal Communication Techniques- Intercultural communication- The difference in Approach in five countries- Vocabulary Enrichment- Pronunciation of words-Mark the stress on appropriate syllable-split the word into syllables- Speaking as an Art-Simple Oral Interaction-Body Language and Speaking- Five characteristics of an ideal GD- group discussions - role plays- short speeches-Extempore – JAM –Debate-Talk shows- Power point presentation and speaking

UNIT II LANGUAGE SKILLS

13 hours

Functional Grammar: Synonyms and Antonyms – Active and Passive Voice- Direct and Indirect Speech- Conditional Clauses- collocations- rearrange the jumbled sentences and make meaningful sentences- Language functions: apologising, greeting, clarifying, inviting, advising, agreeing, disagreeing, refusing, thanking, interrupting, expressing obligation, expressing preferences, CV / application letters- Job interviews-FAQ's – e- mail etiquette

UNIT III PEOPLE SKILLS/SOFT SKILLS

8 hours

SWOT analysis- JOHARI window- Goal setting- speaking on Goals - goals to be achieved- modes of behaviour to achieve the goals- decision making- time management -stress management- power of positive attitude- leadership skills

UNIT IV COMPREHENSION SKILLS

7 hours

Art of Listening- listening to English news- listening to debates on current issues - Listening to dialogues for general meaning and specific information- listening to toast master speeches- -cloze exercises-open comprehension questions-Art of Listening- Reading passages –interpreting in own words- reading articles in magazines/journals/newspapers- writing articles for newspaper-reporting events-completing the middle/end of a story

UNIT V PERSONALITY DEVELOPMENT

9 hours

Define Personality- Types of Personality-Personality test- Leadership Skills - Interpersonal Skills- Team Work - Mind Mapping- concept maps- Study skills and techniques - Edward De Bono's lateral thinking-exercises-questionnaires-project

TEXT BOOK:

- English for Life and the workplace through LSRW&T skills by Dr. Dolly John, Pearson Publications

REFERENCES

- Education and Personality Development, Dr. P.K. Manoharan, APH Publishing Corporation.

- Effective technical Communication, M. Ashraf Rizvi, Tata McGraw Hill Companies
- Professional Speaking Skills, Aruna Koneru, Oxford University Press
- Essential Grammar in Use, Fourth Edition by Raymond Murphy, Cambridge University Press
- Covey Sean, Seven Habit of Highly Effective Teens, New York, Fireside Publishers, 1998.
- Carnegie Dale, How to win Friends and Influence People, New York: Simon & Schuster, 1998.

Web links for reference for Flipped classroom sessions

1. <https://owl.english.purdue.edu/exercises/28/12/33>
2. http://englishplaza.vn/flexpaper/pdf/english-collocations-in-use_1405952201.pdf
3. <http://www.htsb.org/wp-content/uploads/2014/07/Academic-Language-Functions-toolkit.pdf>
4. <http://www.intelligencetest.com/puzzles/lateral.htm>
5. http://www.teachingenglish.org.uk/sites/teacheng/files/mind_map.pdf
6. <http://www.teachingenglish.org.uk/article/using-mind-maps-develop-writing>
7. <http://www.teachingenglish.org.uk/article/jigsaw-readingArrange>
8. <http://www.teachthought.com/critical-thinking/10-team-building-games-that-promote-critical-thinking>
9. http://www.myenglishpages.com/site_php_files/grammar-exercise-conditionals.php
10. <http://flax.nzdl.org/greenstone3/flax?a=fp&sa=collActivity&c=copyrightlaw>
11. <http://www.humanmetrics.com/personality/type>

GEA132 - ENGINEERING PRACTICES LABORATORY II

L T P C
0 0 3 1

S.No	LIST OF EXPERIMENTS	HOURS
	Electrical Engineering:	
1.	Wiring for a tube light.	6
2.	Wiring for a lamp and fan.	6
3.	Staircase wiring	3
4.	Study of (i) Iron box and (ii) Fan with Regulator	6
	Electronics Engineering	
5.	Study of Electronic components and Equipments	3
6.	Characteristics of PN junction diode & measurement of Ripple factor of half wave and full wave rectifier.	9
7.	Applications of OP-AMP - Inverter, Adder and Subtractor.	9
8.	Study and verification of Logic Gates	3
	PRACTICAL	45

Components Required:	
Electrical Engineering	
Choke	2 nos
Starter	2 nos
Tubelight stand	2 nos
36W tubelight	2 nos
Fan	2nos
40W lamp	5nos
Single way switch	10 nos
Two way switch	5 nos
Iron box	2nos
Fan with regulator opened	1no (demo purpose)
Wires	

Electronics Engineering

IC Trainer Kit, Resistors, Capacitors, CRO, Function Generator, Bread Board, Regulated Power Supply, Zener Diode, PN Junction Diode, Potentiometer, Digital Multimeter, Ammeter, Voltmeter, Wattmeter, IC 7408, IC 7432, IC 7486, IC 7400, IC 7404, IC 7402

TEXT BOOK

1. T. Jeyapoovan, M.Saravanapandian and S. Pranitha, Engineering Practices Lab Manual, 3rd Edition 2006, Vikas Publishing house (P) Ltd., New Delhi.

CEB131 SURVEY LABORATORY

L **T** **P** **C**
0 **0** **3** **1**

GOAL

To impart the students with the knowledge about the different types of surveying and levelling field techniques.

OBJECTIVES

The course should enable the students to:
Conduct experiments on Surveying and Levelling.

OUTCOME

The students will be able to:
Take field measurements using various surveying methods such as chain surveying, compass surveying, plane table surveying, Levelling, Theodolite survey, Tachometric survey and contouring.

LIST OF EXPERIMENTS

1. Chain Traversing
2. Compass Traversing
3. Plane Table Surveying
4. Fly levelling
5. Check levelling
6. Theodolite survey traverse
7. Total Station Traverse
8. Grid Contouring using Total Station
9. Measurement of Distance using GPS

TOTAL : 45

LIST OF EQUIPMENTS.

1. Chains (30 m)
2. Cross staff
3. Steel Tapes (30m)
4. Steel Arrows
5. Ranging rods
6. Total Station
7. Plain table
8. Dumpy level
9. Aluminum Leveling staff (4m)
10. Theodolites.
11. GPS

REFERENCE BOOK

1. Dr.B.C.punmia,Ashok K Jain, Arun K Jain, Surveying Vol.I, Laxmi Publications, 2009
2. Surveying and leveling. S.C.Rangwala and P. S. Rangwala, Charotar Publishing House Pvt. Ltd, 2005

ELA132 COMMUNICATION SKILLS LABORATORY II

L	T	P	C
2	0	2	3

GOAL

The goal of the programme is to provide a practical input towards nurturing accomplished learners who can function effectively in the English language skills.

OBJECTIVES

The course should enable the students to:

- Extend the ability of the learners to be able to listen to English and comprehend its message.
- Enable the learners to have a functional knowledge of spoken English.
- Assist the learners to read and grasp the meaning of technical and non-technical passages in English.
- Help the learners develop the art of writing without mistakes.
- Expand the thinking capability of the learners so that they would learn how to view things from a different angle.

OUTCOME

The students will be able to:

- The learners will be able to listen to and evaluate English without difficulty and comprehend its message.
- The learners would have developed a functional knowledge of spoken English so as to use it in the institution and at job interviews.
- The learners will be able to read and comprehend the meaning of technical and non-technical passages in English.
- The learners will have developed the art of writing so as to put down their thoughts and feelings in words.
- At the end of the course, the learners will be able to think independently and contribute creative ideas.

UNIT I LISTENING SKILL

9

Listening to conversations and interviews of famous personalities in various fields --
Listening practice related to the TV-- Talk shows - News - Educative programmes --
Watching films for critical comments

- Listening for specific information - Listening for summarizing information - Listening to monologues for taking notes - Listening to answer multiple-choice questions.

UNIT II SPEAKING SKILL

9

Self-introduction -- Group discussion - Persuading and negotiating strategies - Practice in dialogues

-- Presentations based on short stories / poems -- Speaking on personal thoughts and feelings --academic topics - News reading - Acting as a compere -- Speaking about case studies on problems and solutions - Extempore speeches.

UNIT III READING SKILL**9**

Reading anecdotes to predict the content - Reading for interpretation -- Suggested reading -- Short stories and poems -- Critical reading - Reading for information transfer - Reading newspaper and magazine articles for critical commentary - Reading brochures, advertisements, pamphlets for improved presentation.

UNIT IV WRITING SKILL**9**

At the beginning of the semester, the students will be informed of a mini dissertation of 2000 words they need to submit individually on any non-technical topic of their choice. The parts of the dissertation will be the assignments carried out during the semester and submitted towards the end of the semester on a date specified by the department. This can be judged as part of the internal assessment.

UNIT V THINKING SKILL**9**

Practice in preparing thinking blocks to decode diagrammatical representations into English words, expressions, idioms and proverbs - Inculcating interest in English using thinking blocks. Making pictures and improvising diagrams to form English words, phrases and proverbs -- Picture reading.

TOTAL: 45**REFERENCE BOOKS:**

1. Raman, Meenakshi, and Sangeetha Sharma. Technical Communication: English Skills for Engineers. 2nd edition. New Delhi: Oxford University Press, 2010.
2. Riordian, Daniel. Technical Communication. New Delhi. Cengage Learning, 2009

WEBSITES:

1. British: Learn English - British Council (Listen & Watch) - <http://learnenglish.britishcouncil.org>
2. American: Randall's ESL Cyber Listening Lab - <http://www.esl-lab.com/>.
3. Intercultural: English Listening Lesson Library Online <http://www.elllo.org>

Equipments required

1. Career Lab:1 room
2. 2 Computers as a Server for Labs (with High Configuration)
3. LCD Projectors - 4 Nos
4. Headphones with Mic (i-ball) - 100 Nos
5. Speakers with Amplifiers, Wireless Mic and Collar Mic - 2 Sets
6. Teacher table, Teacher Chair - 1 + 1
7. Plastic Chairs - 75 Nos

Semester - III
MAA211 NUMERICAL METHODS

L	T	P	C
3	1	0	4

GOAL

To create the awareness and comprehensive knowledge in numerical solutions.

OBJECTIVES

The course should enable the students to:

1. Learn the techniques of solving the algebraic and transcendental equations.
2. Learn to interpolate using Newton's forward and backward difference formulae for equal and unequal intervals
3. Understand the use of numerical differentiation and understands to find the approximate area using numerical integration.
4. Understand solving numerically the initial value problems for ordinary differential equations using single step and multi-step method.
5. Learn the methods of solving second order partial differential equations numerically and use it to solve initial and boundary value problems for partial differential equations.

OUTCOME

The students will be able to:

1. Find out the roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations by direct and indirect methods.
2. Solve problems where huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values.
3. Use the numerical differentiation and integration when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.
4. Solve engineering problems which are characterized in the form of nonlinear ordinary differential equations, since many physical laws are couched in terms of rate of change of one independent variable
5. Solve the initial and boundary value problems related heat flow, both one and two dimensional and vibration problems. Understands the numerical techniques of solving the partial differential equation in engineering applications.

UNIT I SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS

12

Linear interpolation methods (method of false position) - Newton's method - Statement of Fixed Point Theorem - Fixed point iteration: $x=g(x)$ method. Solution of linear algebraic system of equations - Direct methods - Gauss-Jordon method and Crout's method - Iterative method: Gauss-Seidel method.

UNIT II INTERPOLATION AND APPROXIMATION **12**

Interpolation - equal intervals - Newton's forward and backward difference formulae - problems. Interpolation-unequal intervals - Newton's divided difference formula - Lagrange's and inverse interpolation-problems.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION **12**

Numerical differentiation - Newton's forward and backward difference - Divided differences and finite differences - Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules. Two and Three point Gaussian quadrature formulae - Double integrals using trapezoidal and Simpson's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS **12**

Single step methods: Taylor series method - first order-second order and simultaneous - Euler and Modified Euler methods. Fourth order Runge - Kutta method for solving first and second order equations - Multi-step methods: Milne's and Adam's predictor and corrector methods.

UNIT V INITIAL AND BOUNDARY VALUE PROBLEMS FOR PARTIAL DIFFERENTIAL EQUATIONS **12**

Finite difference solution of second order ordinary differential equation - classification of partial differential equations - Finite difference solution of two dimensional heat flow equations Laplace and Poisson equations. One dimensional heat equation by explicit and implicit methods - One dimensional wave equation.

TOTAL: 60

TEXT BOOKS:

1. Kandasamy P, Thilagavathy K, Gunavathy K, "Numerical Methods", S.Chand Co. Ltd., New Delhi, 2003.
2. Chandrasekaran A. and Beena James, "Numerical Methods", Dhanam publications, Chennai, 2011.

REFERENCES:

1. Burden R.L, and Faires T.D, "Numerical Analysis", Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.
2. Gerald C.F, Wheatley P.O, "Applied Numerical Analysis", Sixth Edition, Pearson Education Asia, New Delhi, 2002.
3. Balagurusamy E, "Numerical Methods", Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 1999.

CEB201 MECHANICS OF SOLIDS

L	T	P	C
3	1	0	4

GOAL

To introduce the concepts of force, stress, equilibrium, deformation, strain, compatibility, and stress-strain behaviour of materials to the students.

OBJECTIVES

The course should enable the students to:

1. Understand the Stress -Strain behaviour of materials.
2. Understand the concepts in the analysis of plane trusses and thin cylinders/shells.
3. Get knowledge on shear force and bending moment.
4. Get knowledge on the deflection and shear stress distribution in the beams.
5. Understand the concepts of torsion in shafts.

OUTCOME

The students will be able to:

1. Describe the different types of state of stresses acting on rigid bodies. .
2. Analyse simple trusses and calculate the reactions and internal forces which can be used for the design of members.
3. Draw the Shear force and bending moment diagrams for determinate beams for different loading conditions which is needed for the analysis of structures.
4. Find out the deflection of determinate beams and shear stress distribution for different types of sections
5. Differentiate the types of springs and shafts and also to find out the deflection of springs and torsion in solid and hollow shafts.

UNIT I STRESS STRAIN AND DEFORMATION OF SOLIDS, STATES OF STRESS 9

Rigid bodies and deformable solids - stability, strength, stiffness - tension, compression and shear stresses - strain, elasticity, Hooke's law, limit of proportionately, modulus of elasticity, stress-strain curve, lateral strain - temperature stresses - deformation of simple and compound bars - shear modulus, bulk modulus, relationship between elastic constants - biaxial state of stress - stress at a point - stress on inclined plane - principal stresses and principal planes - Mohr's circle of stresses.

UNIT II ANALYSIS OF PLANE TRUSS, THIN CYLINDERS / SHELLS 9

Stability and equilibrium of plane frames - types of trusses - analysis of forces in truss members method of joints- thin cylinders and shells

UNIT III TRANSVERSE LOADING ON BEAMS 9

Beams - types of supports - simple and fixed, types of load - concentrated, uniformly distributed, varying distributed load, combination of above loading - relationship between bending moment and shear force - bending moment, shear force diagram for simply supported, cantilever and over hanging beams - Theory of simple bending - analysis of stresses - load carrying capacity of beams.

UNIT IV DEFLECTION OF BEAMS AND SHEAR STRESSES 9

Deflection of beams - double integration method - Macaulay's method -variation of shear stress - shear stress distribution in rectangular, I sections, solid circular sections, hollow circular sections, angle and channel sections- shear centre.

UNIT V TORSION AND SPRINGS 9

Stresses and deformation in circular (solid and hollow shafts) - stepped shafts - shafts fixed at both ends- stresses in helical springs - deflection of springs.

TOTAL = 60

TEXT BOOKS:

1. R K Bansal, Sanjay Bansal" Strength of Materials" ,Laxmi Publications, 2015
2. V.N. Vazirani, M.M.Ratwani, "Analysis of Structures", Vol-1, Khanna Publishers, New Delhi, 2007

REFERENCES:

1. Kazimi S.M.A, Solid Mechanics, Tata McGraw-Hill Publishing Co, New Delhi, 2003.
2. William Nash, Theory and Problems of Strength of Materials, Schaum's Outline Series, McGraw-Hill International Edition. 2013
3. Srinath L.N, Advanced Mechanics of Solids, Tata McGraw-Hill Publishing Co., New Delhi, 2010.
4. Egor G. Popov, Engineering Mechanics of Solids, Prentice Hall of India, New Delhi, 2009.

CEB202 MECHANICS OF FLUIDS

L	T	P	C
3	1	0	4

GOAL

To introduce the students to basic concepts of the properties of fluid and properties of flow. The concept of model analysis is also introduced.

OBJECTIVES

The course should enable the students to :

1. Understand the properties of fluid.
2. Understand the properties of flow.
3. Understand the principles of Bernoulli's Theorem.
4. Be acquainted with the losses of flow in pipes.
5. Be acquainted with the principles of model analysis.

OUTCOME

The students will be able to:

1. Relate to the properties of fluid.
2. Describe how the different flows can be analysed and measured.
3. Describe the principles and application of Bernoulli's theorem.
4. Identify the losses in pipes.
5. Develop models based on dimensional and model analysis.

UNIT I DEFINITIONS AND FLUID PROPERTIES 5

Definitions - Fluid and fluid mechanics - Dimensions and units - Fluid properties.

UNIT II FLUID STATICS & KINEMATICS 10

Hydrostatic equation - Forces on plane surfaces- Pressure measurement .Stream, streak and path lines - Classification of flows - Continuity equation.

UNIT III FLUID DYNAMICS 10

Euler and Bernoulli's equations - Application of Bernoulli's equation - Discharge measurement - Laminar flows through pipes- Turbulent flow - Darcy-Weisbach formula - Moody diagram.

UNIT IV FLOW THROUGH PIPES 10

Major and minor losses of flow in pipes - Pipes in series and in parallel.

UNIT V SIMILITUDE AND MODEL STUDY 10

Dimensional Analysis - Rayleigh's method, Buckingham's Pi-theorem - Similitude and models.

TOTAL: 60

TEXT BOOKS:

1. Dr. R.K. Bansal "Fluid Mechanics and Hydraulic Machines", Laxmi Publication, 9th edition, 2017.
2. Rajput, R.K., "A text book of Hydraulic Machines", S. Chand Publications, Sixth edition, 2016

3. Garde, R.J. and Mirajgaoaker, A.G., "Engineering Fluid Mechanics", Scitech Pub (2010)
4. Fox, Robert, W. and Macdonald, Alan,T., "Introduction to Fluid Mechanics", John Wiley & Sons, 2011

REFERENCES:

1. Streeter, Victor, L. and Wylie, Benjamin E., "Fluid Mechanics", McGraw-Hill Ltd., 2010.
2. E. John Finnemore "Fluid Mechanics with Engineering Applications", McGraw-Hill International Edition, 2010
3. Pernard Messay, "Mechanics of Fluids" Nelson Thornes Ltd. U. K. 2005

CEB203 CONSTRUCTION TECHNIQUES, EQUIPMENT AND PRACTICES

L T P C
3 0 0 3

GOAL

To make the students aware of the various construction techniques, practices and the equipments needed for different types of construction activities.

OBJECTIVES

The course should enable the students to :

1. Be acquainted with different construction practices used in building construction.
2. Understand the various practices in sub structure construction.
3. Understand the various practices in super structure construction.
4. Understand the techniques adopted in special structures.
5. Familiarize with the various construction equipment used in the construction industry.

OUTCOME

The students will be able to:

1. Develop knowledge in the sequence of construction and various erection techniques.
2. Describe jacking, piling, dewatering and grouting techniques adopted for substructure construction.
3. Apply the techniques of launching of girders, bridge decks, construction sequences in cooling towers, silos, chimney, sky scrapers and erection of articulated structures, braced domes and space decks.
4. Choose suitable techniques for the construction of special structures.
5. Develop knowledge in various equipment needed for construction.

UNIT I CONSTRUCTION PRACTICES

15

Specifications, details and sequence of activities and construction co-ordination - Site Clearance - Marking - Earthwork - masonry - stone masonry - concrete hollow block masonry - flooring - damp proof courses- laying brick -- weather and water proof - roof finishes - construction joints - movement and expansion joints - pre cast pavements - Building foundations - basements - temporary shed - centering and shuttering sheet piles - slip forms.

UNIT II SUB STRUCTURE CONSTRUCTION

15

Techniques of Box jacking - Pipe Jacking -under water construction of diaphragm walls and basement-Tunneling techniques - Piling techniques- driving well and caisson - Dewatering-- well points- sinking cofferdam - cable anchoring and grouting-driving diaphragm walls, sheet piles - shoring for deep cutting

UNIT III SUPER STRUCTURE CONSTRUCTION

15

Launching girders, bridge decks, off shore platforms - special forms for shells - techniques for heavy decks -Introduction to pre-stressing and Post tensioning, aerial transporting handling - erection of transmission towers.

UNIT IV CONSTRUCTION PRACTICES – SPECIAL STRUCTURES 15

Scaffoldings - de-shuttering forms - Fabrication and erection of steel trusses - air conditioning - acoustic and fire protection. Construction sequences in cooling towers, silos, chimney, sky scrapers, bow string bridges, cable stayed bridges -Support structure for heavy Equipment and conveyors -Erection of articulated structures, braced domes and space decks

UNIT V CONSTRUCTION EQUIPMENT 10

Selection of equipment for earth work - earth moving operations - types of earthwork equipment - tractors, motor graders, scrapers, earth movers - Equipment for foundation and pile driving. Equipment for compaction, batching and mixing and concreting - Equipment for material handling and erection of structures - Equipment for dredging, trenching, tunneling, drilling, blasting -- dewatering and pumping equipment - Transporters.

TOTAL = 60

TEXT BOOKS:

1. Varghese , P.C. Building construction, Prentice Hall of India Pvt. Ltd, New Delhi, 2nd revised edition, 2016.
2. M.S Shetty, "Concrete Technology Theory and Practice", S. Chand & Company Ltd., 2012
3. Arora S.P. and Bindra S.P., Building Construction,, Dhanpat Rai and Sons, 2010.
4. P.Purushothama Raja, Construction Techniques Equipment and practice, Sri Krishna Publishers, Chennai 2012
5. Peurifoy.R.L, Construction Planning Equipments and methods, Mc Graw Hill 2013

REFERENCES:

1. Gambhir, M.L, Concrete Technology, Mc Graw Hill India, 2013
2. J Jha, "Contruction and Foundation Engineering", Khanna Publishers, 2004
3. Sharma S.C. "Construction Equipment and Management", Khanna Publishers New Delhi, 2008.
4. Deodhar, S.V. "Construction Equipment and Job Planning", Khanna Publishers, New Delhi, 2012.
5. Dr. S. Seetharaman, Er. M. Chinnasamy "Construction Techniques, Equipment and Practices: Anuradha Publications, 2016

CEB204 ENVIRONMENTAL ENGINEERING

L	T	P	C
3	0	0	3

GOAL

To make the students understand about the water borne diseases, important of water treatment including disinfection of water.

OBJECTIVES

The course should enable the students to:

1. Learn about the population forecasting methods, water demand, source identifications, transportation and treatment of surface water.
2. Know about the different operations and design of water treatment units and distribution network.
3. Study about sewerage system for collection and transmission of sewage.
4. Understand the design principles of sewage and sludge treatment.
5. Study about the safe disposal of sewage.

OUTCOME

The students will be able to:

1. Design the various water treatment units in the water supply system.
2. Describe the water treatment processes such as flocculating, sedimentation, filtration, disinfection etc.,
3. Design sewers for transmission of sewage and the pumping units.
4. Design sedimentation tanks, aeration tank, trickling filter, septic tank etc.,.
5. Apply the suitable technique for the disposal of sewage.

UNIT I WATER SUPPLY SYSTEMS – SOURCE & CONVEYANCE 6

Objectives – Population forecasting – Design period – Water demand– Sources of water and its characteristics – Source selection – Water quality parameters & significance – Standards of drinking water – Intake structures – Conveyance – Hydraulics of flow in pipes – Laying, jointing & testing of pipes – Pump selection – appurtenances

UNIT II DESIGN PRINCIPLES OF WATER TREATMENT 10

Objectives – Selection of unit operations and processes – Principles of flocculation, sedimentation, filtration, disinfection – Design principles of flash mixer, flocculator, clarifiers, filters – Disinfection devices – Softening – Demineralisation – Desalination – Iron removal – Defluoridation – Operation and Maintenance aspects - Residue Management

DISTRIBUTION

Requirements – Components – Lay Out of distribution networks- Service reservoir design – Analysis of distribution network – Hardy Cross method – Equivalent Pipe method – computer application – Leak detection

UNIT III SEWERAGE SYSTEM: COLLECTION & TRANSMISSION **10**

Sources of wastewater – Quantity of sanitary sewage – Storm runoff estimation – Wastewater characteristics and significance – Effluent disposal standover – Design of sewers – Computer applications – Laying, jointing and testing of sewers – Sewer appurtenances – Pump selection

UNIT IV SEWAGE TREATMENT & DESIGN PRINCIPLES **10**

Objectives – Selection of unit operation and process – Design principles of primary and secondary treatment, screen chamber, grit chamber, primary sedimentation tanks, activated sludge process – Aeration tank & oxidation ditch – Trickling filter - Stabilisation ponds – Septic tanks with soak pits – Sludge: treatment and disposal – Biogas recovery – Sewage farming

UNIT V DISPOSAL OF SEWAGE **9**

Standards of Disposal-Disposal on land – Disposal into water bodies – Oxygen sag curve – Streeter Phelp's model – Wastewater reclamation techniques

TOTAL = 45

TEXT BOOKS

1. Garg, S.K., "Environmental Engineering I & II", Khanna Publishers, New Delhi, 2010
2. Modi, P.N., "Environmental Engineering I & II", Standard Book House, Delhi, 2013
3. Duggal K.N., "Elements of Environmental Engineering" S.Chand and Co. Ltd., New Delhi, 2010.

REFERENCES

1. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 2015
2. Manual on Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi, 2013
3. Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi, 1987.
4. Metcalf and Eddy, M.C., "Wastewater Engineering – Treatment & Reuse", 4Th Edition, Mc Graw Hill India, 2005
5. Gray N.F, "Water Technology", Elsevier India Pvt. Ltd., New Delhi, 2006.
6. Birdie, G.S. and Birdie, Water Supply and Sanitary Engineering, Dhanpat Rai & Sons, 2010.

CEB231 COMPUTER AIDED BUILDING DRAWING

L T P C
0 0 3 1

GOAL

To introduce the students to draft the plan, elevation and sectional views of the buildings using Auto CADD

OBJECTIVES

The course should enable the students to:

- Develop the students to draft building drawings using Auto CADD.

OUTCOME

The students will be able to:

- Draft on computer building drawings Industrial buildings and framed structures (Plan, elevation and sectional views) in accordance with development and control rules satisfying orientation and functional requirements.

LIST OF EXPERIMENTS:

- Buildings with load bearing walls Including details of doors and windows. 12
 - RCC framed structures 9
 - Industrial buildings - North light roof structures - Trusses 12
 - Perspective view of one and two storey buildings 12
- TOTAL: 45**

TEXT BOOKS:

- B.P. Verma "Civil Engg. Drawing & House Planning" -, Khanna publishers, Delhi 2007
- V.B.Sikka " Civil engineering drawing" S.K.Kataria & sons.

REFERENCES:

- Building Drawing. Author, M. G. Shah. Edition, 5. Publisher, Tata McGraw Hill, 2012.
- Dr. N. Kumaraswamy, A. Kameswara Rao, Charotar Publishing- Building planning & Drawing, 2017
- Shah, Kale and Patki, Building Drawing, Tata McGraw-Hill, 2011

Examination Guideline

30% of the end semester examination paper shall deal with planning, while the rest 70% shall be based on the drafting skill

LIST OF EQUIPMENTS (For a batch of 30 students)

Sl. No.	Description of Equipments	Quantity
1.	Computer system of Pentium IV or equivalent	1 for each student
2.	Licensed version of any reputed Analysis, Design & Drafting software students	1 copy for a set of 3

CEB232 CONSTRUCTION MATERIALS LABORATORY

L **T** **P** **C**
0 **0** **3** **1**

GOAL

To introduce the students to various properties of the materials that is commonly used in civil engineering construction.

OBJECTIVES

The course should enable the students to: Conduct tests on various construction materials.

OUTCOME

The students will be able to:

Select the suitable construction materials and test the properties for various applications.

UNIT I TESTS ON BRICK

9

Compressive Strength - Water Absorption - Efflorescence.

UNIT II TESTS ON CEMENT

9

Specific gravity - Soundness - Consistency and Setting Times - Vicat - Le Chatelier's

UNIT III TESTS ON AGGREGATES

9

Crushing Strength - Impact Resistance - Flakiness Index.

UNIT IV CONCRETE

TESTS ON
9

Slump cone -Compaction Factor - Cube and Cylinder strength

UNIT V TESTS ON WOOD

9

Compressive Strength of wood-Perpendicular and Parallel to the grain

TOTAL: 45

LIST OF EQUIPMENTS

1. Universal Testing Machine - 400 KN capacity
2. Compression Testing Machine
3. Concrete mixer
4. Compaction Factor Apparatus
5. Slump cone apparatus
6. Aggregate Impact testing machine
7. Flexural Testing Machine
8. Le Chatelier's apparatus
9. Vibrating Table
10. Sieve shaker with accessories
11. Vibrating Table
12. Sieve shaker with accessories
13. Flow table
14. Mortar cube moulds (75mm x75mm x75mm)
15. Concrete cube moulds (150 mmx150mm x150mm)
16. Concrete cylinder moulds (150 mmx300mm)
17. Concrete Prism moulds

18. Pycnometer
19. Sieve Set
20. Trovels and mason pad
21. Weighing Machine
22. Weighing Balance

TEXT BOOKS :

1. M.S Shetty, "Concrete Technology Theory and Practice", S. Chand & Company Ltd., 2012
2. Varghese P.C, Building Materials, PHI, 2nd edition, 2015

REFERENCE :

1. R.K. Rajput, Engineering Materials, S. Chand & Company Ltd., 2014.

L	T	P	C	TCH
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PURPOSE:

The purpose of this course is to build confidence and inculcate various soft skills and to help Students to identify and achieve their personal potential.

INSTRUCTIONAL OBJECTIVES

1. To guide thought process
2. Appear for placement aptitude tests confidently
3. To develop Communication skill
4. To build confidence
5. Acquire aptitude skills for employment

METHODOLOGY:

The entire program is designed in such a way that every student will participate in the class room activities. The activities are planned to bring out the skills and talents of the students which they will be employing during various occasions in their real life.

1. Group Activities + Individual activities
2. Collaborative learning
3. Interactive sessions
4. Ensure participation
5. Empirical learning

LOGICAL REASONING:

Number, Letter series, Analogies- Coding, Decoding – Blood relations, direct sense, Operator based questions – Clock & Calendars
Distribution, Binary Logic and Puzzles – Arrangements, Selections.
Routes & Networks, Comparison – Cubes & Venn Diagrams.

VERBALABILITY:

Critical Reasoning – Antonym, Synonym
Odd man – fill in the blank
Sentence Construction / Completion – Idiomatic expression
Detection of errors.
Jumbled sentences, Vocabulary, Alphabetical sequence, cloze passage.

EVALUATION:

1. University Theory Question paper
2. Activities assessed by both group and individual participation
3. Continuous assessment based on daily participation

SCHEME OF INSTRUCTION:

Marks allocated for regular participation in all oral activities in class.

SCHEME OF EXAMINATION:

Complete internal evaluation on regular basis.

SEMESTER IV
CEB205 STRENGTH OF MATERIALS

L	T	P	C
3	1	0	4

GOAL

To develop a simple inventory to measure fundamental strength of materials (SOM) concepts such as stress, strain and buckling.

OBJECTIVES

The course should enable the students to :

1. Know the concept of strain energy.
2. Understand the concepts of indeterminate beams such as fixed beam, continuous beam, propped cantilever.
3. Understand the concept of short column and long column.
4. Understand the concept of state of stress in 3D and various failure theories.
5. Understand the concepts of bending of beams.

OUTCOME

The students will be able to:

1. Apply energy theorems and compute deflections in beams and trusses
2. Calculate the shear force and bending moment for indeterminate beams which is used for the design..
3. Calculate the critical load acting on the columns for various end conditions.
4. Calculate the principal stresses and principal strains using different theories of failures.
5. Analyse the beams with symmetrical, unsymmetrical sections and curved beams.

UNIT I ENERGY PRINCIPLES

9

Strain energy and strain energy density - strain energy in traction, shear in flexure and torsion - Castigliano's theorems - principle of virtual work - application of energy theorems for computing deflections in beams and trusses - Maxwell's reciprocal theorems

UNIT II INDETERMINATE BEAMS

9

Propped cantilever and fixed beams-fixed end moments and reactions for concentrated load (central, non central), uniformly distributed load, triangular load (maximum at centre and maximum at end) - theorem of three moments - analysis of continuous beams - shear force and bending moment diagrams for continuous beams.

UNIT III COLUMNS

9

Eccentrically loaded short columns - middle third rule - core section - columns of unsymmetrical sections - (angle channel sections) - Euler's theory of long columns - critical loads for prismatic columns with different end conditions; Rankine-Gordon formula for eccentrically loaded columns - thick cylinders - compound cylinders.

UNIT IV STATE OF STRESS IN THREE DIMENSIONS

9

Spherical and deviatoric components of stress tensor - determination of principal stresses and principal planes - volumetric strain - dilatation and distortion - theories of failure - principal stress - principal strain - shear stress - strain energy and distortion energy theories - application in analysis of stress, load carrying capacity and design of members -residual stresses

UNIT V ADVANCED TOPICS IN BENDING OF BEAMS**9**

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections - curved beams - Winkler Bach formula - stress concentration

TOTAL: 60**TEXT BOOKS:**

1. Dr.R.K.Bansal, "A Text Book of Strength of materials", Laxmi Publications, Fourth Edition, 2015
2. V.N. Vazirani, M.M.Ratwani, "Analysis of Structures", Vol-1, Khanna Publishers, New Delhi, (Paper back 2007).
3. R.K.Rajput, "Strength of materials", S. Chand , 2009
4. R. S. Khurmi, "Strength of Materials", S. Chand & Company Ltd, New Delhi, 2006

REFERENCES:

1. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co., New Delhi, 2003.
2. William Nash, "Theory and Problems of Strength of Materials", Schaum's Outline Series, McGraw Hill International Edition.
3. R.S. Khurmi, "Strength of Materials", S. Chand & Company Ltd, New Delhi, 2003
4. Egor P Popov, "Engineering Mechanics of Solids", Prentice Hall of India, New Delhi, 2009.

L T P C
3 1 0 4

GOAL

To gain adequate knowledge on Engineering Properties of soil.

OBJECTIVES

The course should enable the students to :

1. Develop an understanding of the index properties of soils and the various methods of soil classification.
2. Be acquainted with permeability, effective stress concepts and seepage through porous media and flownets.
3. Understand the stress distribution and types of settlement in soil.
4. Gain knowledge about the different tests carried to find out the shear strength of soil.
5. Be acquainted with stability analysis of slopes.

OUTCOME

The students will be able to:

1. Classify the soils based on their properties
2. Assess the permeability and seepage characteristics of soil.
3. Find out the settlement of soil based on the stress distribution.
4. Assess the shear strength of various types of soil.
5. Analyse the stability of slopes using different methods.

UNIT I INTRODUCTION

10

Nature of Soil - Problems with soil - phase relation - sieve analysis - sedimentation analysis - Atterberg limits - classification for engineering purposes - BIS Classification system - Soil compaction - factors affecting compaction - field compaction methods and monitoring.

UNIT II SOIL WATER AND WATER FLOW

8

Soil water - Various forms – Soil structure- Influence of clay minerals – Diffused Double Layer- Capillary rise - Suction - Effective stress concepts in soil - Total, neutral and effective stress distribution in soil - Permeability - Darcy's Law-Permeability measurement in the laboratory - quick sand condition - Seepage - Laplace Equation - Introduction to flow nets -properties and uses - Application to simple problems.

UNIT III STRESS DISTRIBUTION, COMPRESSIBILITY AND SETTLEMENT

10

Stress distribution in soil media - Boussinesque formula - stress due to line load and circular and rectangular loaded area - approximate methods - Use of influence charts - Westergaard equation for point load - Components of settlement - Immediate and consolidation settlement - - laboratory consolidation test - Field consolidation curve - Normal Consolidation and Over Consolidation clays - problems on final and time rate of consolidation

UNIT IV SHEAR STRENGTH

9

Shear strength of cohesive and cohesionless soils - Mohr - Coulomb failure theory - Saturated soil and unsaturated soil (basics only) - Strength parameters - Measurement of shear strength, direct shear, Triaxial compression, UCC and Vane shear tests - Drained and undrained behaviour of clay and sand

Slope failure mechanisms - Modes - Infinite slopes - Finite slopes - Total and effective stress analysis - Stability analysis for purely cohesive and C- soils - Method of slices - Friction circle method - stability number - problems - Slope protection measures.

TOTAL = 60

TEXT BOOKS

- Punmia B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd., New Delhi, 16th Edition, (2005).
- Gopal Ranjan and Rao A.S.R., "Basic and applied soil mechanics", New Age International Publishers, New Delhi, 2006.
- Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers,, New Delhi 2010

REFERENCES

- Coduto, D.P., "Geotechnical Engineering Principles and Practices", Prentice Hall of India Private Limited, New Delhi, 2002.
- McCarthy D.F., "Essentials of Soil Mechanics and Foundations Basic Geotechniques", Sixth Edition, Prentice-Hall, New Jersey, 2002.
- Das, B.M, "Principles of Geotechnical Engineering", (fifth edition), Thomas Books/ cole, 2002
- Muni Budhu, "Soil Mechanics and Foundations", Wiley- Blackwell, Inc, New York, 2015
-

CEB207 DESIGN OF CONCRETE STRUCTURES - I

L **T** **P** **C**
3 **1** **0** **4**

GOAL

To introduce the different types of philosophies related to design of Reinforced Concrete Structures and design of basic elements such as slab, beam, column and footing which form part of any structural system.

OBJECTIVES

The course should enable the students to :

1. Know the methods of design of concrete structures.
2. Understand the limit state design of slab and beam.
3. Know the behavior of RC beam in shear and torsion.
4. Get the concept of Limit state design of columns.
5. Understand the Limit State design of footings and masonry structures.

OUTCOME

The students will be able to:

1. Describe the concept of elastic, ultimate, working stress and limit state method of design of concrete structures.
2. Design one way, two way, rectangular slab, singly and doubly reinforced rectangular beam and flanged beam by Limit State Method.
3. Design RC members for combined bending shear and torsion using Limit State Method.
4. Analyse and design short and long columns.
5. Design axially and eccentrically loaded rectangular and combined footing.

UNIT I METHODS OF DESIGN OF CONCRETE STRUCTURES 9

Concept of elastic method ultimate load method and limit state method- advantages of limit state method over other methods-design codes and specification -Introduction to working stress method-IS 456 - limit state philosophy as detailed in current IS code

UNIT II LIMIT STATE DESIGN FOR FLEXURE 9

Analysis and design of one way and two way slabs - rectangular slab subjected to uniformly distributed and concentrated loads - boundary conditions and corner effects - singly and doubly reinforced rectangular and flanged beams - design aids for flexure-deflection and crack width control.

UNIT III LIMIT STATE DESIGN FOR SHEAR, TORSION, BOND AND ANCHORAGE 9

Behaviour of RC beams in shear and torsion-shear and torsion reinforcement-limit state design of RC members for combined bending shear and torsion- use of design aids.

UNIT IV LIMIT STATE DESIGN OF COLUMNS 9

Types of columns-analysis and design of short columns for axial un axial and bi axial bending- design of long columns- use of design aids

9

UNIT V LIMIT STATE DESIGN OF FOOTINGS

Design of wall footing-design of axially and eccentrically loaded rectangular footing-design of combined rectangular footing for two columns only.

TOTAL = 60

TEXT BOOKS:

- N. Krishnaraju, and R. N.Pranesh," Reinforced Concrete Design", New Age International Pvt. Ltd., 2009
- Varghese P C, Limit State Design of Reinforced Concrete, Prentice Hall of India, Private, Limited New Delhi,2010.
- Gambhir.M.L., "Fundamentals of Reinforced Concrete Design", Prentice Hall of India Private Limited, New Delhi, 2011.

REFERENCES:

- Prab Bhatt, T.J. MacGinley, Ban SengChoo, "Reinforced Concrete Design: Design Theory and Examples", Third Edition, 2006, CRC Press, Taylor & Francis Group, U.S.
- Sinha, S.N., "Reinforced Concrete Design", Third Edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2014
- Punmia B.C, Ashok Kumar Jain, ArunK.Jain, "R.C.C. Designs Reinforced Concrete Structures", Laxmi Publications Pvt. Ltd., New Delhi, 2012
- UnnikrishnaPillai, S., DevdasMenon, "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., 2009
- Subramanian,N.,"Design of Reinforced Concrete Structures",Oxford University Press, New Delhi, 2013.
- IS 456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, 2000
- SP16, IS 456:1978 "Design Aids for Reinforced Concrete to Bureau of Indian Standards, New Delhi, 1999
- IS 456:2000 and SP 16 are permitted in the Examination.

L	T	P	C
3	1	0	4

GOAL

To introduce the students to the basic concepts of open channel flow and to provide the students with skills to design Hydraulic Mechanics.

OBJECTIVES

The course should enable the students to:

- Understand the principles behind open channel flow.
- Differentiate between uniform and non- uniform flow.
- Throw light on impulse momentum principle.
- Be acquainted with the design the concepts of turbines.
- Be familiar with the design the concepts of pumps.

OUTCOME

The students will be able to:

- Describe the principles of most economical sections.
- Identify the gradually varied flow profiles.
- Apply the velocity triangle concepts to find out the force & power of hydraulic machines.
- Describe the different types of turbines and their performance.
- Describe the principles of pumps and their applications.

UNIT I OPEN CHANNEL FLOW**9**

Open channel flow - Types of flow - Velocity distribution in open channel - Wide open channel - Specific energy - Critical flow and its computation.

UNIT II UNIFORM AND NON UNIFORM FLOW**9**

Uniform flow - Velocity measurement - Manning's and Chezy's formula - Determination of roughness coefficients -Most economical rectangular and trapezoidal sections- Hydraulic Jumps.

UNIT III IMPULSE MOMENTUM PRINCIPLE**9**

Application of momentum principle - Introduction to impact of jets on vanes - velocity triangles.

UNIT IV TURBINES**9**

Turbines - classification - Impulse and Reaction turbines - draft tube and cavitations - performance of turbines.

UNIT V PUMPS**9**

Centrifugal pump - multistage Pumps - Jet and submersible pumps - reciprocating pump - negative slip - flow separation conditions - air vessels -indicator diagram.

TOTAL = 60**TEXT BOOKS:**

- Subramanyam K., "Flow in Open channels", Tata McGraw-Hill Publishing Company, 2015.
- P.N.Modi,S.M.Seth," Hydraulics and Fluid Mechanics", Standard Book House,15th Edition,2005

- R.K. Bansal "Fluid Mechanics and Hydraulic Machines", Laxmi Publication (P) Publishing House (P) Ltd.,9 th Edition 2010.

REFERENCES:

- Ven Te Chow, "Open-Channel Hydraulics", The Blackburn Press; 2009
- Ramamirtham S., "Fluid Mechanics, Hydraulics and Fluid Machines", Dhanpat Rai & Sons, Delhi, 2006
- John A.Roberson, "Hydraulic Engineering", John Wiley & Sons, Incorporated, 2013.

CEB234 GEO TECHNICAL LABORATORY

L T P C
0 0 3 1

GOAL

To expose the students in testing of different types of soils and to determine its characteristics experimentally.

OBJECTIVES

The course should enable the students to :

Conduct experiments in different types of soils to determine the properties and characteristics.

OUTCOME

The students will be able to:

Identify the type of soil, test the soil and assess its Engineering and Index properties.

LIST OF EXPERIMENTS

1. Grain size distribution - Sieve analysis	3
2. Grain size distribution - Hydrometer analysis	3
3. Specific gravity of soil grains	3
4. Relative density of sands	3
5. Atterberg limits test	3
6. Determination of moisture - Density relationship using standard Proctor test.	3
7. Permeability determination (constant head and falling head methods)	3
8. Determination of shear strength parameters.	3
9. Direct shear test on cohesionless soil	3
10. Unconfined compression test on cohesive soil	3
11. Triaxial compression test	3
12. One dimensional consolidation test (Determination of co-efficient of consolidation only)	6
13. Field density test (Core cutter and sand replacement methods)	6

TOTAL : 45

REFERENCES

1. "Soil Engineering Laboratory Instruction Manual", Published by the Engineering College Co-operative Society, Chennai, 2002.
2. Head, K.H, "Manual of Soil Laboratory Testing, Whittles Publishing;3rd revised edition 2006
- 3.
4. Lambe T.W., "Soil Testing for Engineers", John Wiley and Sons, New York, 1990.
5. "I.S.Code of Practice (2720) Relevant Parts", as amended from time to time.

L T P C
0 0 3 1

GOAL

To get exposed to the functions of various hydraulic devices and machines.

OBJECTIVES

The course should enable the students to :

- To get exposed to the working of various hydraulic devices such as orifice meter, Venturimeter and notches.
- To get exposed to the working of various hydraulic machines such as pumps and turbines.

OUTCOME

The students will be able to:

- Describe the performance characteristics of turbines and pumps
- The students will be able to describe the performance characteristics of turbines and pumps.

LIST OF EXPERIMENTS

1. Determination of co-efficient of discharge for orifice
2. Determination of co-efficient of discharge for notches
3. Determination of co-efficient of discharge for venturimeter
4. Determination of co-efficient of discharge for orifice meter
5. Study of impact of jet on flat plate (normal / inclined)
6. Study of friction losses in pipes
7. Study of minor losses in pipes
8. Study on performance characteristics of Pelton turbine.
9. Study on performance characteristics of Francis turbine
10. Study on performance characteristics of Centrifugal pumps (Constant speed / variable speed)
11. Study on performance characteristics of reciprocating pump.

CEB236 SURVEY PROJECT

L T P C
0 0 8 3

GOAL

Five days shall be allotted for Survey Project. The record shall include all original field observations, calculations and plots. Survey project includes the following topics.

- Traversing
- Triangulation
- Setting out simple curves
- Contouring

EVALUATION PROCEDURE

1. Internal marks : 20 marks
(Decided by the staff in –charge appointed by the Hindustan University)
2. Evaluation of Survey Project Report : 30 marks
(Evaluated by the external examiner)
3. Viva-voce Examination : 50 marks
(Evaluated by the internal examiner appointed by the HOD External Examiner appointed by the University)

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PURPOSE:

The purpose of this course is to build confidence and inculcate various soft skills and to help Students to identify and achieve their personal potential.

INSTRUCTIONAL OBJECTIVES

1. To guide thought process
2. Appear for placement aptitude tests confidently
3. To develop Communication skill
4. To build confidence
5. Acquire aptitude skills for employment

METHODOLOGY:

The entire program is designed in such a way that every student will participate in the class room activities. The activities are planned to bring out the skills and talents of the students which they will be employing during various occasions in their real life.

1. Group Activities + Individual activities
2. Collaborative learning
3. Interactive sessions
4. Ensure participation
5. Empirical learning

QUANTITATIVE APTITUDE:

Sample Equation, Ratio, Proportion, Variation.
Percentage, Profit & Loss, Partnership.
Averages, Mixtures, Allegations: Simple & Compound Interest.
Time Work, Time Distance.
Geometry & Mensuration.
Permutation, Combination & Probability.
Data Interpretation & Data Sufficiency.

Analytical reasoning:
Non- Verbal Reasoning
Word problem

EVALUATION:

1. Activities assessed by both group and individual participation
2. Continuous assessment based on daily participation

SCHEME OF INSTRUCTION:

Marks allocated for regular participation in all oral activities in class.

SCHEME OF EXAMINATION:

Complete internal evaluation on regular basis.

SEMESTER V
CEB301 STRUCTURAL ANALYSIS - I

L	T	P	C
3	1	0	4

GOAL

To introduce the students to basic theory and concepts of Structural analysis and the classical methods as they require in the analysis of buildings.

OBJECTIVES

The course should enable the students to :

1. Understand the principles of analysis of determinate structures.
2. Impart knowledge in the analysis of the structural elements using the classical method of analysis.
3. Gain knowledge on different types of arches.
4. Study the concept of influence lines for the analysis of beams and trusses.

OUTCOME

The students will be able to :

1. Analyse the trusses and frames using principle of conservation of energy.
2. Analyse beams and frames using slope deflection method, which is the basic method of analysis..
3. Analyse the Multistorey buildings using the Moment Distribution method, which is an iterative method often used in the analysis of indeterminate structures.
4. Analyse Hinged and fixed arches used in the construction industry.
5. Analyse the structure for moving loads and to get the shear force and bending moment for any complex type of moving loads.

UNIT I DEFLECTION OF DETERMINATE STRUCTURES 9

Principles of virtual work for deflections - Deflections of pin-jointed plane frames and rigid plane frames - Williot diagram - Mohr's correction

UNIT II SLOPE DEFLECTION METHOD 9

Continuous beams and rigid frames (with and without sway) - Simplification for hinged end - Support displacements.

UNIT III MOMENT DISTRIBUTION METHOD 9

Distribution and carry over of moments - Stiffness and carry over factors - Analysis of continuous beams - Plane rigid frames with and without sway.

UNIT IV ARCHES 9

Arches as structural forms - Examples of arch structures - Types of arches - Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches - Settlement and temperature effects.

UNIT V MOVING LOADS AND INFLUENCE LINES (DETERMINATE & INDETERMINATE STRUCTURES) 9

Influence lines for reactions in statically determinate structures - influence lines for members forces in pin-jointed frames - Influence lines for shear force and bending moment in beam sections. Muller Breslau's principle - Influence lines for continuous beams and single storey rigid frames.

TOTAL: 60

TEXT BOOKS:

1. Vaidyanadhan, R and Perumal, "Comprehensive Structural Analysis - Vol. 1 & Vol. 2", P, Laxmi Publications, New Delhi, 2008
2. Ghali.A, Nebille, A.M. and Brown,T.G. "Structural Analysis" A unified classical and Matrix approach", CRC Press, 6 edition, 2009
3. S.S. Bhavikatti,Structural Analysis, Vol I & II, Vikas Publishing House Pvt. Ltd, 2011.

REFERENCES:

1. C.K. Wang, Tata McGraw-Hil,I Analysis of Indeterminate Structures
2. Devdas Menon, Structural Analysis, Narosa, Reprint 2016
3. L.S. Negi & R.S. Jangid, "Structural Analysis", Tata McGraw-Hill Publications, New Delhi, Sixth Edition, 2003.

CEB302 DESIGN OF CONCRETE STRUCTURES -II

L	T	P	C
3	1	0	4

GOAL

To give an exposure to advanced topics in structural design comprising of RCC retaining walls, water tanks, yield line theory and prestressed concrete structures.

OBJECTIVES

The course should enable the students to :

- Understand basic principles of different codes of practice.
- Understand the design and detailing of different types of water tanks.
- Know about the pre stressed concrete materials and systems.
- Get exposure to yield line theory of slabs.
- Have design knowledge related to structures that are likely to be encountered in professional practice.

OUTCOME

The students will be able to:

- Describe the design principles adopted in various codes.
- Design underground and overhead circular and rectangular water tanks.
- Gain knowledge on the prestressing methods and the design and analysis of pretensioned and post tensioned concrete beams and losses in prestress.
- Analyse square, rectangular and triangular slabs using yield line theory.
- Familiarise with the design principles of road bridges and design the flat slabs and staircases.

UNIT I INTRODUCTION TO INTERNATIONAL CODES

9

Introduction to British Codes, Euro codes, Canadian codes, American standards and other international codes of practices.

UNIT II WATER TANK

9

Underground rectangular tanks - Overhead circular and rectangular tanks - Design of staging and foundations.

UNIT III PRINCIPLES OF PRESTRESSING

9

Materials for prestressed concrete - Different methods and systems - introduction to prestressing and post tensioning- Uniform and non uniform prestressing - Losses in prestress - Analysis of simply supported beams with straight and parabolic tendons.

UNIT IV YIELD LINE THEORY

9

Application of virtual work method to Square, Rectangular and Triangular slabs.

UNIT V ADVANCED TOPICS

9

Design of staircases (ordinary and doglegged) - Design of flat slabs - Principles of design of road bridges for IRC loading.

TOTAL = 60

TEXT BOOKS:

- N. Krishnaraju, R.N.Pranesh, "Design of Reinforced Concrete Design" New Age International (P) Ltd. Publishers, 2009
- Punmia B.C, Ashok Kumar Jain, ArunK.Jain, R.C.C. Designs, Laxmi Publications, Tenth edition, 2015
- Varghese.P.C., "Advanced Reinforced Concrete Design", Prentice Hall of India Pvt. Ltd., New Delhi, 2012.

REFERENCES:

- Jaikrishna and O.P. Jain, Plain and Reinforced Concrete, Vol. I & II, Nemchand& Brothers, 2007.
- S.N.Sinha, "Reinforced Concrete Design", McGraw Hill Education, Third edition, 2017.
- Gambhir.M.L., "Design of Reinforced Concrete Structures", Prentice Hall of India Private Limited, 2012.
- Syal, I.C. and Goel, A.K., "Reinforced Concrete Structures", A.H. Wheelers & Co. Pvt. Ltd., 2013.
- Subramanian. N., "Design of Reinforced Concrete Structures", Oxford University, New Delhi, 2013.
- IS 456:2000, Code of practice for Plain and Reinforced Concrete, Bureau of Indian Standards, New Delhi, 2000, Ammended 2014.

NOTE: IS 456:2000, SP 16, IRC Bridge codes, BIS 3370, IS 1343 are permitted in the Examination

CEB303 TRANSPORTATION ENGINEERING

L **T** **P** **C**
3 **0** **0** **3**

GOAL

To introduce the various concepts and components of Highways, Airport, Railway, Dock and Harbour ,their geometric elements and design, and introduction to Monorails, MRTS, High Speed Rails.

OBJECTIVES

The course should enable the students to:

1. Understand the geometric design of highways.
2. Understand the concepts of traffic Engineering.
3. Understand the design principles of Railway track.
4. Get exposed to the Airport layout and its traffic layout.
5. Know about harbour engineering.

OUTCOME

The students will be able to:

1. Design the horizontal and vertical alignments, sight distances and to understand the IRC recommendations for the geometric design of highways
2. Describe the concepts of Traffic Engineering
3. Design the railway track and describe the materials used.
4. Prepare airport layout and design traffic control
5. Describe various components of Harbour and docks.

UNIT I GEOMETRIC DESIGN OF HIGHWAYS

9

Design of Horizontal Alignments - Super elevation, Widening of Pavements on Horizontal Curves and Transition Curves [Derivation of Formulae and Problems] Design of Vertical Alignments - Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves Sight Distances - Factors affecting Sight Distances, PIEV theory, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination Sight Distance [Derivations and Problems in SSD and OSD] Geometric Design of Hill Roads [IRC Standards Only]

UNIT II TRAFFIC ENGINEERING

9

Road User Characteristics – Vehicular Characteristics – Traffic Studies – Volume Count – Spot Speed – Traffic Flow Characteristics – Traffic Capacity Studies – Speed, Volume, Density – Traffic Signs – Intersection – At Grade- Channelised – Rotary – Grade Separators.

UNIT III RAILWAY TRACK DESIGN AND CONSTRUCTION

9

Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks Sleepers – Functions, Materials, Density Ballasts – Functions, Materials, Ballastless Tracks

Geometric Design of Railway Tracks – Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal and Vertical Curves (Derivations of Formulae and Problems) , Points and Crossings - Design of Turnouts-Level Crossings. Introduction to mono rail, high speed rail and MRTS

UNIT IV AIRPORT LAYOUTS, VISUAL AIDS, AND AIR TRAFFIC CONTROL 9

Airport Layouts – Apron, Terminal Building, Hangers, Motor Vehicle Parking Area and

Circulation Pattern, Case studies of Airport Layouts Airport Buildings – Primary functions, Planning Concept, Principles of Passenger Flow, Passenger Facilities Visual Aids – Runway and Taxiway Markings, Wind Direction Indicators, Runway and Taxiway Lightings Air Traffic Control – Basic Actions, Air Traffic Control Network Helipads, Hangars, Service Equipments.

UNIT V HARBOUR ENGINEERING & OTHER MODES OF TRANSPORT 9

Definition of Terms - Harbours, Ports, Docks, Tides and Waves, Littoral Drift, Sounding, Area, Depth, Satellite Ports Requirements and Classification of Harbours Site Selection & Selection Investigation

Construction Materials, Coast Lines Dry and Wet Docks,, Planning and Layouts Entrance, Position of Light Houses, Navigating Terminal Facilities – Port Buildings, Warehouse, Transit Sheds, Inter-modal Transfer Facilities, Mooring Accessories, Navigational Aids Coastal Structures- Piers, Breakwaters, Wharves, Jetties, Quays, Spring Fenders Coastal Shipping

TOTAL = 45

TEXT BOOKS :

1. Khanna K,Justo C E G Justo and Veeraraghavan A Highway Engineering, Khanna Publishers, Roorkee, 2014.
2. Alok Kumar, Goel, Highway Engineering, S.K Kataria & Sons, 2016
3. Kadiyali L R,Traffic Engineering and Transport Planning,Khanna publishers,2011.
4. Dr.Purushothama raj, Railways, Airports and Harbour Engineering,Sri Krishna Hitech Publishing Company Pvt.Ltd,2013
5. Saxena Subhash C and Satyapal Arora, A Course in Railway Engineering, Dhanpat Rai and Sons, Delhi, 2011.

REFERENCES:

1. Kadiyali L R & N.B. Lal, Principles and Practice of Highway Engineering, Khanna Publishers, 2005
2. Rangwala, Airport Engineering, Charotar Publishing House, 1996.
3. Oza and Oza, "A course in Docks & Harbour Engineering"
4. Bureau of Indian Standards (BIS) Publications on Highway Materials
5. Specifications for Road and Bridges, MORTH (India)
6. Guidelines for the Design of Flexible Pavements, IRC:37 - 2001, The Indian roads
7. Guideline for the Design of Rigid Pavements for Highways, IRC:58-2011, The Indian Roads Congress, New Delhi.

ELA331 COMMUNICATION SKILLS & PERSONALITY DEVELOPMENT

L	T	P	C
0	0	2	1

GOAL

The goal of the programme is to provide the learners with the methods and materials required for becoming accomplished personalities through the medium of English.

OBJECTIVES

The course is expected to enable students to:

1. Be aware of self-knowledge by exposure to soft skills, values, behaviour, attitudes, temperamental changes, and a positive attitude to life.
2. Learn personality traits and undergo personality tests to determine their own personality characteristics and the scope for improvement.
3. Cultivate the art of speaking fluently making use of proper gestures, tone and voice modulation, adding humour to the speech.
4. Figure out the need to work in teams, adorn or accept team leadership, and make use of body language to enhance team spirit.
5. Be familiar with the art of managing self, people, work and time, keeping in mind problems like time-wasters and stress-builders.

OUTCOME

The students will be able to:

1. Apply the knowledge gained to improve upon their values, behaviour, attitude, and develop the soft skills required for home, workplace and the society.
2. Employ the concept of personality traits and build up an accomplished personality that would be pleasing to people around so as to influence them positively.
3. Develop a personal style and communicate fearlessly and effectively in a convincing manner so as to impress listeners or the audience.
4. Participate in presentations, group discussions, debates and mock interviews making good use of language skills and interpersonal relationships.
5. Comprehend stress-management tips to overcome stress-prone habits and develop a career plan with personal, familial and societal goals for success.

UNIT I

12

Values and attitudes - Value-formation - Values & education - Terminal & Instrumental values - Civic responsibilities - The power of Personal/ Cultural/ Social values -- Behaviour and attitudes -- Features of attitudes - Developing positive attitude - Overcoming negative attitude -- People skills - Soft skills as per the Work Force Profile - The four temperaments - Sanguine - Choleric - Melancholic - Phlegmatic -- Tests for Personal Chemistry.

UNIT II

12

What is personality development? - Types of personalities as per (i) Heredity (ii) Environment (iii) Situation - the 16 personality factors - MBTI Tests - Personality types - Increasing self awareness: Assessing one's locus of control, Machiavellianism, self-esteem, self-monitoring, risk-taking, Type A, Type B personality elements - Intellectual and physical abilities for jobs -- Personality tests.

UNIT III**12**

Developing the art of speaking - How to get rid of stage fright? - Enhancing fluency - Modulating voice

- Enunciation - Positive and negative gestures - Preparation - How to begin? - How to convince the listeners? - How to wind up the speech? - Adding humour and illustration - Developing one's own style

- Types of style - How to influence the audience? - How to become an effective speaker? -- Tests for effective speaking.

UNIT IV**12**

Team work - Team building - Team leadership -- How to face an interview? -- How to participate in a group discussion? - How to argue for or against in a debate? - Body language - Non-verbal communication - Personal appearance - Facial expression - Posture - Gestures - eye contact - Etiquette - Voluntary and involuntary body language - Gender implications -- Tests.

UNIT V**12**

Managing self, people, work, situations - Time-management - Secrets of time-management - Time-wasters - Stress -- Kinds of stress - Spotting stress - Stress-builders - Stress - management tips - Stress-prone habits -- Goals - Career planning - Interpersonal interaction - Interpersonal relationships -- Tests.

TOTAL : 60**REFERENCES:**

- Burlington, V.T. Group Interaction in High Risk Environments. Ashgate Publication, 2004.
- Fisher, Kimball. Leading Self-directed Work Teams: A Guide to Developing New Team Leadership Skills. New York, NY: McGraw Hill, 2000.
- Ted W. Engstrom and R. Alec Mackenzie. Managing Your Time: Practical Guidelines on the Effective Use of Time. 2008.
- Study material will be prepared by the Department of Languages.
- Tests suggested will be prepared by a senior faculty of the department.
- Movies will be screened to discuss and debate on the topics introduced in each unit.

LABORATORY REQUIREMENTS:

- Career Lab:1 room
- 2 Computers as a Server for Labs (with High Configuration)
- Headphones with Mic (i-ball) - 100 Nos
- Speakers with Amplifiers, Wireless Mic and Collar Mic - 2 Sets
- Teacher table, Teacher Chair - 1 + 1
- Plastic Chairs - 75 Nos

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GOAL

To expose the testing of different materials under the action of various forces and to determine the characteristics experimentally.

OBJECTIVES

The course should enable the students to:

Understand different methods available for testing materials under the action of various forces like axial compression axial tension, torsion, flexure, shear etc.

OUTCOME

The students will be able to:

Identify the material and its mechanical properties such as strength, stiffness , hardness, modulus of elasticity etc.

LIST OF EXPERIMENTS

1. Tension Test on Mild Steel bars
2. Compression Test on Concrete cubes and cylinders
3. Torsion test on Mild steel bars
4. Bending Test on Wood
5. Tests on springs
6. Hardness tests
7. Shear test
8. Test for impact resistance
9. Verification of Maxwell's Reciprocal Theorem
10. Determination of Modulus of Elasticity of Concrete using Strain gauges.

LIST OF EQUIPMENTS (For a batch of 30 students)

Sl. No.	Description of Equipments	Quantity
1.	UTM of 100 ton capacity	1
2.	Torsion testing machine for steel rods	1
3.	Izod Impact Testing machine	
4.	Hardness testing machine (Rockwell , Brinell)	1
5.	Spring Testing Machine	1
6.	Beam deflection test apparatus	1
7.	Extensometer	1
8.	Compressometer	1
9.	Dial gauges	few

CEB332 DESIGN PROJECT I

L **T** **P** **C**
0 **0** **8** **3**

GOAL

To impart and improve the design capability of the students in any one of the disciplines of Civil Engineering.

OBJECTIVES:

The course should enable the students to :

- Impart and improve the design capability of the students in any one of the disciplines of Civil Engineering

OUTCOME:

The students will be able to:

- Design Environmental Structures, Transportation systems, concrete structural elements and hydraulic structures.

EVALUATION PROCEDURE

The method of evaluation will be as follows:

1.	Internal Marks (Decided by conducting 3 reviews by the guide appointed by the Institution)	: 20 marks
2.	Evaluation of Project Report (Evaluated by the external examiner appointed by the University). Every student belonging to the same group gets the same mark	: 30 marks
3.	Viva voce examination	: 50 marks

(Evaluated by the internal examiner appointed by the HOD, external examiner appointed by the University and Guide of the course - with equal Weightage)

The design problem can be allotted to either an individual student or a group of students comprising of not more than six. At the end of the course the group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings which follow the design.

SEMESTER VI
CEB304 STRUCTURAL ANALYSIS – II

L	T	P	C
3	1	0	4

GOAL

To introduce the students to basic theory and concepts of structural analysis and, the classical methods of analysis of buildings.

OBJECTIVES:

The course should enable the students to :

1. Understand the constraints in beams, frames and truss elements thus select suitable analysis method for analysis.
2. Understand matrix approach for analysis of complex engineering problems which incorporates solution for unknown forces and moments
3. Understand the concepts involved in Finite Element Analysis
4. Understand the plastic behavior of structural elements.
5. Understand and infer the nature of forces in arches, cables and suspension bridges.

OUTCOME:

The students will be able to:

1. Analyse beams, trusses and frames using Force method of analysis, which is an advanced method of structural analysis.
2. Analyse structures using Stiffness method of analysis, which is the basis for software analysis.
3. Apply basics of finite element analysis to use new sophisticated softwares.
4. Analyse the different types of beams and portal frames with the concept of plastic analysis.
5. Analyse space frames, cables and suspension bridges and determine the forces acting on the members.

UNIT I FLEXIBILITY METHOD FOR INDETERMINATE FRAMES 9

Equilibrium and compatibility - Determinate Vs Indeterminate structures - Indeterminacy - Primary structure - Compatibility conditions - Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames (with redundancy restricted to two).

UNIT II MATRIX STIFFNESS METHOD 9

Element and global stiffness matrices - Analysis of continuous beams - Co-ordinate transformations - Rotation matrix - Transformations of stiffness matrices, load vectors and displacements vectors - Analysis of pin-jointed plane frames and rigid frames.

UNIT III PLASTIC ANALYSIS OF STRUCTURES 9

Statically indeterminate axial problems - Beams in pure bending - Plastic moment of resistance - Plastic modulus - Shape factor - Load factor - Plastic hinge and mechanism - Plastic analysis of indeterminate beams and frames - Upper and lower bound theorems

UNIT IV SPACE AND CABLE STRUCTURES**9**

Analysis of Space trusses using method of tension coefficients - Suspension bridges-cables with two and three hinged stiffening girders

UNIT V FINITE ELEMENT METHOD**9**

Introduction - Discretisation of a structure - Displacement functions - Truss element - Beam element.

TOTAL = 60**TEXT BOOKS**

- Vaidyantha, R. and Perumal, P., "Comprehensive structural Analysis - Vol.I & II", Laxmi Publications, New Delhi, 2016.
- S.S. Bhavikatti, Structural Analysis, Vol I & II, Vikas Publishing House, Delhi,Pvt.Ltd, 2011
- L.S.Negi & R.S.Jangid, " Structural Analysis", Tata McGraw-Hill Publications, New Delhi, 2003.

REFERENCES

- Ghali.A, Nebille, A.M. and Brown,T.G. "Structural Analysis" A unified classical and Matrix approach", CRC Press, 6 edition, 2009.
- Vazirani V.N, & Ratwani, M.M, "Analysis of Structures", Khanna Publishers, Delhi,2008.
- G.S. Pandit & S.P. Gupta, Structural Analysis - A Matrix Approach -, Tata McGraw Hill,2008.
- Jr. William Weaver & James M. Gere Matrix Analysis of Framed Structures -, CBS Publishers and Distributors, Delhi,2004.
- Devdas Menon, Structural Analysis, Narosa,Publishing house,Delhi, Reprint 2016.

CEB305 DESIGN OF STEEL STRUCTURES - I

L T P C
3 1 0 4

GOAL

To introduce the students to limit state design of structural components as per current codal provisions.

OBJECTIVES :

The course should enable the students to :

1. Gain Knowledge on the of limit state design of steel structures and the design of connections.
2. Be familiar with the design concepts of steel structural members subjected to tension.
3. Understand the design concepts of the structural steel members subjected to compression.
4. Be familiar with the design concepts of structural members subjected to bending .
5. Be acquainted with the design concepts of the components of industrial structures.

OUTCOME :

The students will be able to :

1. Design the connections for the steel structural members using bolts and welds.
2. Design the structural members subjected to tension.
3. Design single and compound compression members and the laced and Battened columns.
4. Design laterally supported and unsupported beams subjected to axial bending.
5. Design the components of industrial structures.

[Note: Limit State Design Only]

UNIT I INTRODUCTION

9

Properties of steel - Structural steel sections - Limit State Design Concepts - Loads on Structures - Metal joining methods using welding, bolting - Design of bolted, and welded joints - Eccentric connections - Efficiency of joints - High Tension bolts

UNIT II TENSION MEMBERS

6

Types of sections - Net area - Net effective sections for angles and Tee in tension - Design of connections in tension members - Use of lug angles - Design of tension splice - Concept of shear lag

UNIT III COMPRESSION MEMBERS

10

Types of compression members - Theory of columns - Basis of current codal provision for compression member design - Slenderness ratio - Design of single section and compound section compression members - Design of lacing and battening type columns .

UNIT IV BEAMS**10**

Design of laterally supported and unsupported beams - Built up beams-Beams subjected to bi-axial bending .

UNIT V ROOF TRUSSES AND INDUSTRIAL STRUCTURES**10**

Roof trusses - Roof and side coverings - Design loads, design of purlin and elements of truss; end bearing – Introduction to pre-engineered buildings.

TEXT BOOKS :

1. N.Subramanian , "Design of Steel Structures" , Oxford University press,2011.
2. S.K.Duggal, Limit State Design of Steel Structures, Tata McGraw Hill Education Pvt. Ltd, 2010
3. IS 800 -2007

REFERENCES:

1. Dr.Ramachandra, Virendra Gehlot, "Limit State Design of Steel Structures", Scientific Publishers, New Delhi, 2010
2. "Teaching Resources for Structural Steel Design - Vol. I & II", INSDAG, Kolkatta.
3. Dr. V.L.Shah, S.S.Karve, "Limit State Design of Steel Structures", Structures Publications, 2009.
4. www.steel_insdag.org

CEB333 COMPUTER AIDED STRUCTURAL ANALYSIS LABORATORY

L T P C
0 0 3 1

GOAL

- To Impart knowledge in analyzing the structures using software

OBJECTIVES

The course should enable the students to :

- Get exposed to the usage of software in the analysis of structures and also testing of structural components through virtual lab

OUTCOME

The students will be able to:

- Analyze multi-storeyed buildings using STAAD pro and ANSYS software

LIST OF EXPERIMENTS:

1. Introduction to Structural Engineering virtual lab	9
2. Analysis of beams and Portal Frames	12
3. Analysis of Trusses	12
4. Analysis of Multi Storied Buildings- Residential Buildings, Commercial Buildings	12

SOFTWARES REQUIRED

- STAAD PRO - Software
- ANSYS Civil

TOTAL : 45

LIST OF EQUIPMENTS (For a batch of 30 students)

Sl. No.	Description of Equipments	Quantity
1.	Computer system of Pentium IV or equivalent	1 for each student
2.	Licensed version of STADD PRO, ANSYS CIVIL	1 copy for a set of 3 students

CEB334 IRRIGATION AND ENVIRONMENTAL ENGINEERING DRAWING

L T P C
0 0 3 1

GOAL

The student shall be able to conceive, design and draw all types of irrigation and environmental structures in detail showing plan, elevation sections.

OBJECTIVES

The course should enable the students to :

- Understand the concepts of hydraulic design and to draw detailed drawings of hydraulic Structures.
- Introduce the design concepts of major units associated with water and sewage treatment

OUTCOME

The students will be able to:

- Design and draw plan, elevation and sections of irrigation structures in detail.
- Design the sewage treatment plant units and draw the general arrangement

PART A

1. TANK IRRIGATION STRUCTURES 9

Tank surplus weirs - Tank sluices weirs on pervious foundations - Detailed drawings showing foundation details, plan and elevation - gravity dams - earth dams

2. CANAL TRANSMISSION STRUCTURES 9

Canal head works - Canal regulator Aqueducts - Canal drops - Notch type - Drawing showing plan, elevation, foundation details

TEXT BOOKS :

1. Garg, S.K, "Irrigation Engineering and Hydraulic Structures",Khanna Publishers,Delhi,2006
2. Satyanarayana Murthy, "Irrigation Design and Drawing", Published New Age international (P) Limited, 2004.
3. Sharma R.K, "Irrigation Engineering and Hydraulic Structures", Oxford and IBH Publishing Co., New Delhi, 2002.

PART B

- General layout of water treatment of plant - Design & drawing Slow sand filter - Rapid sand filter - Pressure filter - Chlorinator - Bleaching powder doser - Softeners - Demineralisation plant 6
- Design and drawing of infiltration gallery. 3
- General layout of wastewater treatment plant - Sludge digester - Sludge drying beds - Waste stabilisation ponds 6
- Drawing of raw water - Intake towers - Manholes - Sewer lines - Pumping stations for water and sewage 6
- Design and drawing of: Water supply and drainage for buildings - Septic tanks and disposal arrangements - House service connection for water supply and drainage - Appurtenances in water supply and drainage 6

REFERENCES :

1. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999
2. Manual of Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi, 2013.
3. Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi, 1987
4. Peary, H.S., Rowe, D.R., and Tchobanoglous, G., "Environmental Engineering", McGraw-Hill Book Co., New Delhi, 2015.
5. Metcalf & Eddy, "Wastewater Engineering (Treatment and Reuse)", 4th Edition, Tata McGraw-Hill, New Delhi, 2013.

CEB335 COMPREHENSION

L	T	P	C
2	0	0	2

GOAL

To encourage the students to comprehend the knowledge acquired from the first Semester to Sixth Semester of B.Tech. Degree Course through periodic exercise.

SSA331- PLACEMENT PREPARATORY PROGRAMME

L T P C
1 0 1 1

PURPOSE:

The Purpose of the course is to build confidence and inculcate various soft skills and to help Students to identify and achieve their personal potential.

INSTRUCTIONAL OBJECTIVES:

At the end of the course the students will be able to

1. Acquire the important soft skills for employment
2. Take part in group discussions and job interviews confidently
3. Gain self confidence to face the placement process.

METHODOLOGY:

The entire program is designed in such a way that every student will participate in the class room activities. The activities are planned to bring out the skills and talents of the students which they will be employing during various occasions in their real life.

1. Group activities & Individual activities
2. Collaborative learning
3. Interactive Sessions
4. Ensure Participation
5. Empirical Learning
6. Resume writing
7. SWOT Analysis
8. Interview techniques
9. Presentation skills
10. Body Language for Interview
11. Rules of Group Discussion
12. FAQs

EVALUATION:

1. Activities assessed by both group and individual participation
2. Continuous assessment based on daily participation

SCHEME OF INSTRUCTION:

Marks allocated for regular participation in all oral activities in class.

SCHEME OF EXAMINATION:

Complete Internal Evaluation on a regular Basis.

SEMESTER VII

CEB401 DESIGN OF STEEL STRUCTURES - II

L	T	P	C
3	1	0	4

GOAL

To give exposure to the advanced design of steel structures such as plate girder, gantry girder, columns, light gauge steel sections and design of beams using plastic theory.

OBJECTIVES

The course should enable the students to :

1. Understand the design concepts of plate girder.
2. Familiar with the design concepts of gantry girder.
3. Understand the behaviour of columns subjected to axial load and bending moment.
4. Know about light gauge sections and its design concepts.
5. Familiar with the design concepts of Self-supporting chimney.

OUTCOME

The students will be able to:

1. Design the plate girder and its components.
2. Design of gantry girder for moving loads .and fatigue effects.
3. Design simple and built up columns subjected to axial load and bending moment.
4. Design beams and columns using light gauge steel sections.
5. Design the self-supporting steel chimney.

UNIT I PLATE GIRDER

9

Design of plate girders - web and flange design - curtailment of flange plates - Design of stiffeners and splices.

UNIT II GANTRY GIRDERS

9

Introduction - Loading Considerations - Maximum Loads Effects - Fatigue Effects - Selection of Gantry Girder - Design of Gantry Girder.

UNIT III COLUMNS SUBJECTED TO COMBINED BENDING AND AXIAL LOADS

9

Design of simple and built up columns subject to combined bending and axial loads - design of column base and connection to foundation.

UNIT IV LIGHT GAUGE STEEL SECTIONS

9

Forms of Light Gauge Sections –Stiffened and Unstiffened Elements-Effective Width - Design of flexural and compression members

UNIT V DESIGN OF SELF SUPPORTING CHIMNEY**9**

Dimensions of steel stacks-Chimney lining- Design of Self Supporting Chimney –
Design of foundation for the Chimney

TOTAL = 60**TEXT BOOKS:**

- S.S.Bhavikatti, "Design of Steel Structures ", I.K.International Publishing House,2011
- N.Subramanian, "Design of Steel Structures" , Oxford University press, 2008.
- B.C.Punmia," Design of Steel Structures", Laxmi Publications,2001
- IS.800 -2007 : General Construction In Steel - Code of Practice
- IS 801- 1975 : Code of Practice for Use of Cold Formed Light Gauge Steel Structural Members In General Building
- IS 6533 -1989: Design of Construction of Steel Chimney

REFERENCES:

- S.K.Duggal, Limit State Design of Steel Structures, Tata McGraw Hill Education Pvt. Ltd, 2010

CEB402 FOUNDATION ENGINEERING

L	T	P	C
3	0	0	3

GOAL

To make the students understand the need of soil investigation, its importance in the choice of foundation and the design of suitable foundation

OBJECTIVES

The course should enable the students to :

1. Get a basic understanding of the geotechnical site investigation.
2. Understand the types of foundation and the design concepts of shallow foundation.
3. Get exposed to footings and rafts.
4. Get the concepts of pile foundation.
5. Know about Retaining walls.

OUTCOME

The students will be able to:

1. Describe different soil exploration techniques.
2. Describe the factors affecting bearing capacity of shallow foundation, various tests to find the bearing capacity and the components of settlement of foundation.
3. Determine the contact pressure distribution below footings and rafts, types and proportioning of isolated and combined footings and mat foundation.
4. Describe the types of piles, their functions, factors influencing the selection of pile, load carrying capacity of pile and pile group and the settlement of pile groups.
5. Calculate the plastic equilibrium in soils, earth pressure on retaining walls and the pressure on the wall due to line loads.

UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION

9

Scope and objectives - Methods of exploration-averaging and boring - Wash boring and rotary drilling - Depth of boring - Spacing of bore hole - Sampling - Representative and undisturbed sampling - sampling techniques - Split spoon sampler, Thin tube sampler, Stationary piston sampler - Bore log report - Penetration tests (SPT and SCPT)

UNIT II SHALLOW FOUNDATION

9

Introduction - Location and depth of foundation - codal provisions - bearing capacity of shallow foundation on homogeneous deposits - Terzaghi's formula and BIS formula - factors affecting bearing capacity - problems - Bearing Capacity from insitu tests (SPT, plate load) - Allowable bearing pressure, Settlement
- Components of settlement -Allowable settlements- Methods of minimising settlement, differential settlement.

9

UNIT III FOOTINGS AND RAFTS

Types of foundation - Contact pressure distribution below footings & raft - Isolated and combined footings - types - proportioning - mat foundation - types - use - proportioning

UNIT IV PILES

9

Types of piles and their function - Factors influencing the selection of pile - Carrying capacity of single pile in granular and cohesive soil - Static formula - dynamic formulae (Engineering news and Hiley's)-Negative skin friction - uplift capacity - Group capacity by different methods (Feld's rule, Converse Labarra formula) - Settlement of pile groups - Interpretation of pile load test -- under reamed piles

UNIT V RETAINING WALLS

9

Plastic equilibrium in soils - active and passive states - Rankine's theory - cohesionless and cohesive soil - Coloumb's wedge theory - condition for critical failure plane - Earth pressure on retaining walls of simple configurations - Graphical methods (Rebhann and Culmann) - pressure on the wall due to line load.

TOTAL = 60

TEXT BOOKS :

- Arora K.R. "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 2009.
- Purushothama Raj. P., "Soil Mechanics and Foundation Engineering", 2nd Edition, Pearson Education, 2013
- Gopal Ranjan and Rao A.S.R. "Basic and Applied soil mechanics", New Age International Pvt Ltd; Third edition, 2016
- Varghese, P.C., "Foundation Engineering", Prentice Hall of India Private Limited, New Delhi, 2005.

REFERENCES :

- Das, B.M. "Principles of Foundation Engineering" 5th edition, Thompson Asia Pvt. Ltd., Singapore, 2015.
- Bowles J.E, "Foundation analysis and design", McGraw-Hill, 2017
- Swami Saran, "Analysis and Design of Substructures – Limit state Design", Oxford IBH Publishing Co-Pvt. Ltd., New Delhi, 2008.
- Kaniraj, S.R, "Design aids in Soil Mechanics and Foundation Engineering", Tata McGraw Hill publishing company Ltd., New Delhi, 2016
- B.C. Punmia, Ashok Kumar Jain & Arun Kumar Jain , "Soil Mechanics and Foundations", Laxmi Publications; Sixteenth edition, 2017
- Venkatramaiah, C. "Geotechnical Engineering", New Age International Publishers, New Delhi, 2007 (Reprint)
- Murthy, V.N.S, "Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd, New Delhi, 2008.
 - **NOTE:** IS 456:2000, IS 6403, IS2911(Part1 to Part 4) are permitted in the Examination.

CEB403 BASICS OF DYNAMICS AND ASEISMIC DESIGN OF STRUCTURES

L	T	P	C
3	1	0	4

GOAL

To introduce to the student the phenomena of earthquakes, the process, measurements and the factors that affects the design of structures in seismic areas.

OBJECTIVES

The course should enable the students to :

- Understand the concepts involved in finding the response of Structures for Dynamic forces.
- Know about the mode shapes of the structures under dynamic loading.
- Study the causes of earthquake and its characteristics.
- Have knowledge about the response of structures under earthquake loading.
- Be familiarize with the codal provisions and the aseismic design methodology.

OUTCOME

The students will be able to:

- Analyze the structures with single degree of freedom for dynamic loading conditions.
- Find out the natural frequencies and the mode shapes of structures under dynamic loading.
- Describe the causes of earthquake and the damage on the structures caused by earthquake.
- Find out the response, of the structures, such as acceleration and displacement, for earthquake loading.
- Design earthquake resistant structures and adopt appropriate vibration control techniques.

UNIT I THEORY OF VIBRATIONS

9

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

UNIT II MULTIPLE DEGREE OF FREEDOM SYSTEM

9

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

UNIT III ELEMENTS OF SEISMOLOGY

9

Causes of Earthquake - Geological faults - Tectonic plate theory - Elastic rebound - Epicentre - Hypocentre - Primary, shear and Raleigh waves - Seismogram - Magnitude and intensity of earthquakes - Magnitude and Intensity scales - Spectral Acceleration -

Information on some disastrous earthquakes

UNIT IV RESPONSE OF STRUCTURES TO EARTHQUAKE

9

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

UNIT V DESIGN METHODOLOGY

9

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

TOTAL = 60

TEXT BOOKS

- S.R.Damodarasamy, S.Kavitha "Basics of Structural dynamics and Aseismic Design", PHI Learning Private Limited., 2009.
- Pankaj Agarwal, "Earthquake Resistant Design of Structures", Prentice Hall of India, 2007.

REFERENCES

- Mario Paz,William Leigh, " Structural Dynamics Theory and Computation", Springer - 2012.
- Madhujit Mukhopdhyay, " Structural Dynamics, Vibrations and Systems", Anne Books India, 2006.

CEB431 COMPUTER AIDED DESIGN AND DRAFTING

L T P C
0 0 3 1

GOAL

To acquire hands on experience in design and preparation of structural drawings for concrete / steel structures normally encountered in Civil Engineering practice.

OBJECTIVES

The course should enable the students to :

- Understand the design principles of various types of structures and to draw the structural drawings using Auto CADD.

OUTCOME

The students will be able to:

- Design and prepare structural drawings for concrete / steel structures normally encountered in Civil Engineering practice

LIST OF EXPERIMENTS

- Design and drawing of Deep beams and flat slab. 9
- Design of solid slab bridge for IRC loading and reinforcement details 9
- Design of circular and rectangular water tank - Detailed drawings 9
- Design and drafting of truss 9
- Design of plate Girder - Detailed Drawings including connections. 9

TOTAL:45

LIST OF EQUIPMENTS (For a batch of 30 students)

Sl. No.	Description of Equipments	Quantity
1.	Computer system of Pentium IV or equivalent	1 for each student
2.	Licensed version of AUTO CADD	1 copy for a set of 3 students

TEXT BOOKS:

1. Krishna Raju, "Structural Design & Drawing (Concrete & Steel)", Universities Press, India, 2009
2. Punmia, B.C., Ashok Kumar Jain, Arun Kumar Jain, "Comprehensive Design of steel structures", Lakshmi publications, 2nd edition, 2017

REFERENCES:

1. Krishnamurthy, D., "Structural Design & Drawing - Vol. II", CBS Publishers & Distributors, 2015
2. Krishnamurthy, D., "Structural Design & Drawing - Vol. III Steel Structures", CBS Publishers & Distributors, 2012

CEB432 DESIGN PROJECT II

L T P C
0 0 8 3

GOAL

To impart and improve the design capability of the students in any one of the disciplines of Civil Engineering.

OBJECTIVES:

The course should enable the students to:

- Impart and improve the design capability of the students in any one of the disciplines of Civil Engineering

OUTCOME:

The students will be able to:

- Analyse and Design Multi-storeyed Steel and RC Structures, Environmental Structures, Transportation systems and hydraulic structures.

EVALUATION PROCEDURE

The method of evaluation will be as follows:

1. Internal Marks : 20 marks
(Decided by conducting 3 reviews by the guide appointed by the Institution)
2. Evaluation of Project Report : 30 marks
(Evaluated by the external examiner appointed by the University).
Every student belonging to the same group gets the same mark
3. Viva voce examination : 50 marks

(Evaluated by the internal examiner appointed by the HOD, external examiner appointed by the University and Guide of the course - with equal Weightage)

The design problem can be allotted to either an individual student or a group of students comprising of not more than six. At the end of the course the group should submit a complete report on the design problem consisting of the data given, the design calculations, specifications if any and complete set of drawings which follow the design.

SEMESTER VIII

CEB441 PROJECT & VIVA - VOCE

L	T	P	C
0	0	24	6

GOAL

- To impart and improve the design capability of the students in any one of the disciplines of Civil Engineering.

OBJECTIVES

The course should enable the students to:

- Work on a project involving theoretical and experimental studies related to Civil Engineering.

OUTCOME

The students will be able to:

- Widen their knowledge based on the experimental or theoretical studies carried out in any one of the Civil Engineering areas such as Structural Engineering, Environmental Engineering, Water Resources Engineering, Transportation Engineering, Soil Mechanics and remote sensing.

PROJECT DESCRIPTION

Students shall work in convenient groups of not more than six members in a group. Every Project Work shall have a Guide who is a member of the faculty of the University. Twenty four periods per week shall be allotted in the Time Table for this important activity and this time shall be utilized by the students to receive directions from the Guide, on library reading, laboratory work, computer analysis or field work as assigned by the Guide and also to present in periodical seminars the progress made in the project.

Each student shall finally produce a comprehensive report covering background information, literature survey, problem statement, Project work details and conclusions. This final report shall be typewritten form as specified in the guidelines.

EVALUATION PROCEDURE

The method of evaluation will be as follows:

- Internal Marks : 20 marks
(Decided by conducting 3 reviews by the guide appointed by the Institution)
- Evaluation of Project Report: 30 marks
(Evaluated by the external examiner appointed by the University).
- Every student belonging to the same group gets the same mark
- Viva voce examination : 50 marks
(Evaluated by the internal examiner appointed by the HOD, external examiner appointed by the University)

CYA102 ENVIRONMENTAL SCIENCE AND ENGINEERING (Common to all Branches)

L	T	P	C
3	0	0	3

GOAL:

To impart basic knowledge on the significance of environmental science for engineers.

OBJECTIVES:

The objective of the course is

- To make the students aware of the existing natural resources such as forest water resources etc. and to educate them to understand the need for preserving the resources.
- To educate the students about the functions of various ecosystems and biodiversity.
- To provide knowledge on the various aspects of different types of pollution such as air pollution, water pollution, soil pollution etc.
- To give a basic knowledge on the social issues such as global warming, acid rain,

OUTCOMES:

Upon successful completion of the course, the outcomes are as follows:

- The students would have understood the effects of over exploitation of water resources, forest resources etc. and their impact on day to day life on earth.
- Knowledge on the functions of several of ecosystems will help the students to design the processes that are eco-friendly.
- Knowledge on the different types of pollution will help the young minds to device effective control measures to reduce rate of pollution.
- Exposure on the issues such as global warming, acid rain, ozone layer depletion, nuclear hazards and ill effects of fire-works will make the students understand the significances of sustainable development and the need to enforce Environmental Acts.
- Educating on the various aspects of population explosion will create an awareness on population control for effective utilization of the resources and the need to explore new alternate energy resources for a healthy environment

INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 10

Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies. 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, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

ECOSYSTEMS AND BIODIVERSITY

12

Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to Biodiversity – Definition: genetic, species and ecosystem diversity – Biogeographical classification of India – Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-spots of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Field study of common plants, insects, birds

Field study of simple ecosystems – pond, river, hill slopes, etc.

ENVIRONMENTAL POLLUTION

10

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – Soil waste Management: Causes, effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

Ill effects of fireworks and upkeep of clean environment: Chemical contents of fireworks- and health hazards-Soil pollution, water pollution, air pollution and noise pollution.

Field Study of local polluted site – Urban / Rural / Industrial / Agricultural

SOCIAL ISSUES AND THE ENVIRONMENT

7

From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns, case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – Wasteland reclamation – Consumerism and waste products – Environment Protection Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and Control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues involved in enforcement of environmental legislation – Public awareness

HUMAN POPULATION AND THE ENVIRONMENT

6

Population growth, variation among nations – Population explosion – Family Welfare Programme – Environment and human health – Human Rights – Value Education – HIV / AIDS – Women and Child Welfare – Role of Information Technology in Environment and human health – Case studies.

TEXT BOOKS

- Gilbert M. Masters & Wendell P. Ela , Introduction to Environmental Engineering and Science, Pearson; 3 edition, 2007
- Miller T.G. Jr., Environmental Science, Cengage; 14 edition, 2014
- Townsend C., Harper J and Michael Begon, Essentials of Ecology, John Wiley & Sons; 4th Revised, 2014.
- Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, ABD Publishers, 2003

REFERENCES

- Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad India, 2004.
- Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media.
- Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopaedia, Jaico Publ., House, Mumbai, 2001.
- Wager K.D., Environmental Management, W.B. Saunders Co., Philadelphia, USA, 1998.

PROFESSIONAL ELECTIVES

SEMESTER – V CEC357 APPLIED HYDROLOGY

L	T	P	C
3	0	0	3

GOAL

To make the students understand the components of hydrologic cycle and its measurement along with flood routing and ground water hydrology.

OBJECTIVES

The course should enable the students to :

1. Understand the concepts of hydrologic cycle.
2. Learn the various methods of measurement of rainfall.
3. Get acquainted with the principles of hydrograph.
4. Understand the concepts behind flood routing and control.
5. Understand the concepts of ground Water hydrology.

OUTCOME

The students will be able to:

1. Describe the various components of hydrologic cycle.
2. Analyse the basic data for rainfall prediction.
3. Describe the unit hydrograph techniques.
4. Apply various methods of flood routing.
5. Describe the principles of Ground water hydrology.

UNIT I PRECIPITATION

10

Hydrologic cycle - Types of precipitation - Forms of precipitation - Measurement of Rainfall - Spatial measurement methods - Temporal measurement methods - Frequency analysis of point rainfall - Intensity, duration, frequency relationship - Probable maximum precipitation.

UNIT II ABSTRACTION FROM PRECIPITATION

10

Losses from precipitation - Evaporation process - Reservoir evaporation - Infiltration process - Infiltration capacity - Measurement of infiltration - Infiltration indices - Effective rainfall.

UNIT III HYDROGRAPHS

10

Factors affecting Hydrograph - Baseflow separation - Unit hydrograph - Derivation of unit hydrograph - S curve hydrograph - Unit hydrograph of different deviations - Synthetic Unit Hydrograph

UNIT IV FLOODS AND FLOOD ROUTING

9

Flood frequency studies - Recurrence interval - Gumbel's method - Flood routing - Reservoir flood routing - Muskingum's Channel Routing - Flood control

UNIT V GROUND WATER HYDROLOGY

6

Types of aquifers - Darcy's law - Dupuit's assumptions - Confined Aquifer - Unconfined Aquifer - Recuperation test - Transmissibility - Specific capacity - Pumping test - Steady flow analysis only.

TOTAL = 45

TEXT BOOKS:

- Subramanya, K., "Engineering Hydrology", Tata McGraw-Hill Publishing Co., Ltd., 2000
- Raghunath, H.M., "Hydrology", Wiley Eastern Ltd., 2000

REFERENCES:

- Ernest W. Tollner "Engineering Hydrology for Natural Resources Engineers" Wiley-Blackwell; 2 edition (October 17, 2016)
- Singh, V.P., "Hydrology", McGraw-Hill Inc., Ltd., 2000
- Dr.Jaya Rami Reddy, " A Text Book of Hydrology" , University Science Press, Laxmi Publications, second edition, 2011.

CEC358 REMOTE SENSING TECHNIQUES AND APPLICATIONS

L	T	P	C
3	0	0	3

GOAL

To equip the students with knowledge about remote sensing techniques and its application in natural resource management.

OBJECTIVES

The course should enable the students to:

1. Understand the concepts of Electromagnetic radiance.
2. Learn the various types of land use/ land cover.
3. Get acquainted with the principles of mapping flood risk zone.
4. Understand the concepts behind agriculture, forest and soil.
5. Understand the concepts of earth science.

OUTCOME

The students will be able to:

1. Describe the various components of electromagnetic radiation
2. Analyse the basic data for urban land use planning
3. Identify ground water potential zones, recharge area and assess drought.
4. Prepare crop inventory mapping and can produce estimation.
5. Describe the principles of lithological and structural mapping.

UNIT I INTRODUCTION

9

Definition - Physics of remote sensing - electromagnetic radiation (EMR) - remote sensing windows - interaction of EMR with atmosphere, earth surface, soils, water and vegetation - platform and sensors - image interpretations.

UNIT II LAND USE STUDIES

9

Definition of land use - land use / land cover classification - schemes and levels of classification systems with RS data - land use mapping - change detection - urban land use planning, site suitability analysis, transportation planning.

UNIT III WATER RESOURCES

9

Aerial assessment of surface water bodies - Capacity survey of water bodies - mapping of snow - covered areas - flood risk zone mapping - identification of groundwater potential zones, recharge areas - droughts, definition, drought assessment and management.

UNIT IV AGRICULTURE, SOIL AND FORESTRY

9

Crop inventory mapping - production estimation - command area monitoring - soil mapping - crop stress detection - estimation of soil erosion - forest types and density mapping - forest fire risk zone mapping.

UNIT V EARTH SCIENCE

9

Lithology - lithological mapping - structural mapping - Geomorphology - nature and type of landforms - identification - use of remote sensing data for landslides - targeting mineral resource - Engineering geology and Environmental geology.

TEXT BOOK:

- Michael Hord, R. Remote Sensing Methods and Application, John Wiley and Sons, New York, 1986.

REFERECNES:

- Thomas Lillesand, Ralph W. Kiefer & Jonathan Chipman, "Remote Sensing and Image Interpretation", Wiley, 7 edition, 2015.

CEC359 HOUSING PLANNING AND MANAGEMENT

L	T	P	C
3	0	0	3

GOAL

To enable the students to develop skills on Housing Policies, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies and to decide appropriate New Constructions Techniques.

OBJECTIVES

The course should enable the students to:

1. Understand the principles of sustainable housing and strategies of National housing policies.
2. Gain knowledge on the standards for different housing programmes.
3. Understand the concepts involved in the planning and design of housing projects.
4. Familiarise with the construction techniques and different materials for construction.
5. Know about Housing Finance.

OUTCOME

The students will be able to:

1. Describe the housing laws at state level at urbans and rural local bodies.
2. Describe the standards for apartments, rental housing, slum housing etc.
3. Make site analysis and execute the layout design and housing unit design.
4. Choose the suitable techniques and materials for constructions.
5. Make cash flow analysis and pricing of housing units.

UNIT I INTRODUCTION TO HOUSING

9

Definition of Basic Terms - House, Home, Household, Apartments, Multi-storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies - levels - Development Control Regulations, Institutions for Housing at National, State and Local levels.

UNIT II HOUSING PROGRAMMES

9

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organisations.

UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS

9

Formulation of Housing Projects - Site Analysis, Layout Design, Design of Housing Units (Design Problems).

UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIAL

9

New Construction Techniques - Cost Effective Modern Construction Materials, Building Centres - Concept, Functions and Performance Evaluation.

UNIT V HOUSING FINANCE AND PROJECT APPRAISAL

9

Appraisal of Housing Projects - Housing Finance, Cost Recovery - Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing of Housing Units, Rents, Recovery Pattern (Problems).

TOTAL = 45

TEXT BOOKS:

1. Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi. 1999.
2. Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House, Bombay, 1997.
3. Gol, National Urban Housing and Habitat Policy 2007,
4. India Habitat III National Report 2016, Ministry of Housing and Urban Poverty Alleviation, Government of India, New Delhi,.
5. Gautam Bhatia, Laurie Baker: Life, Work & Writings, Penguin Books, India, 2003.
6. Peter Birch, The Swedish housing market: Trends and risks: university of Copenhagen publication, 2013.
7. Model State Affordable Housing Policy for Urban Areas, 2014, Ministry of Housing and Urban Poverty Alleviation, Government of India, New Delhi,

REFERENCES:

1. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2014
2. National Housing Policy, 1994, Government of India.
3. Isaacs, N., Camilleri, M., French, L., Pollard, A., Saville-Smith, K., Fraser, R., Rossouw, P., Jowett J. (2006). Energy use in New Zealand households—HEEP year 10 report. New Zealand: Building Research Association of New Zealand.

CEC360 MANAGEMENT OF IRRIGATION SYSTEMS

L	T	P	C
3	0	0	3

GOAL

To provide the students with a clear concept of irrigation water management practices.

OBJECTIVES

The course should enable the students to:

1. Understand the different cropping patterns and crop water requirements.
2. Be familiar with irrigation scheduling.
3. Gain knowledge on the strategies in water use.
4. Understand the operation of canal irrigation system.
5. Be familiar with participatory irrigation management.

OUTCOME

The students will be able to:

1. Estimate the crop water requirement for different crops.
2. Describe scheduling for irrigation.
3. Describe conjunctive use of water and manage during deficit years
4. Describe the regulation of water through canals by the knowledge obtained through case studies.
5. Demonstrate the advantages of Farmer's participation in System operation.

UNIT I IRRIGATION SYSTEM REQUIREMENTS 9

Irrigation systems - Supply and demand of water - Cropping pattern - Crop rotation - Crop diversification - Estimation of total and peak crop water requirements - Effective and dependable rainfall - Irrigation efficiencies.

UNIT II IRRIGATION SCHEDULING 8

Time of irrigation - Critical stages of water need of crops - Criteria for scheduling irrigation - Frequency and interval of irrigation.

UNIT III MANAGEMENT 9

Structural and non-structural strategies in water use and management - Conjunctive use of surface and ground waters - Quality of irrigation water.

UNIT IV OPERATION 9

Operational plans - Main canals, laterals and field channels - Water control and regulating structures - Performance indicators - Case study

UNIT V INVOLVEMENT OF STAKE HOLDERS 10

Farmer's participation in System operation - Water user's associations - Farmer councils - Changing paradigms on irrigation management - Participatory irrigation management.

TOTAL = 45

TEXT BOOKS:

1. Dilip Kumar Majumdar, "Irrigation Water Management - Principles and Practice", Prentice Hall of India Pvt. Ltd., New Delhi, 2013
2. Hand book on Irrigation Water Requirement, R.T. Gandhi, et. al., Water Management Division, Department of Agriculture, Ministry of Agriculture, New Delhi

REFERENCES:

1. Hand Book on Irrigation System Operation Practices, Water Resources Management and Training Project, Technical report No. 33, CWC, New Delhi, 1990
2. Maloney, C. and Raju, K.V., "Managing Irrigation Together", Practice and Policy in India, Stage Publication, New Delhi, India, 1994.

CEC361 ENVIRONMENTAL IMPACT ASSESSMENT

L T P C
3 0 0 3

GOAL

To introduce the student the basic theory and concepts of various impact assessment procedures to protect the Environment.

OBJECTIVES

The course should enable the students to:

1. Know about the basics of Environmental Impact Assessment (EIA) and the legal provision in EIA.
2. Study about the various methodologies in EIA.
3. Understand and assess the impact of various developmental activities on environment.
4. Get knowledge about the environmental management plan to take care of adverse impacts.
5. Study the impact due to highway projects, airport projects and other infrastructure projects.

OUTCOME

The students will be able to:

1. Describe the importance of EIA studies.
2. Apply the various methods for carrying out EIA studies.
3. Apply the various techniques for predicting and assessing the impact.
4. Mitigate the adverse impacts arising out of developmental projects.
5. Carry out EIA studies and prepare EIA report for various infrastructure and development projects.

UNIT I INTRODUCTION

5

Impact of development projects under Civil Engineering on environment - Environmental Impact Assessment (EIA) - Environmental Impact Statement (EIS) - EIA capability and limitations - Legal provisions on EIA.

UNIT II METHODOLOGIES

5

Methods of EIA - Check lists - Matrices - Networks - Cost-benefit analysis - Analysis of alternatives - Case studies.

UNIT III PREDICTION AND ASSESSMENT

10

Assessment of Impact on land, water and air, noise, social, cultural flora and fauna; Mathematical models; public participation - Rapid EIA.

UNIT IV ENVIRONMENTAL MANAGEMENT PLAN

10

Plan for mitigation of adverse impact on environment - options for mitigation of impact on water, air and land, flora and fauna; addressing the issues related to the Project Affected People - ISO 14000

UNIT V CASE STUDIES

15

EIA for infrastructure projects - Bridges - Stadium - Highways - Dams - Multi-storey Buildings - Water Supply and Drainage Projects.

TOTAL = 45

TEXT BOOKS:

- R. Pannirselvam and S. Karthikeyan, "Environmental Impact Assessment", SPGS Publishers, Chennai - 600 088, 2005.
- James T. Maughan "Environmental Impact Analysis: Process and Methods" CRC Press; 1 edition, 2013..
- Shukla, S.K. and Srivastava, P.R., "Concepts in Environmental Impact Analysis", Common Wealth Publishers, New Delhi, 1992.
- Lawrence, D.P., Environmental Impact Assessment - Practical solutions to recurrent problems, Wiley-Interscience, New Jersey, 2003

REFERENCES:

- John G. Rau and David C Hooten (Ed)., "Environmental Impact Analysis Handbook", McGraw-Hill Book Company, 1990.
- "Environmental Assessment Source book", Vol. I, II & III. The World Bank, Washington, D.C., 1991.
- B. Carroll and T. Turpin "Environmental Impact Assessment Handbook, 2nd edition" Thomas Telford Publisher, 2009.
- Salim Momtaz and S. M. Zobaidul Kabir "Evaluating Environmental and Social Impact Assessment in Developing Countries" Elsevier; 1 edition (May 16, 2013)
- The World Bank Group, Environmental Assessment Source Book Vol. I, II and III. The World Bank, Washington, 1991.
- Charles Yoe, "Principles of Risk Analysis: Decision Making Under Uncertainty, CRC Press; 1 edition, 2011

• **CEC362 INDUSTRIAL WASTE MANAGEMENT**

L T P C
3 0 0 3

GOAL

To familiarize the students about characteristics of industrial wastewater, cleaner production, recycling of waste, various types of industrial waste waters, treatment technologies and hazardous wastes management.

OBJECTIVES

The course should enable the students to:

1. Understand the various types of Industrial waste waters, their characteristics and their effects on the environmental resources.
2. Study and understand the various legislative measures related to prevention and control of industrial wastes.
3. Study and understand the cleaner production, waste audit, recycling and by-product recovery.
4. Know about the waste generated in selected industries like textiles, tanneries , electro plating, Pulp and paper etc.,
5. Know about the various treatment technologies like equalization, Neutralisation, chemical oxidation, adsorption etc.,
6. Study about hazardous waste management.

OUTCOME

The students will be able to:

1. Characterize the various types of wastewaters coming out from industries like textiles, tanneries, pulp and paper, etc.,
2. Design specific flow sheets to treat the various types of industrial waste.
3. Liase with the statutory agencies like pollution control boards and Ministry of Environment and Forests.
4. Practice cleaner production technologies by interacting with the industries.
5. Demonstrate hazardous waste management.

UNIT I INTRODUCTION

7

Types of industries and industrial pollution - Characteristics of industrial wastes - Population equivalent - Bioassay studies - effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health - Environmental legislations related to prevention and control of industrial effluents and hazardous wastes

UNIT II CLEANER PRODUCTION

8

Waste management Approach - Waste Audit - Volume and strength reduction - Material and process modifications - Recycle, reuse and by-product recovery - Applications.

UNIT III POLLUTION FROM MAJOR INDUSTRIES

10

Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants - Wastewater reclamation concepts

12

UNIT IV TREATMENT TECHNOLOGIES

Equalisation - Neutralisation - Removal of suspended and dissolved organic solids - Chemical oxidation - Adsorption - Removal of dissolved inorganics - Combined treatment of industrial and municipal wastes - Residue management - Dewatering - Disposal

UNIT V HAZARDOUS WASTE MANAGEMENT

8

Hazardous wastes - Physico chemical treatment - solidification - incineration - Secured land fills

TOTAL = 45

TEXT BOOKS:

1. M.N.Rao & A.K.Dutta, "Wastewater Treatment", Oxford - IBH Publication,2001.
2. W .W. Eckenfelder Jr., "Industrial Water Pollution Control", McGraw-Hill Book Company, New Delhi, 2000.

REFERENCES:

1. Thomas T. Shen, "Industrial Pollution Prevention (Environmental Science and Engineering)", Springer, 2010
2. Robert Clark, Simon Hakim & Avi Ostfeld, "Handbook of Water and Wastewater Systems Protection (Protecting Critical Infrastructure)", Springer, 2011
3. H.M.Freeman, "Industrial Pollution Prevention Hand Book", McGraw-Hill Inc., New Delhi, 1995.
4. Paul L. Bishop, "Pollution Prevention: Fundamentals and Practice, Waveland Pr In, 2004

CEC363 AIR POLLUTION MANAGEMENT

L **T** **P** **C**
3 **0** **0** **3**

GOAL

To make the students familiar with various types of Air Pollutants, their effects and control methods, and to expose the students to the various Air Pollution dispersion models.

OBJECTIVES

The course should enable the students to:

1. Understand the various types of Air Pollutants and their effects of human beings, materials, vegetations and animals.
2. Understand the meteorological factor responsible for dispersion of pollutants.
3. Know about the measurement of the Air Pollutants in the ambient air using high volume air samplers.
4. Study about the control methods adopted for different types of Air Pollutants coming out from different types of industries.
5. Study about the noise pollution problems and the noise standards.

OUTCOME

The students will be able to:

1. Categorise the various type of Air Pollutants coming out from different sources.
2. Demonstrate dispersion of pollutants, meteorological factors and dispersion models.
3. Sample and analyse the major air pollutants present in the ambient air.
4. Select appropriate control equipment to minimize the air pollution problems in industries.
5. Measure noise levels in industries and compare with standards and to suggest appropriate measures to noise pollution problems.

UNIT I SOURCES AND EFFECTS OF AIR POLLUTANTS

9

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

UNIT II DISPERSION OF POLLUTANTS

9

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

UNIT III AIR POLLUTION CONTROL

15

Concepts of control - Principles and design of control measures - Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation - Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion - Pollution control for specific major industries.

UNIT IV AIR QUALITY MANAGEMENT**7**

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

UNIT V NOISE POLLUTION**5**

Sources of noise pollution - Effects - Assessment - Standards - Control methods - Prevention

TOTAL = 45**TEXT BOOKS:**

- Karl B. Schnelle Jr., Russell F. Dunn & Mary Ellen Ternes, "Air Pollution Control Technology Handbook", CRC Press, 2 edition, 2015 // C. David Cooper & F. C. Alley, "Air Pollution Control: A Design Approach", Waveland Pr Inc, 4 edition, 2010
- Rao M.N., and Rao H. V. N., Air Pollution Control, Tata-McGraw-Hill, New Delhi, 1996.
- Lawrence K. Wang, Norman C Perelra, Yung-Tse Hung, "Air Pollution Control Engineering", Tokyo, 2004.
- Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.

REFERENCES:

- Peter Brimblecombe, "Urban Pollution and changes to material and building surfaces", World Scientific, 2016
- Mahajan, "Pollution Control in Process Industries", McGraw Hill Education, 2017
- Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, "Environmental Engineering", McGraw Hill Education; First edition, 2017
- S. K. Garg, "Water Supply Engineering: Environmental Engineering", v. 1, Khanna, 2010
- Mahajan, "Pollution Control in Process Industries", McGraw Hill Education, 2017
- Liu, ENVIRONMENTAL ENGINEERS HANDBOOK, CRC Press, 2016
- Anjaneyulu, Y, "Air Pollution & Control Technologies", Allied Publishers (P) Ltd., India, 2002.
- Boubel Richard W., "Fundamentals Of Air Pollution", cbspd, 2006
- U S Environmental Protection Agency, "Atmospheric Dispersion and Desposition Modeling", Vol. 4, Bibliogov, 2012

SEMESTER VI
CEC364 ELECTRONIC SURVEYING

L	T	P	C
3	0	0	3

GOAL

To equip the students with knowledge about advance surveying techniques, Electronic Distance Measurement and Electronic Surveying.

OBJECTIVES

The course should enable the students to:

1. Know about electronic devices which are used in electronic surveying.
2. Gain knowledge on various conductors and equipment used.
3. Gain fundamental technical knowledge about electromagnetic waves.
4. Understand the various techniques of micro waves
5. Understand the principles of Electronic Distance Measurement(EDM)

OUTCOME

The students will be able to :

1. Demonstrate the principles of electronic surveying.
2. Apply the fundamentals of electronics in surveying instruments.
3. Use the techniques, skills, and modern surveying engineering tools necessary for surveying
4. Apply the knowledge on propagation of micro waves.
5. Conduct survey using the EDM for measurement of distances, traversing and base line measurement.

UNIT I BASICS

7

Methods of measuring distance, historical development, basic principles, classifications, applications and comparison with conventional surveying.

UNIT II CONDUCTORS

8

Fundamentals of electronics, resonant circuits, semiconductors, Lasers, Cathode ray tube, photo multiplier tube, transducers, oscillators, frequency mixing, modulation and demodulation, Kerrcell modulator, measurement of phase difference, reflectors and power sources

UNIT III ELECTROMAGNETIC WAVES

8

Definition, classification, applications, propagation properties, wave propagation at lower and higher frequencies. Refractive index, factors affecting, computation of group refractive index for light and near infrared waves at standard conditions and ambient conditions, reference refractive index, first velocity correction.

UNIT IV MICRO WAVES

7

Definition, classification, applications, propagation properties, wave propagation at lower and higher frequencies, computation of refractive index for microwaves, measurement of atmospheric parameters, mean refractive index, real time application of first velocity correction, second velocity correction and total atmospheric correction.

UNIT V ELECTROMAGNETIC DISTANCE MEASURING SYSTEM

15

Electro-optical system, measuring principle, working principle, sources of error, infrared

EDM instruments, Laser EDM instruments and total station. Microwave system, measuring principle, working principle, sources of error, microwave EDM instruments, comparison with Electro-optical system, care and maintenance of EDM instruments, Modern Positioning Systems, EDM traversing, trilateration and base line measurement using EDM.

TOTAL = 45

TEXT BOOKS:

1. Burnside, C.D. Electromagnetic distance measurement 3rd edition, Blackwell Science, 1991.
2. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 1996.

REFERENCES:

1. Chandra, A.M."Higher Surveying"New age international, 2006
2. Gheorghe M.T. Radulescu"Modern surveying technologies used for tall constructions"LAP LAMBERT Academic Publishing,2015.

CEC365 ENGINEERING GEOLOGY

L	T	P	C
3	0	0	3

GOAL

To equip the students with the basic & advanced skills needed to become a specialized engineer in Engineering Geology.

OBJECTIVES

The course should enable the students to :

- Know about earth structures composition and earthquake belts.
- Know about the physical properties and engineering significance of minerals.
- Study about different classification of rocks and its engineering properties.
- Know about seismic and electrical methods for Civil Engineering investigations.
- Understand the geological conditions necessary for Civil Engineering constructions.

OUTCOME

The students will be able to:

- Describe the earth structures, composition and earthquake belts.
- Describe the engineering significance physical properties of minerals such as quartz , auguite, muscovite etc.,
- Describe the engineering properties of different types of rock materials.

- Apply the seismic and electrical methods for Civil Engineering investigations.
- Describe the geological conditions necessary for construction of dams, tunnels, buildings, load cuttings etc.,

UNIT I GENERAL GEOLOGY

9

Geology in Civil Engineering - Branches of geology - Earth Structures and composition - Elementary knowledge on continental drift and plate technologies. Earth processes - Weathering - Work of rivers, wind and sea and their engineering importance - Earthquake belts in India. Groundwater - Mode of occurrence - prospecting - importance in civil engineering

UNIT II MINERALOGY

9

Elementary knowledge on symmetry elements of important crystallographic systems - physical properties of minerals - study of the following rock forming minerals - Quartz family. Feldspar family, Augite, Hornblende, Biotite, Muscovite, Calcite, Garnet - properties, behaviour and engineering significance of clay minerals - Fundamentals of process of formation of ore minerals - Coal and petroleum - Their origin and occurrence in India.

UNIT III PETROLOGY

9

Classification of rocks - distinction between igneous, sedimentary and metamorphic rocks. Description occurrence, engineering properties and distribution of following rocks. Igneous rocks - Granite, Syenite, Diorite, Gabbro, Pegmatite, Dolerite and Basalt Sedimentary rocks sandstone, Limestone, shale conгло, Conglomerate and

breccia. Metamorphic rocks. Quartzite, Marble, Slate, Phyllite, Gneiss and Schist.

UNIT IV STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD 9

Attitude of beds - Outcrops - Introduction to Geological maps - study of structures - Folds, faults and joints - Their bearing on engineering construction. Seismic and Electrical methods for Civil Engineering investigations

UNIT V GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING 9

Remote sensing techniques - Study of air photos and satellite images - Interpretation for Civil Engineering projects - Geological conditions necessary for construction of Dams, Tunnels, Buildings, Road cuttings, Land slides - Causes and preventions. Sea erosion and coastal protection.

TOTAL = 45

TEXT BOOKS:

1. Parbin Singh, "Engineering and General Geology", S.K. Kataria and Sons, 2015.
2. Krynine and Judd, "Engineering Geology and Geotechniques", CBS Publisher 2005.

REFERENCES:

1. Subinoy Gangopadhyay "Engineering Geology" Oxford University Press, 2013.
2. Alan E Kehew "Geology for Engineers and Environmental Scientists" Pearson India (2016)

CEC366 BUILDING SERVICES

L	T	P	C
3	0	0	3

GOAL

To impart the students with the various aspects of pumps and machinery involved in Civil Engineering practice and the principles of electrical and air conditioning facilities involved.

OBJECTIVES

The course should enable the students to :

1. Study about machineries used in the Civil Engineering field.
2. Acquire knowledge about electrical systems in the buildings.
3. Gain knowledge on the principles of Lighting and Illumination in the buildings.
4. Understand the refrigeration principles and its applications.
5. Create an awareness of the fire safety aspects in the buildings.

OUTCOME

The students will be able to:

1. Describe the different machineries used in the construction.
2. Plan the electrical wiring for the buildings.
3. Design the lighting system required for different types buildings.
4. Choose suitable refrigeration and air conditioning systems for different types of buildings.
5. Describe the fire safety aspects of building services.

UNIT I MACHINERIES

8

Hot Water Boilers - Lifts and Escalators - Special features required for physically handicapped and elderly - Conveyors - Vibrators - Concrete mixers - DC/AC motors - Generators - Laboratory services - Gas, water, air and electricity

UNIT II ELECTRICAL SYSTEMS IN BUILDINGS

10

Basics of electricity - Single / Three phase supply - Protective devices in electrical installations - Earthing for safety - Types of earthing - ISI specifications - Types of wires, wiring systems and their choice - Planning electrical wiring for building - Main and distribution boards - Transformers and switch gears - Layout of substations

UNIT III PRINCIPLES OF ILLUMINATION & DESIGN

8

Visual tasks - Factors affecting visual tasks - Modern theory of light and colour - Synthesis of light - Additive and subtractive synthesis of colour - Luminous flux - Candela - Solid angle illumination - Utilisation factor - Depreciation factor - MSCP - MHCP - Lams of illumination - Classification of lighting - Artificial light sources - Spectral energy distribution - Luminous efficiency - Colour temperature - Colour rendering. Design of modern lighting - Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.

UNIT IV REFRIGERATION PRINCIPLES & APPLICATIONS

10

Thermodynamics - Heat - Temperature, measurement transfer - Change of state - Sensible heat - Latent heat of fusion, evaporation, sublimation - saturation temperature - Super heated vapour - Subcooled liquid - Pressure temperature relationship for liquids - Refrigerants - Vapour compression cycle - Compressors - Evaporators - Refrigerant control devices - Electric motors - Starters - Air handling units - Cooling towers - Window type and packaged air-conditioners - Chilled water plant - Fan coil systems - Water piping - Cooling load - Air conditioning systems for different types of buildings - Protection against fire to be caused by A.C. Systems

UNIT V FIRE SAFETY INSTALLATION

9

Causes of fire in buildings - Safety regulations - NBC - Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types - Heat and smoke detectors - Fire alarm system, snorkel ladder - Fire lighting pump and water storage - Dry and wet risers - Automatic sprinklers.

TOTAL = 45

TEXT BOOKS:

1. Udayakumar, R, "A Text Book of Building Services", Eswar Press 2007.
2. Hervé Descottes and Cecilia Ramos" Architectural lighting", 2011
3. Arora " Refrigeration and air conditioning" McGraw Hill Education,2017)
4. Das a K, "Principles of fire safety engineering" Prentice Hall India Learning Private Limited (2014)

REFERENCES:

1. John W. Mitchell and James E. Braun "Principles of Heating, Ventilation, and Air Conditioning in Buildings"Wiley; 1 edition (March 6, 2012).
2. Handbook for Building Engineers in Metric systems, NBC, New Delhi, 1968.
3. Norbert Lechner, "Heating, Cooling, Lighting: Sustainable Design Methods for Architects", John Wiley & Sons; 4th Edition, 2014
4. Nihal E. Wijesundera, "Principles of heating, ventilation and air conditioning with worked examples", World Scientific, 2016
5. National Building Code.

CEC367 MUNICIPAL SOLID WASTE MANAGEMENT

L	T	P	C
3	0	0	3

GOAL

To make the students learn about the various types of solid waste produced the collection and transportation methods, and the treatment in disposal methods.

OBJECTIVES

The course should enable the students to :

1. Become familiar with the problems associated with the solid waste of Municipalities and Industries.
2. Know about the collection, segregations, and treatment of solid waste.
3. Be Aware of the various treatment technologies available for treating solid waste.
4. Know about various methods of collection and disposal of solid waste .
5. Be familiar with the biogas production from solid waste.

OUTCOME

The students will be able to:

1. Describe the solid waste collection and transportation methodology.
2. Describe the on-site storage methods, segregation and treatment of solid waste.
3. Apply knowledge on various methods of collection and disposal of solid waste.
4. Demonstrate biogas generation and to develop vermi culture for composting of solid waste.
5. Describe the biogas production from solid waste.

UNIT I. SOURCES AND TYPES OF MUNICIPAL SOLID WASTES 9

Sources and types of solid wastes - Quantity – factors affecting generation of solid wastes; characteristics – methods of sampling and characterization; Effects of improper disposal of solid wastes – public health effects. Principle of solid waste management – social & economic aspects; Public awareness; Role of NGOs - **Municipal solid waste (M&H) rules.**

UNIT II ON-SITE STORAGE & PROCESSING 9

On-site storage methods – materials used for containers – on-site segregation of solid wastes – public health & economic aspects of storage – case studies under Indian conditions – **Reduction, Reuse and recycling**

UNIT III COLLECTION AND TRANSFER 9

Methods of Collection – types of vehicles – Manpower requirement – collection routes; transfer stations – selection of location, operation & maintenance; options under Indian conditions.

UNIT IV OFF-SITE PROCESSING**9**

Processing techniques and Equipment; Resource recovery from solid wastes – composting, **Biomethanation**, incineration, Pyrolysis - options under Indian conditions.

UNIT V DISPOSAL**9**

Dumping of solid waste; sanitary landfills – site selection, design and operation of sanitary landfills – **Land fill gas management** - Leach ate collection & treatment.

TOTAL = 45**TEXT BOOKS:**

- George Tchobanoglous et.al., “Integrated Solid Waste Management”, McGraw-Hill Publishers, 2014.
- T.V. Ramachandra “ Management of municipal solid waste” Teri press, 2009.

REFERENCES:

- Manual on Municipal Solid Waste Management, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 2000
- John Pichtel "Waste Management Practices: Municipal, Hazardous, and Industrial"CRC Press; 2014.
- Sunil Kumar"Municipal Solid Waste Management in Developing Countries"CRC Press (November 18, 2016..

CEC368 MODERN CONSTRUCTION MATERIALS

L	T	P	C
3	0	0	3

GOAL

To educate students on protective, preventive and corrective actions, to be taken in a building with regards to various materials, details and stages in construction, for comprehensive understanding of practices to cover water proofing, types of insulation, covering, paints and enamels.

OBJECTIVES

The course should enable the students to:

1. Understand the various materials and methods of water- proofing.
2. Study about thermal insulation.
3. Know about Acoustic Insulation.
4. Understand the various floor and wall finishing materials, their properties, method of laying.
5. Gain knowledge on the properties, and applications of various paints, enamels, emulsions, varnishes.

OUTCOME

The students will be able to:

1. Make proper choice of material for water proofing for different places.
2. Describe the process of heat transfer; in various materials & make proper choice of thermal insulative material.
3. Choose various acoustic insulation materials & its importance.
4. Make proper choice of floor & wall finishing materials.
5. Describe types of paint, enamels, and varnishes & make proper choice.

UNIT I DAMP AND WATER PROOFING

9

Damp proofing- hot applied and cold applied- Emulsified asphalt, Bentonite clays, butyl rubber, silicon, vinyl's Epoxy resins and metallic water proofing materials properties, uses.(Water proofing membranes such as rag, asbestos, glass, felt- plastic and synthetic rubber- vinyl, butyl rubber, neoprene polyvinyl chloride (PVC)- Application of the above under various situations- basement floors, swimming pool, terraces, etc.

UNIT II THERMAL INSULATION

9

Heat transfer and heat gain by materials- vapor barriers and rigid insulation- properties and uses of spun glass, foamed glass, cork, vegetable fibers,mineral fibers, foamed plastics, and vermiculite and glass fibers. Gypsum- manufacture, properties and uses, plaster of paris and hydride gypsum.

UNIT III ACOUSTIC INSULATION

9

Porous, Baffle and perforated materials such as acoustic plastic, acoustic tiles, wood, partial board, fiber board, cork, quilts and muts- Brief study on properties and uses of the above- current developments.

UNIT IV FLOOR AND WALL COVERINGS**9**

Floor coverings- flooring- softwood, hardwood- Resilient flooring- terrazzo- properties, uses and laying. Wall coverings - Porcelain, enameled metal, wood veneer, Vinyl, plastic surfaced paneling - properties uses and lying. Wall and floor tiles- Ceramic glazed mosaic, quarry and cement files- properties uses and lying. Market study of current developments.

UNIT V PROTECTIVE AND DECORATIVE COATINGS**9**

Paints - Enamels, distempers, plastic emulsions, cement based paints- properties, uses and applications- defects in painting, varnishes, special purpose paints- luminous & fire retardant paints, properties, uses & application.

TOTAL = 45**TEXT BOOKS**

- S.C.Rangwala, "Building Construction" , Charotar Publishing House, Anand, India, 2008.
- B.C.Punmia, "Building Construction", Laxmi Publications Pvt. Ltd., New Delhi, 2017.
- Francis. D. K. Ching, "A Visual Dictionary of Architecture", Van Nostrand Reinhold - 2011
- Arora S.P. and Bindra S.P., Building Construction Planning Techniques and Method of Construction, Dhanpat Rai Sons, 2010.

REFERENCES

- William P. Spence and Eva Kultermann"Construction Materials, Methods and Techniques"Delmar Cengage Learning; 4 edition (January 25, 2016)
- Arthur R.Llons, "Materials for architects and builders An introduction", Holder Headline group, Great Britain, 2014.
- G. C Sahu and Joygopal Jenna " Building materials and construction" McGraw Hill Education,2014.

CEC369 IRRIGATION ENGINEERING

L	T	P	C
3	0	0	3

GOAL

To introduce the students to the basic concepts of Irrigation system as they pertain to agriculture and power generation.

OBJECTIVES

The course should enable the students to :

1. Understand the necessity of irrigation.
2. Be familiar with different methods of irrigation.
3. Be acquainted with the different hydraulic structures.
4. Be familiar with canal irrigation.
5. Be acquainted with integration of management with irrigation systems.

OUTCOME

The students will be able to:

1. Identify the need for irrigation.
2. Describe the different types of irrigation.
3. Describe the canal irrigation system.
4. Design the hydraulic structures based on hydraulic parameters.
5. Describe how the management and irrigation systems are integrated.

UNIT I INTRODUCTION

9

Irrigation - Need for irrigation - Merits and demerits of irrigation - Crop and crop seasons - consumptive use of water - Duty - Factors affecting duty - Irrigation efficiencies - Planning and Development of irrigation projects.

UNIT II IRRIGATION METHODS

9

Canal irrigation - Lift irrigation - Tank irrigation - Flooding methods - Merits and demerits - Sprinkler irrigation - Drip irrigation.

UNIT III DIVERSION AND IMPOUNDING STRUCTURES

9

Weirs - elementary profile of a weir - weirs on pervious foundations - Types of impounding structures - Tanks, Sluices and Weirs - Gravity dams - Earth dams - Arch dams - Spillways - Factors affecting location and type of dams - Forces on a dam.

UNIT IV CANAL IRRIGATION

9

Classification of canals - Alignment of canals- Canal drops -Cross drainage works - Canal Head works - Canal regulators - River Training works.

UNIT V IRRIGATION WATER MANAGEMENT

9

Need for optimisation of water use - Minimising irrigation water losses - On farm development works -Participatory irrigation management - Water users associations - Changing paradigms in water management.

TOTAL = 45

TEXT BOOKS:

- S.K. Garg, "Irrigation Engineering And Hydraulic Structures" , Khanna publishers, 2004
- Sharma R.K., and Sharma T.K., "Irrigation Engineering", S. Chand and company, New Delhi, 2008.
- J.L Sharma, "Irrigation Engineering", Satya Prahesan, New Delhi, 2017

REFERENCES:

- A.M.Michael, "Irrigation, Theory and Practices", Vikas Publishing House Pvt.Ltd, Second Edition , 2008
- Dilip Kumar Majumdar, "Irrigation Water Management (Principles & Practices)", Prentice Hall of India (P), Ltd, 2013.
- Basak, N.N, "Irrigation Engineering", Tata McGraw-Hill Publishing Co. 2017

CEC370 ESTIMATION AND QUANTITY SURVEYING

L T P C
3 0 0 3

GOAL

To provide the students with the ability to estimate the quantities of item of works involved in buildings, water supply and sanitary works, road works and irrigation works, and also to equip the student with ability to do rate analysis, valuation of properties, planning & scheduling and preparation of report for estimation of various items.

OBJECTIVES

The course should enable the students to

- Know about various methods of estimates and be familiar with the estimated of load bearing & framed structures.
- Be familiar with the estimate of sanitary and water supply works including estimation of roads and cross drainage works.
- Be familiar with specification and analysis of rates.
- Understand the procedures involved in valuation of structure.
- Acquire knowledge in planning and scheduling and detailed report preparation of estimates.

OUTCOME:

The Students will be able to:

- Apply practical knowledge of estimation building, water supply, sanitary, road and cross drainage works.
- Prepare cost estimation by using schedule of rates, with standard data and specifications.
- Calculate the valuation, standard rent of buildings.
- Make use of network planning techniques like CPM& PERT, apply methods of cost control for civil engineering projects and report preparation.

UNIT I . INTRODUCTION & ESTIMATE OF BUILDINGS: 12

Types of estimates –Units of measurements – Methods of estimates – Advantages. Load bearing and framed structures – Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms residential building with flat and pitched roof.

UNIT II . ESTIMATE OF OTHER STRUCTURES 9

Estimating of septic tank, soak pit – sanitary and water supply installations – water supply pipe line – sewer line – tubewell – open well – estimate of bituminous and cement concrete roads – estimate of retaining walls – culverts.

UNIT III. SPECIFICATION 6

Data – Schedule of rates – Analysis of rates – Specifications – sources – Detailed and general specifications

UNIT IV VALUATION**6**

Necessity – Basics of value engineering – capitalized value – Depreciation – Escalation
–Value of building – Calculation of Standard rent – Mortgage - Lease

UNIV V PLANNING & SCHEDULING**12**

Concepts of network – network planning methods CPM/PERT – management by
network analysis and control – Principles of cost control – bill of quantities and
Principles for report preparation.

TOTAL : 45**TEXT BOOKS:**

1. Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 2003
2. Kohli D.D. and Kohli, R.C., "A Text book of estimating and costing (Civil)", S. Chand & Company Ltd., 2004.
3. Dr. B.C. Purnia & k.K. Khandelwal, "Project Planning and Control with PERT & CPM" Laxmi Publications (P) Ltd., 2010.

PROFESSIONAL ELECTIVES
SEMESTER VII
CEC451 CONSTRUCTION MANAGEMENT

L	T	P	C
3	0	0	3

GOAL

To introduce to the students the functions of management, network planning techniques, contract system & accounting procedures in government ,organization & groom them to match to the requirement of employer expectation in construction industry.

OBJECTIVE :

The course should enable the students to:

1. Understand the functions of management and various organizational structures.
2. Understand the construction planning, resource planning and various labour legislations
3. Understand the concept of network planning methods and principles of cost control
4. Study the concept of tender and contracts and impart idea about quality control and safety requirements
5. Know various accounting procedures adopted in government organizations.

OUTCOME :

The students will be able to:

1. Describe the importance of management and know the merits and demerits of various organizational structures.
2. Gain knowledge on resource planning for civil engineering projects and know the labour requirements.
3. Make use of network planning techniques like CPM and PERT and apply methods of cost control for civil engineering projects.
4. Execute the project works by inviting tenders and document and interpret project work progress.
5. Document and Communicate Schedule and Cost Impacts

UNIT I PRINCIPLES OF MANAGEMENT

9

Definition – importance – function of management – relevance to Government and Quasi Government departments – private contractors and contracting firms – organisational structure.

UNIT II CIVIL ENGINEERING MANAGEMENT

9

a) Construction Planning : Collection of field data – preliminary estimates – approval and sanction of estimates – budget provision – construction stages – scheduling methods – progress reports and charts.

b) Resource Planning: Planning for materials, machines, men and organisation – resource allocation.

c) Labour and Labour Welfare

Relationship between management and labour – problems – labour Legislations – Minimum Wages Act – settlement of disputes – industrial psychology.

UNIT III MANAGEMENT METHODS

9

Concepts of network – network planning methods **CPM/PERT** – management by network analysis and control – principles of cost control – control by graphical representation, by bill of quantities and by network analysis.

UNIT IV EXECUTION OF WORK

9

a) Departmental Works : Procedure – departmental labour – quality control, inspection and duties of personnel – safety requirements.

b) Contracts: Contract system – types of contracts – specifications, documents, procedures, condition, taxes, law of contractors and legal implications are penalties.

c) Tender and Tender Documents: Definition – calling for tenders – tender documents – submission of tenders – processing of tenders – negotiations and settlement of contracts-agreement between the owner and the contractor

d) Quality Control: Quality of materials – role of site engineer- workmanship

UNIT V ACCOUNTS AND STORES

9

Measurements of work – recording – checking – types of bills – mode of payment – budget estimate – revised estimates – completion of reports and certificates – claims – banking settlement – types of accounts – drawal and transfer classifications of transactions – ledger accounts – interest account – cash book.

Suspense classification – storing – maintenance inspection – inventories – transfer of surplus and accounting of shortage stores – procedures adopted in P.W.D. and C.P.W.D

TOTAL 45

TOTAL 45

TEXT BOOKS:

- Sanga Reddy and Meyyappan, Construction management, Kumaran Publications, 2005
- Saurabh K Soni, Construction Management and Equipment, S.K. Kataria & Sons, 2016
- Sengupta , Construction Management, Tata McGraw Hill, 2002
- J.L. Sharma, , Construction Management and accounts,by Satya Publications, 2002
- D. Lal , Construction Management and P.W.D. Accounts, S.K. Kataria & Sons, 2017

REFERENCE BOOKS:

- C.P.W.D. Manuals
- Public Works Accounts Code, PWD, Tamilnadu
- Kumar NeerajJha, Construction Project Management -Theory and Practice, Pearson publications, 2nd edition, 2016.
- Jimmie Hinze, Construction Contracts, McGraw hill education, 2013.
- Joseph T. Bockreth, Contracts and Legal environment, McGraw hill education, 2013.

CEC452 TRAFFIC ENGINEERING MANAGEMENT

L	T	P	C
3	0	0	3

GOAL

To explore the students how to provide for the safe, rapid, comfortable, convenient, economical and environmentally compatible movement of people and goods.

OBJECTIVES

The course should enable the students to:

1. Study the various components of Traffic Engineering.
2. Familiarize with traffic surveys and their analysis.
3. Study about the traffic control method.
4. Understand the principles involved in the geometric design of Intersection.
5. Know the concepts of Traffic management.

OUTCOME

The students will be able to:

1. Describe the road, traffic and land use characteristics.
2. Describe different components of traffic survey and analyse it.
3. Design Traffic signals and its co-ordination using the knowledge obtained about the computer applications in signal design.
4. Design the Intersections.
5. Develop the skill on Traffic Management and Traffic Forecasting techniques and the Intelligence Transport System.

UNIT I INTRODUCTION

9

Significance and scope, Characteristics of Vehicles and Road Users, Skid Resistance and Braking Efficiency (Problems), Components of Traffic Engineering - Road, Traffic and Land Use Characteristics.

UNIT II TRAFFIC SURVEYS AND ANALYSIS

9

Surveys and Analysis - Volume, Capacity, Speed and Delays, Origin and Destination, Parking, Pedestrian Studies, Accident Studies and Safety Level of Services - Problems.

UNIT III TRAFFIC CONTROL

9

Traffic signs, Road markings, Design of Traffic signals and Signal co-ordination (Problems), Traffic control aids and Street furniture, Street Lighting, Computer applications in Signal design.

UNIT IV GEOMETRIC DESIGN OF INTERSECTIONS

9

Conflicts at Intersections, Classification of Intersections at Grade. - Channelized and Unchannelized Intersection - Grade Separators (Concepts only), Principles of Intersection Design, Elements of Intersection Design, Channelization and Rotary design (Problems), Grade Separators.

UNIT V TRAFFIC MANAGEMENT

9

Traffic Management - Traffic System Management (TSM) and Travel Demand Management (TDM), Traffic Forecasting techniques, Restrictions on turning movements, One-way Streets, Traffic Segregation, Traffic Calming, Tidal flow operations, Exclusive Bus Lanes - Introduction to Intelligence Transport System (ITS).

TOTAL = 45

TEXT BOOKS:

1. SK Khanna, CEG Justo, A Veeraragavan, Highway Engineering, Nem Chand & Brothers, 2015
2. Kadiyali L R, Traffic Engineering and Transport Planning, Khanna publishers,2011.

REFERENCES:

1. Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management.
2. Guidelines of Ministry of Road Transport and Highways, Government of India.
3. Yang, Xiaoguogang, Traffic Design, S.K Kataria & Sons, 2017

CEC453 PRESTRESSED CONCRETE

L	T	P	C
3	0	0	3

GOAL

To possess the students with knowledge about behaviour, analysis and design requirements for prestressed concrete members according to Indian design code requirements.

OBJECTIVES :

The course should enable the students to:

1. Understand the basic concepts of prestressing.
2. Be acquainted with the codal provision for the design of prestressed concrete elements.
3. Understand the principles involved in the design of tensioned bridge decks.
4. Have comprehensive design knowledge about circular prestressing.
5. Understand the design concepts of pressure composite constructions.

OUTCOME :

The students will be able to:

1. Describe the systems and methods of prestressing and find the deflection of prestressed elements.
2. Design the prestressed concrete elements as per the codal provisions.
3. Design prestressed concrete tanks, poles and sleepers.
4. Analyse the concrete composite members.
5. Describe the principles of pre tensioned and post tensioned concrete bridge decks.

UNIT I INTRODUCTION - THEORY AND BEHAVIOUR

9

Basic concepts - Advantages - Materials required - Systems and methods of prestressing - Analysis of sections - Stress concept - Strength concept - Load balancing concept - Effect of loading on the tensile stresses in tendons - Effect on tendon profile on deflections - Factors influencing deflections - Calculation of deflections - Short term and long term deflections - Losses of prestress - Estimation of crack width

UNIT II DESIGN

9

Flexural strength - Simplified procedures as per codes - strain compatibility method - Basic concepts in selection of cross section for bending - stress distribution in end block, Design of anchorage zone reinforcement - Limit state design criteria - Partial prestressing - Applications.

UNIT III CIRCULAR PRESTRESSING**9**

Design of prestressed concrete tanks - Poles and sleepers

UNIT IV COMPOSITE CONSTRUCTION**9**

Analysis for stresses - Estimate for deflections - Flexural and shear strength of composite members

UNIT V PRE-STRESSED CONCRETE BRIDGES**9**

General aspects - pretension prestressed bridge decks - Post tensioned prestressed bridge decks - Advantages over R.C. bridges - Principles of design only

TOTAL = 45**TEXT BOOKS:**

- Krishna Raju N., Prestressed concrete, Tata McGraw Hill Company, New Delhi 2012
- Lin T.Y. Design of prestressed concrete structures, Asia Publishing House, Bombay 1995.
- Dr. Y.R.M. Rao, J. P. Annie, P. Easwari, Prestressed Concrete Analysis and Design, G S Enterprises, 2017.

REFERENCES:

- Ramaswamy G.S., Modern prestressed concrete design, Arnold Heinimen, New Delhi, 2012
- David A. Sheppard, William R. and Philips, Plant Cast precast and prestressed concrete - A design guide, McGraw Hill, New Delhi 2011.
- Praveen Nagaraja, Prestressed Concrete Design, Kindersley India, 2013

CEC454 FINITE ELEMENT ANALYSIS

L	T	P	C
3	0	0	3

GOAL

To possess the students with knowledge about basic finite-element theory, computer implementation of this theory, and its practical applications.

OBJECTIVES

The course should enable the students to :

1. Understand finite-element analysis modeling and various methods involved in it.
2. Understand the concepts of finite element analysis of one dimensional problem.
3. Gain knowledge on finite element formulation of two dimensional elements through generalized coordinates approach.
4. Study about Isoparametric elements and formulation of element equations.
5. Study about finite element analysis of problems related to field applications.

OUTCOME

The students will be able to:

1. Solve simple problems using Ritz method and weighted residuals method.
2. Discretize one dimensional elements, formulate the element equation and find the solution of equation using cholesky method.
3. Discretize the two dimensional elements using triangular and quadrilateral elements, assemble element. matrices and find solution for different boundary conditions.
4. Describe the Isoparametric elements and formulate element equations in one and two dimensions.
5. Apply finite element analysis for field applications such as Heat - transfer, Fluid flow etc.,

UNIT I INTRODUCTION - VARIATIONAL FORMULATION

9

General field problems in Engineering - Modelling - Discrete and Continuous models - Characteristics - Difficulties involved in solution - The relevance and place of the finite element method - Historical comments - Basic concept of FEM, Boundary and initial value problems - Gradient and divergence theorems - Functionals - Variational calculus - Variational formulation of VBPS. The method of weighted residuals - The Ritz method.

UNIT II FINITE ELEMENT ANALYSIS OF ONE DIMENSIONAL PROBLEMS

9

One dimensional second order equations - discretization of domain into elements - Generalised coordinates approach - derivation of elements equations - assembly of elements equations - imposition of boundary conditions - solution of equations - Cholesky method - Post processing - Extension of the method to fourth order equations

and their solutions - time dependant problems and their solutions - example from heat transfer, fluid flow and solid mechanics.

UNIT III FINITE ELEMENT ANALYSIS OF TWO DIMENSIONAL PROBLEMS

9

Second order equation involving a scalar-valued function - model equation - Variational formulation - Finite element formulation through generalised coordinates approach - Triangular elements and quadrilateral elements - convergence criteria for chosen models - Interpolation functions - Elements matrices and vectors - Assembly of element matrices - boundary conditions - solution techniques.

UNIT IV ISOPARAMETRIC ELEMENTS AND FORMULATION

9

Natural coordinates in 1, 2 and 3 dimensions - use of area coordinates for triangular elements in - 2 dimensional problems - Isoparametric elements in 1,2 and 3 dimensional - Lagrangean and serendipity elements - Formulations of elements equations in one and two dimensions - Numerical integration.

UNIT V APPLICATIONS TO FIELD PROBLEMS IN TWO DIMENSIONALS

9

Equations of elasticity - plane elasticity problems - axisymmetric problems in elasticity - Bending of elastic plates - Time dependent problems in elasticity - Heat - transfer in two dimensions - incompressible fluid flow.

TEXT BOOK:

- Chandrupatla, T.R., and Belegundu, A.D., "Introduction to Finite Element in Engineering", Pearson Education India; 4 edition, 2015

REFERENCES:

- J Reddy, "An Introduction to the Finite Element Method", McGraw-Hill Education, 3 edition, 2005
- Zienkiewics, "The finite element method, Basic formulation and linear problems", Vol.1, 4/e, McGraw-Hill, Book Co. ,1989
- S.S.Rao, "The Finite Element Method in Engineering", Pergaman Press, 2003.
- Ivo Babuska, John Whiteman, Theofanis Strouboulis, "Finite Elements: An Introduction to the Method and Error Estimation, Oxford University Press, U.S.A.,2010

CEC455 WATER RESOURCES ENGINEERING

L	T	P	C
3	0	0	3

GOAL

To expose the students with the National water policy and reservoir planning and management.

OBJECTIVES

The course should enable the students to:

1. Know about the economics of water resources planning and National water policy.
2. Gain knowledge on the analysis of hydrologic data.
3. Know about estimation of water requirement, water budget and development plan.
4. Be familiar with reservoir planning and management.
5. Understand the benefits of cost Analysis and discounting techniques.

OUTCOME

The students will be able to:

1. Describe the water resources in India and Tamil Nadu and the meteorological and hydrological data for water resources development.
2. Analyse the hydrologic data.
3. Make estimation of water requirement for irrigation, drinking and navigation and also development plan.
4. Describe the reservoir planning and its management.
5. Describe the various economic analysis techniques.

UNIT I GENERAL

9

Water resources survey - Water resources of India and Tamilnadu - Description of water resources planning - Economics of water resources planning, physical and socio economic data - National Water Policy - Collection of meteorological and hydrological data for water resources development.

UNIT II NETWORK DESIGN

9

Hydrologic measurements - Analysis of hydrologic data - Hydrologic station network - Station network design - Statistical techniques in network design.

UNIT III WATER RESOURCE NEEDS

9

Consumptive and non-consumptive water use - Estimation of water requirements for irrigation, for drinking and navigation - Water characteristics and quality - Scope and aims of master plan - Concept of basin as a unit for development - Water budget and development plan.

UNIT IV RESERVOIR PLANNING AND MANAGEMENT

9

Reservoir - Single and multipurpose - Multi objective - Fixation of Storage capacity - Strategies for reservoir operation - Sedimentation of reservoirs - Design flood-levees and flood walls - Channel improvement.

UNIT V ECONOMIC ANALYSIS

9

Estimation of cost and Evaluation of Benefits - Discount rate - Discounting factors - Discounting techniques - Computer Applications.

TOTAL = 45

TEXT BOOKS :

- Linsley R.K. and Franzini J.B, "Water Resources Engineering", McGraw-Hill Inc, 2000.
- Douglas J.L. and Lee R.R., "Economics of Water Resources Planning", Tata McGraw-Hill Inc. 2000.
- Duggal, K.N. and Soni, J.P., "Elements of Water Resources Engineering", New Age International Publishers, 2003

REFERENCES :

- Vijay P Singh, Shalini Yadav, Ram Narayan Yadava, Water Resources Management: Select Proceedings of ICWEES-2016 (Water Science and Technology Library), 2017
- Thomas V. Cech , "Principles of Water Resources: History, Development, Management, and Policy", Wiley, 3 edition, 2009
- Patrick Purcell, "Design of Water Resources Systems", Thomas Telford Publishing, 2003

CEC456 PAVEMENT DESIGN AND ENGINEERING

L T P C
3 0 0 3

GOAL

To introduce the students on various IRC guidelines for designing rigid and flexible pavements.

OBJECTIVES

The course should enable the students to :

1. Understand the types of pavements and the stress distribution in them.
2. Understand the methods of design of flexible pavements.
3. Familiarize with the various methods of design of rigid pavements.
4. Understand the pavement evaluation techniques and their maintenance.
5. Get exposed to the pavement stabilization techniques.

OUTCOME

The students will be able to:

1. Describe the various types of pavements, stress and deflections in pavements under repeated loading.
2. Design the flexible pavement as per IRC.
3. Design the rigid pavement as per IRC.
4. Perform pavement evaluation by surface appearance and by deflection measurement.
5. Choose the suitable soil stabilisers and Geo-synthetics for rural roads.

UNIT I TYPE OF PAVEMENT AND STRESS DISTRIBUTION ON LAYERED SYSTEM 9

Introduction - Pavement as layered structure - Pavement types - rigid and flexible - Stress and Deflections in pavements under repeated loading

UNIT II DESIGN OF FLEXIBLE PAVEMENTS 9

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 9

Cement concrete pavements - Modified Westergaurd approach - Design procedure as per latest IRC guidelines - Concrete roads and their scope in India.

UNIT IV PERFORMANCE EVALUATION AND MAINTENANCE 9

Pavement Evaluation [Condition and evaluation surveys (Surface Appearance, Cracks, Patches and Pot Holes, Undulations, Ravelling, Roughness, Skid Resistance), Structural Evaluation By Deflection Measurements, Present Serviceability Index] Pavement maintenance. [IRC Recommendations Only]

UNIT V STABILISATION OF PAVEMENTS 8

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.

TOTAL = 45

TEXT BOOKS:

- Kadiyali L R & N.B. Lal, Principles and Practice of Highway Engineering, Khanna Publishers, 2005
- T. Papagiannakis, E. A. Masad , " Pavement Design and Materials ", John Wiley, 2008
- Karen K., Dixon Paul & H. Wright, Highway Engineering, Wiley; Seventh edition, 2009
- Design and Specification of Rural Roads (Manual), Ministry of rural roads, Government of India, New Delhi, 2001
- SK Khanna, CEG Justo, A Veeraragavan, Highway Engineering, Nem Chand & Brothers, 2015.

REFERENCES:

- Yang H. Huang, "Pavement Analysis and Design", Pearson India, 2nd edition, 2009.
- Guidelines for the Design of Flexible Pavements, IRC:37 - 2001, The Indian roads Congress, New Delhi.
- Guideline for the Design of Rigid Pavements for Highways, IRC:58-1998, The Indian Roads Congress, New Delhi.

CEC457 GROUND IMPROVEMENT TECHNIQUES

L	T	P	C
3	0	0	3

GOAL

To equip the students with the latest available ground improvement techniques for Civil Engineering Structures.

OBJECTIVES

The course should enable the students to:

1. Understand the geotechnical problems in various types of soils and suggests suitable ground improvement techniques.
2. Be familiar with the various dewatering techniques that can be used in the soils with higher ground water level.
3. To know the various techniques and procedures adopted for ground improvement.
4. Understand the concept, types and applications of earth reinforcement.
5. Gain knowledge about the various types, materials and techniques used for grouting

OUTCOME

The students will be able to :

1. Assess the geotechnical problems in various types of soils and suggest suitable ground improvement techniques.
2. Choose suitable dewatering techniques for construction sites where the ground water table is at a higher level.
3. Identify the apt ground improvement technique for various types of soils and site conditions.
4. Apply the earth reinforcement techniques for retaining walls and slopes.
5. Select the appropriate grouting materials and techniques to strengthen the soil.

UNIT I INTRODUCTION

9

Role of ground improvement in foundation engineering - methods of ground improvement - Geotechnical problems in alluvial, laterite and black cotton soils - Selection of suitable ground improvement techniques based on soil condition.

UNIT II DRAINAGE AND DEWATERING

9

Drainage techniques - Well points - Vacuum and electro osmotic methods - Seepage analysis for two dimensional flow-fully and partially penetrating slots in homogenous deposits (Simple cases only).

UNIT III IN-SITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS

9

In-situ densification of cohesionless and consolidation of cohesive soils -Dynamic compaction and consolidation - Vibrofloatation - Sand pile compaction - Preloading with sand drains and fabric drains - Stone columns - Lime piles - Installation techniques only - relative merits of various methods and their limitations.

UNIT IV EARTH REINFORCEMENT**9**

Concept of reinforcement - Types of reinforcement material - Applications of reinforced earth - use of Geotextiles for filtration, drainage and separation in road and other works. Prevention of land sliding and techniques adopted for the same.

UNIT V GROUT TECHNIQUES**9**

Types of grouts - Grouting equipment and machinery - Injection methods - Grout monitoring - Stabilisation with cement, lime and chemicals - Stabilisation of expansive soils.

TOTAL = 45**TEXT BOOK:**

1. Purushothama Raj, P. "Ground Improvement Techniques", Laxmi Publications, 2016.
2. Nihar Ranjan Patra, Ground Improvement Techniques, S.Chand Publishers 2012
3. Peter Nicholson, Soil Improvement and ground modification methods, Butterworth Heinemann 2014

REFERENCES:

- 1 Jones J.E.P., Earth Reinforcement and Soil Structure, Butterworths, 1996.
2. Robert M. Koerner , "Designing with Geosynthetics Vol. 1&2", Xlibris; 6 edition, 2012
3. Jie Han, Principles and Practice of Ground Improvement, John Wiley & Sons, 2015
4. Braja M Das, "Principles of Foundation Engineering", CL Engineering, 8 edition, 2015.

CEC458 DESIGN OF STEEL SKELETAL STRUCTURES

L	T	P	C
3	0	0	3

GOAL

To introduce the students to the design of skeletal structures such as transmission line towers, steelmonopoles, communication towers

OBJECTIVES

The course should enable the students to:

- Understand the design concepts of transmission line.
- Know about the design concepts of steel monopoles.
- Be familiar with the design concepts of communication towers.
- Understand the design concepts of steel frames for building.
- Be acquainted with the analysis and design of braced and unbraced frames.

OUTCOME

The students will be able to:

- Design the different types of Transmission line towers including the foundation as per codal provision.
- Design the tabular poles along with the foundation.
- Analyse the communication towers for wind load and design its components as per codal provision.
- Analyse the steel space frames using computer and design it as per codal provision.
- Analyse the braced and unbraced frames using computer and design as per codal provision.

UNIT I TRANSMISSION LINE TOWERS

9

Various components of transmission line towers - Types of transmission line towers - single circuit-double circuit - Load tree generation as per IS:802 - calculation of conductor loads - calculation of body wind forces- design of members - effective length of main legs - primary bracings - secondary bracings - Types of foundations - Design of simple tower foundations -Brief description on mandatory testing of towers.

UNIT II DESIGN OF STEEL MONOPOLES

9

Type of monopole steel structures - load tree generation for monopole structures - design of tubular poles - fabrication practices - design of monopole foundations.

UNIT III COMMUNICATION TOWERS

9

Communication towers - type - square base - triangular base - roof top towers with flat-sided members - circular pipe section - hybrid towers with flat sided and circular pipes. Types of antenna mountings GSM, dish - calculation of wind loads on antenna and on body of tower - Wind load calculation using IS: 875-Part III - design of members as per IS: 800(2007) foundation design on roof top.

UNIT IV SPACE FRAMES STRUCTURES

9

Types of medium and large span - spans and suitability of different schemes- flat and

curved vaults - Design of simple double layered grid space frames - different type of connectors - wind load calculation as per IS:875 - analysis of simple space frames using computers - design using IS:800(2007).

UNIT V STEEL FRAMES FOR BUILDINGS

9

Types of steel frames for buildings - braced frames- unbraced frames - load carrying mechanism for braced and unbraced frames - stability design of plane frames with large gravity load - design of columns of braced and unbraced frames using formulae in IS: 800(2007) - analysis of simple braced and unbraced frames using computer - Preliminary and final design of members - drift restrictions in frames structures for buildings etc.

TOTAL = 45

TEXT BOOKS:

1. Subramanian Narayanan, Space Structures: Principles and Practice, Multi Science Publishing Co Ltd, 2007
2. Sriram Kalaga & Prasad Yenumula, Design of Electrical Transmission Lines: Structures and Foundations, 2016

REFERENCES:

1. IS:875 Part III
2. IS 800 (2007) Indian Standard code of practice for general construction in steel.
3. IS:802 - Code of Practice for the use of structural steel in overhead transmission line towers - Parts 1-3.

CEC459 CONCRETE TECHNOLOGY

L T P C
3 0 0 3

GOAL

To impart knowledge about advanced concrete technology which would help the students to match their skills in materials understanding with the current requirements of the construction industry

OBJECTIVES

The course should enable the students to :

1. Study about the properties of cement.
2. Get exposure to different types of mineral admixture.
3. Know about the mechanical properties of aggregates.
4. Understand the concepts of mix proportioning of concrete.
5. Study about the properties and durability of concrete.

OUTCOME

The students will be able to:

1. Describe the manufacture and hydration process of cement.
2. Choose suitable retarders, air entraining agents, and plasticizers that should be used in concrete.
3. Describe physical durability and chemical stability of aggregates.
4. Execute mix proportioning of concrete and describe how the strength of concrete can be modified using fibers
5. Describe the properties and durability of concrete.

UNIT I CEMENT 9

Composition of OPC-Manufacture-Modified Portland cements-Hydration process of Portland cements-Structure of Hydrated cement Pastes

UNIT II ADMIXTURES 9

Mineral admixtures-Slags-Pozolanas and Fillers-Chemical Admixtures-Solutes Retarders-Air Entraining Agents-Water proofing compounds-Plasticizers and Super Plasticizers

UNIT III AGGREGATES 9

Shape and Mechanical properties-Absorption and Physical durability-Chemical stability and packing Characteristics

UNIT IV FRESH CONCRETE 9

Workability-Mix proportioning-Mixes incorporating Fly-Ash Mixes for High performance concrete-Fibre reinforced concrete.

UNIT V PROPERTIES AND DURABILITY OF CONCRETE 9

Interfacial Transition zone-Fracture strength-Mechanical properties-High strength concrete-Shrinkage-Creep- Other properties.Basic consideration-Stability of constituents-Chemical Attack-Corrosion of Reinforcing steel.

TOTAL = 45

TEXT BOOK:

- Neville, A.M., "Properties of concrete ", 5th edition, Pearson, 2012
- M.S Shetty, "Concrete Technology Theory and Practice", S. Chand & Company Ltd., 2012
- S Christian Johnson, Concrete Technology, Dipti Press (OPC), 2017

REFERENCES:

- P. Kumar Mehta & Paulo J. M. Monteiro, Concrete: Microstructure, Properties, and Materials, McGraw-Hill Education; 4 edition, 2013
- Sidney Mindess, J. Francis Young, David Darwin, "Concrete ", Pearson; 2 edition, 2002.

CEC460 BRIDGE STRUCTURE

L T P C
3 0 0 3

GOAL

To introduce the students to basic theory and concepts of design of steel, reinforced concrete and pre stressed concrete bridge design for IRC loading conditions

OBJECTIVES

The course should enable the students to :

1. Understand the design concepts of steel highway bridges.
2. Study about the design concepts of Pratt type truss girder highway bridges and plate girder railway bridges.
3. Be acquainted with the design concepts of reinforced concrete slab bridges.
4. Study the design concepts of reinforced concrete girder bridges.
5. Be acquainted with the design techniques involved in prestressed concrete bridges.

OUTCOME

The students will be able to:

1. Design through type and deck type steel highway bridges for IRC loading.
2. Design the components of pratt type trusses girder and the components of plate girder including wind effects.
3. Design reinforced concrete bridges for IRC loading.
4. Design reinforced concrete tee beam bridges and balanced cantilever bridges.
5. Design the components of the prestressed concrete bridges such as girder section, end block etc.

UNIT I INTRODUCTION

9

Design of through type steel highway bridges for IRC loading - Design of stringers, cross girders and main girders - Design of deck type steel highway bridges for IRC loading - Design of main girders.

UNIT II STEEL BRIDGES

9

Design of pratt type truss girder highway bridges - Design of top chord, bottom chord, web members - Effect of repeated loading - Design of plate girder railway bridges for railway loading - - Wind effects
- Design of web and flange plates - Vertical and horizontal stiffeners.

UNIT III REINFORCED CONCRETE SLAB BRIDGES

9

Design of solid slab bridges for IRC loading - Design of kerb - Design of tee beam bridges - Design of panel and cantilever for IRC loading.

UNIT IV REINFORCED CONCRETE GIRDER BRIDGES

9

Design of tee beam - Courbon's theory - Pigeaud's curves - Design of balanced cantilever bridges - Deck slab - Main girder - Design of cantilever - Design of articulation.

UNIT V PRESTRESSED CONCRETE BRIDGES

9

Design of prestressed concrete bridges - Preliminary dimensions - Flexural and

torsional parameters - Courbon's theory - Distribution coefficient by exact analysis - Design of girder section - Maximum and minimum prestressing forces - Eccentricity - Live load and dead load shear forces - cable zone in girder - Check for stresses at various sections - Check for diagonal tension - Diaphragms - End block - Short term and long term deflection.

TEXT BOOKS:

1. Johnson Victor D., "Essentials of Bridge Engineering", Oxford and IBH Publishing Co., New Delhi, 2010
2. Ponnuswamy S., "Bridge Engineering", Tata McGraw-Hill, New Delhi, 2017.
3. M. K. Pant, Bridge Engineering, S.K Kataria & Sons, 2016

REFERENCE:

1. Phatak D.R., "Bridge Engineering", Satya Prakashan, New Delhi, 2000.
2. Rangwala, Bridge Engineering, Charotar Publishing House Pvt. Ltd, 16 edition, 2015
3. S.P. Bindra, "Principles and Practices of Bridge Engineering", Dhanpat Rai Publications, 2012

EC461 STORAGE STRUCTURES

L	T	P	C
3	0	0	3

GOAL

To introduce the student to basic theory and concepts of storage structures design and steel and concrete tanks, bunkers and silos.

OBJECTIVES

The course should enable the students to :

1. Understand the principles involved in the design of steel water tanks.
2. Be familiar with the design of concrete water tanks.
3. Be acquainted with the basic design concepts of steel bunkers and silos.
4. Understand the design concepts of steel bunkers and silos.
5. Understand the principles of circular prestressing.

OUTCOME

The students should be able to:

1. Design the steel water tanks such as pressed water tank and water tanks with hemispherical bottom.
2. Design concrete water tanks like elevated rectangular water tank, circular tank and under ground tanks.
3. Apply the design concepts in the design of steel bunkers and silos.
4. Design steel square bunker and steel cylindrical size.
5. Design prestressed concrete circular water tanks.

UNIT I STEEL WATER TANKS

15

Design of rectangular riveted steel water tank - Tee covers - Plates - Stays - Longitudinal and transverse beams - Design of staging - Base plates - Foundation and anchor bolts - Design of pressed steel water tank - Design of stays - Joints - Design of hemispherical bottom water tank - side plates - Bottom plates - joints - Ring girder - Design of staging and foundation.

UNIT II CONCRETE WATER TANKS

15

Design of Circular tanks - Hinged and fixed at the base - IS method of calculating shear forces and moments - Hoop tension - Design of intze tank - Dome - Ring girders - Conical dome - Staging - Bracings - Raft foundation - Design of rectangular tanks - Approximate methods and IS methods - Design of under ground tanks - Design of base slab and side wall - Check for uplift.

UNIT III STEEL BUNKERS AND SILOS

5

Design of square bunker - Jansen's and Airy's theories - IS Codal provisions - Design of side plates - Stiffeners - Hooper - Longitudinal beams - Design of cylindrical silo - Side plates - Ring girder - stiffeners.

UNIT IV CONCRETE BUNKERS AND SILOS

5

Design of square bunker - Side Walls - Hopper bottom - Top and bottom edge beams -
Design of cylindrical silo - Wall portion - Design of conical hopper - Ring beam at
junction.

UNIT V PRESTRESSED CONCRETE WATER TANKS

5

Principles of circular prestressing - Design of prestressed concrete circular water tanks.

TOTAL = 45

TEXT BOOKS:

1. Rajagopalan K., Storage Structures, Routledge, 2004
2. N. Krishna Raju, Advanced Reinforced Concrete Design (IS: 456-2000), CBS Publishers, 2nd edition, 2013

CEC462 TALL STRUCTURES

L	T	P	C
3	0	0	3

GOAL

To impart overall knowledge about the elements and systems with planning, analysis and design involved in Tall structures.

OBJECTIVES

The course should enable the students to :

1. Understand the various aspects of planning of Tall buildings.
2. Know the different types of loads considered in the analysis of Tall structures.
3. Impart knowledge about the stability analysis of various structural systems.
4. Introduce various structural systems used for the construction of Tall buildings.
5. Understand the concepts of approximate analysis of Structural system.

OUTCOME

The students should be able to :

1. Describe the various structural systems used in the construction of Tall structures.
2. Capable of analyzing the tall structures using the computer based methods and approximate method of analysis.
3. Execute stability analysis, overall buckling analysis of frames, Analysis for various secondary effects -such as Creep, Shrinkage and Temperature.
4. Carry out approximate analysis of framed and shear wall structures.
5. Describe High Rise Suspension system and Deep Beam system.

UNIT I INTRODUCTION

9

The Tall Building in the Urban Context - The Tall Building and its Support Structure - Development of High Rise Building Structures - General Planning Considerations. Dead Loads - Live Loads-Construction Loads -Snow, Rain, and Ice Loads - Wind Loads-Seismic Loading -Water and Earth Pressure Loads - Loads - Loads Due to Restrained Volume Changes of Material - Impact and Dynamic Loads - Blast Loads - Combination of Loads.

UNIT II THE VERTICAL STRUCTURE PLANE

9

Dispersion of Vertical Forces- Dispersion of Lateral Forces - Optimum Ground Level Space - Shear Wall Arrangement - Behaviour of Shear Walls under Lateral Loading. The Floor Structure or Horizontal Building Plane Floor Framing Systems-Horizontal Bracing- Composite Floor Systems The High - Rise Building as related to assemblage Kits Skeleton Frame Systems - Load Bearing Wall Panel Systems - Panel - Frame Systems - Multi-storey Box Systems.

UNIT III COMMON HIGH-RISE BUILDING STRUCTURES AND THEIR BEHAVIOUR UNDER LOAD

9

The Bearing Wall Structure- The Shear Core Structure - Rigid Frame Systems- The Wall - Beam Structure: Interspatial and Staggered Truss Systems - Frame - Shear Wall

Building Systems - Flat Slab Building Structures - Shear Truss - Frame Interaction System with Rigid - Belt Trusses - Tubular Systems-Composite Buildings - Comparison of High - Rise Structural Systems Other Design Approaches Controlling Building Drift Efficient Building Forms - The Counteracting Force or Dynamic Response.

UNIT IV APPROXIMATE STRUCTURAL ANALYSIS AND DESIGN OF BUILDINGS

9

Approximate Analysis of Bearing Wall Buildings The Cross Wall Structure - The Long Wall Structure The Rigid Frame Structure Approximate Analysis for Vertical Loading - Approximate Analysis for Lateral Loading - Approximate Design of Rigid Frame Buildings-Lateral Deformation of Rigid Frame Buildings The Rigid Frame - Shear Wall Structure - The Vierendeel Structure - The Hollow Tube Structure.

UNIT V OTHER HIGH-RISE BUILDING STRUCTURE

9

Deep Beam Systems -High-Rise Suspension Systems - Pneumatic High -Rise Buildings - Space Frame Applied to High Rise Buildings - Capsule Architecture.

TOTAL = 45

TEXT BOOKS:

- Bungalow S. Taranath, Structural Analysis and Design of Tall Buildings: Steel and Composite Construction, CRC Press, 2011
- Bryan Stafford Smith & Alex Coull , Tall Building Structures: Analysis and Design, Wiley India, 2011

REFERENCES:

- Vicente Lopes Junior, Valder Steffen Jr. & Marcelo Amorim Savi , "Dynamics of Smart Systems and Structures: Concepts and Applications", Springer, 1st ed. 2016
- David Parker, Antony Wood, The Tall Buildings Reference Book, Routledge 2013

CEC463 WIND ENGINEERING

L	T	P	C
3	0	0	3

GOAL

To possess the students with knowledge about the force generated on structure due to normal wind and gusts.

OBJECTIVES

The course should enable the students to :

1. Understand the basic concepts of wind generation and flow.
2. Understand the response of different type of structures to wind pressure.
3. Understand the codal provisions for the safe design of high rise structures.
4. Study the design concepts of towers and roof trusses
5. Get exposure to wind tunnel experiments.

OUTCOME

The students should be able to:

1. Analyse the structure for different wind load condition.
2. Design the structure for the given wind force condition as per the codal provisions.
3. Design the chimneys, towers and bridges
4. Design towers and roof trusses for wind loading.
5. Describe how the structural models can be tested in the wind tunnel and its uses.

UNIT I INTRODUCTION 9

Terminology - Wind Data - Gust factor and its determination - Wind speed variation with height - Shape factor - Aspect ratio - Drag and lift.

UNIT II EFFECT OF WIND ON STRUCTURES 9

Static effect - Dynamic effect - Interference effects (concept only) - Rigid structure - Aero elastic structure (concept only).

UNIT III EFFECT ON TYPICAL STRUCTURES 9

Tall buildings - Low rise buildings - Roof and cladding - Chimneys, towers and bridges.

UNIT IV APPLICATION TO DESIGN 9

Design forces on multi-storey building, towers and roof trusses.

UNIT V INTRODUCTION TO WIND TUNNEL 9

Types of models (Principles only) - Basic considerations - Examples of tests and their use.

TOTAL = 45

TEXT BOOKS:

1. Peter Sachs, "Wind Forces in Engineering, Pergamon Press, New York, 1992.
2. Ted Stathopoulos & Charalambos C. Baniotopoulos, Wind Effects on Buildings and Design of Wind-Sensitive Structures, Springer, 2007

REFERENCES:

1. Dr. Kishor Mehta, Dr. Doug Smith & Dr. Scott Norville, Dr. James McDonald, "Wind Loads on Structures", American Society of Civil Engineers, 2003
2. Wind Force on Structures - Course Notes, Building Technology Centre, Anna University, 1995.

CEC464 INDUSTRIAL STRUCTURES

L	T	P	C
3	0	0	3

GOAL

To get exposed to the design of industrial structures and its functional requirements

OBJECTIVES

The course should enable the students to :

- Familiarize with planning and layout of buildings and its components.
- Know about the functional requirements of industries.
- Understand the design concepts of steel storage structures.
- Understand the design concepts of concrete storage structures.
- Study the general principles of prefabrication and the functional requirements for Precast concrete units.

OUTCOME

The students should be able to :

- Describe the general requirements for industries like cement, chemical and steel plants.
- Describe the functional requirements such as lighting, ventilation and fire safety of industries.
- Design the steel storage structures like bunkers and silos.
- Design the concrete storage structures like bunkers and silos.
- Describe the functional requirements of Precast concrete units.

UNIT I PLANNING

9

Classification of Industries and Industrial structures - General requirements for industries like cement, chemical and steel plants - Planning and layout of buildings and components.

UNIT II FUNCTIONAL REQUIREMENT

9

Lighting - Ventilation - Accounts - Fire safety - Guidelines from factories act.

UNIT III DESIGN OF STEEL STRUCTURES

9

Industrial roofs - Crane girders - Mill buildings - Design of Bunkers and Silos

UNIT IV DESIGN OF R.C. STRUCTURES

9

Silos and bunkers - Chimneys - Principles of folded plates and shell roofs

UNIT V PREFABRICATION

9

Principles of prefabrication - Pre stressed precast roof trusses- Functional requirements for Precast concrete units

TOTAL = 45

TEXT BOOKS

- P.Dayaratnam - Design of Steel Structure - S. Chand and Company, 2008.
- N. Subramanian, "Design of Reinforced Concrete Structures", Oxford, 2013

REFERENCES

- Henn W. Buildings for Industry, vols.I and II, London Hill Books, 1995
- Handbook on Functional Requirements of Industrial buildings, SP32 - 1986, Bureau of Indian Standards, New Delhi 1990
- Course Notes on Modern Developments in the Design and Construction of Industrial Structures, Structural Engineering Research Centre, Madras, 1982
- Koncz, J, Manual of Precast Construction Vol I & II Bauverlay GMBH, 1971.
- Wai Kwong Lau , "Building Construction with Precast Concrete Structural Elements", LAP Lambert Academic Publishing, 2010
- Andreas Achilles & et al., Basics Building Construction, Birkhauser, 2015

CEC465 PRE-FABRICATED STRUCTURES

L	T	P	C
3	0	0	3

GOAL

To impart knowledge on modular construction, industrialized construction and to design some of the pre-fabricated elements and also have the knowledge on the construction methods using these elements.

OBJECTIVES

The course should enable the students to :

- Know about modular coordination, production ,transportation and erection of pre-fabricated structures.
- Get knowledge on the construction of prefabricated components.
- Familiarize with the design of prefabricated members.
- Get knowledge on the prefabricated structural connection.
- Get acquainted with the design procedures of prefabricated structures under earthquake and cyclone loading.

OUTCOME

The students should be able to:

- Describe about the modular construction.
- Describe the procedures involved in the construction of prefabricated components such as roof, floor slab, wall panels & shear walls.
- Design prefabricated structural members.
- Design the connections for prefabricated members.
- Design prefabricated structural components when subjected to earthquake and cyclone loading.

UNIT I INTRODUCTION

9

Need for prefabrication - Principles - Materials - Modular coordination - Standardization - Systems - Production - Transportation - Erection.

UNIT II PRE-FABRICATED COMPONENTS

9

Behaviour of structural components - Large panel constructions - Construction of roof and floor slabs - Wall panels - Columns - Shear walls

UNIT III DESIGN PRINCIPLES

9

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

9

Joints for different structural connections - Dimensions and detailing - Design of expansion joints

UNIT V DESIGN FOR ABNORMAL LOADS

9

Progressive collapse - Code provisions - Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., - Importance of avoidance of progressive collapse.

TOTAL = 45

TEXT BOOKS:

- CBRI, Building materials and components, India, 1990
- Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994
- Varghese P.C, Building Materials, PHI, 2nd edition, 2015
- Ryan E. Smith, Prefab Architecture: A Guide to Modular Design and Construction, John Wiley & Sons, 2011
- Dr. Ramachandra Murthy, ' Design and Construction of Precast Concrete Structures, Dipti Press (OPC) Pvt Ltd, 2017

REFERENCES:

- Koncz, J, Manual of Precast Construction Vol I & II Bauverlay GMBH, 1971.
- Wai Kwong Lau , "Building Construction with Precast Concrete Structural Elements", LAP Lambert Academic Publishing, 2010
- Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009.

L	T	P	C
3	0	0	3

GOAL

To make the students to understand the principles involved in the analysis and design of steel concrete composite structures.

OBJECTIVES

The course should enable the students to :

- Understand the concepts of limit state design of steel concrete composite structures.
- Get exposure in the design concepts of steel concrete composite beams.
- Familiarize with the design concepts of steel concrete composite trusses and columns.
- Understand the design concepts of steel- concrete composite box girder bridges.
- Know about the seismic behaviour of composite structures.

OUTCOME

The students should be able to:

- Describe the principles involved in the limit state design of steel concrete composite structures.
- Design the steel concrete composite beam with deck slabs.
- Design the steel concrete composite columns.
- Design the composite box girders.
- Describe the seismic behaviour of composite structures.

UNIT I INTRODUCTION

9

Review of Limit State Design of steel columns and beams - Introduction to steel concrete composite structures - concepts and Theory - Typical shear connectors and interaction with concrete - Tests for strength of shear connections.

UNIT II DESIGN OF COMPOSITE BEAMS

9

Ultimate behaviour of simply supported and continuous steel - concrete composite beams with solid deck slabs and profiled deck slabs.

UNIT III DESIGN OF COMPOSITE TRUSSES AND COLUMNS

9

Behaviour and design of steel concrete composite Trusses - Shear connection details - Design of Steel concrete columns.

UNIT IV COMPOSITE BOX GIRDER BRIDGES

9

Introduction to behaviour of box girder bridges - Design concepts.

UNIT V GENERAL

9

Introduction to steel concrete sandwich construction - Seismic behavior of composite structures - case studies on steel-concrete composite construction in buildings.

TOTAL = 45

TEXT BOOK :

- R.P. Johnson, Composite Structures of Steel and Concrete: Beams, Slabsm Columns and Frames for Buildings, Wiley India Pvt Ltd; Third edition, 2012

REFERENCES:

- Teaching Resource on Structural Steel Design - Vol II
- Appropriate of IS British and Euro Codes.

CEC467 REPAIR AND REHABILITATION OF STRUCTURES

L	T	P	C
3	0	0	3

GOAL

To get the knowledge on quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.

OBJECTIVES

The course should enable the students to :

1. Understand the causes for distress in reinforced concrete structures, the methods of maintenance, inspection and damage assessment procedure.
2. Be familiar with the quality assurance procedure for concrete, construction errors, corrosion and climatic effects.
3. Understand the repair materials and repair techniques
4. Learn the strengthening techniques used for concrete structures subjected to weathering corrosion, wear, fire, leakage and marine exposure..
5. Be familiar with the Engineered demolition techniques for Dilapidated structures.

OUTCOME

The students should be able to:

1. Assess the distressed structures, conduct field monitoring and non-destructive evaluation of concrete structures and maintain the structures.
2. Appreciate the mechanisms of degradation of concrete structures, the durability aspects and the quality assurance procedure for durable concrete structures.
3. Select the suitable repair materials and adopt the appropriate repair techniques.
4. Select the suitable strengthening technique for concrete structures subjected to weathering corrosion, wear, fire, leakage and marine exposure..
5. Apply the demolition techniques used for Dilapidated structures.

UNIT I MAINTENANCE AND REPAIR STRATEGIES

8

Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance various aspects of Inspection, Assessment procedures for evaluating a damaged structure. Causes of deterioration. Quality assurance for concrete construction

UNIT II SERVICEABILITY AND DURABILITY OF CONCRETE

12

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

UNIT III MATERIALS AND TECHNIQUES FOR REPAIR

15

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, ferro cement, Fibre reinforced concrete. Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and dry pack, vacuum concrete, Guniting and

Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning, Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection.

UNIT IV REPAIRS, REHABILITATION AND RETROFITTING OF STRUCTURES

6

Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire and marine exposure. Leakages in buildings – its causes – remedial measures – case studies

UNIT V DEMOLITION TECHNIQUES

4

Engineered demolition techniques for Dilapidated structures - case studies

TOTAL = 45

TEXT BOOKS :

- A.R.Santha Kumar, " Concrete Technology", Oxford University Press, 2015
- S. C. Edwards, J. D. N. Shaw & R. T. Allen, Repair of Concrete Structures, Springer, 2013.
- R Dodge Woodson, Concrete Structures- Protection, repair and rehabilitation, Elsevier, 2011

REFERENCES:

- M.S Shetty, "Concrete Technology Theory and Practice", S. Chand & Company Ltd., 2012
- Santhakumar, A.R., Training Course notes on Damage Assessment and repair in Low Cost Housing, "RHDC-NBO" Anna University, July 1992.
- Lakshmipathy, M. et al. Lecture notes of Workshop on "Repairs and Rehabilitation of Structures", 29 - 30th October 1999