

JALPAIGURI GOVERNMENT ENGINEERING COLLEGE

JALPAIGURI- 735 102

(AN AUTONOMOUS GOVERNMENT COLLEGE)

**COURSE STRUCTURE AND SYLLABUS
FOR**

B.TECH. IN CIVIL ENGINEERING

(Implemented from the Academic Year 2013-14 -for the new batch only)



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Syllabus for B.Tech. (Civil Engineering)

FIRST SEMESTER

Sl. No	Field	Theory/Practical	Field Contact Hours Per Week				Credit Points
			L	T	P	Total	
A: THEORY							
1	HU101	English Language & Technical Communication.	2	0	0	2	2
2	PH101	Physics-I	3	1	0	4	4
3	CS101	Principles of Computer Programming	3	1	0	4	4
4	ME101	Engineering Mechanics	3	1	0	4	4
5	M101	Mathematics – I	3	1	0	4	4
Total Theory						18	18
B: PRACTICAL							
6	PH191	Physics-I Lab	0	0	3	3	2
7	CS191	Principles of Computer Programming Lab	0	0	3	3	2
8	ME191	Engineering Drawing and Graphics	0	0	3	3	2
9	HU181	English Language & Technical Communication Lab	0	0	3	3	2
10	XC181	Extra Curricular Activity(NSS/NCC/NSO etc.)	0	0	2	2	1
Total Practical						14	9
TOTAL (THEORY + PRACTICAL)			14	4	14	32	27

FIRST YEAR – SECOND SEMESTER

Sl. No	Field	Theory/Practical	Field Contact Hours Per Week				Credit Points
			L	T	P	Total	
A: THEORY							
1	HU202	Economics for Engineers	3	0	0	3	3
2	CH201	Chemistry-I	3	1	0	4	4
3	EE201	Basic Electrical Engineering	3	1	0	4	4
4	EC201	Basic Electronics Engineering	3	1	0	4	4
5	M201	Mathematics – II	3	1	0	4	4
Total Theory						19	19
B: PRACTICAL							
6	CH291	Chemistry-I Lab.	0	0	3	3	2
7	EE291	Basic Electrical Engineering Lab.	0	0	3	3	2
8	EC291	Basic Electronics Engineering Lab.	0	0	3	3	2
9	ME292	Workshop Practice	0	0	3	3	2
Total Practical						12	8
TOTAL (THEORY + PRACTICAL)			15	4	12	31	27

Syllabus for B.Tech. (Civil Engineering)

THIRD SEMESTER

Sl.	Field	Theory/Practical	Field Contact	Credit
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No			Hours Per Week				Points
			L	T	P	Total	
A: THEORY							
1	HU301	Values & Ethics in Profession	3	0	0	3	3
2	CE301	Engineering Geology and Rock Mechanics	4	0	0	4	4
3	CE302	Solid Mechanics	3	1	0	4	4
4	CE303	Fluid Mechanics	3	0	0	3	3
5	CE304	Building Material & Construction	4	0	0	4	4
6	CE305	Engineering Survey – I	3	1	0	4	4
Total Theory						22	22
B: PRACTICAL							
7	CE391	Engineering Geology Lab.	0	0	3	3	2
8	CE392	Survey Practice – I Lab.	0	0	3	3	2
9	CE393	Building Design & Drawing	0	0	3	3	2
Total Practical						9	6
TOTAL (THEORY + PRACTICAL)			20	2	9	31	28

FOURTH SEMESTER

Sl. No	Field	Theory/Practical	Field Contact Hours Per Week				Credit Points
			L	T	P	Total	
A: THEORY							
1	M402	Mathematics – III	3	1	0	4	4
2	M(CS)401	Numerical Methods	2	0	0	2	2
3	CH401	Basic Environmental Engineering and Elementary Biology	3	0	0	3	3
4	CE401	Structural Analysis – I	3	1	0	4	4
5	CE402	Hydraulics & Hydraulic Machines	3	0	0	3	3
6	CE403	Engineering Survey – II	3	1	0	4	4
Total Theory						20	20
B: PRACTICAL							
7	M(CS)491	Numerical Methods Lab.	0	0	3	3	2
8	HU481	Technical Report Writing & Language Lab. Practice	0	0	3	3	2
9	CE491	Fluid Mechanics Lab.	0	0	3	3	2
10	CE492	Survey Practice – II Lab.	0	0	3	3	2
Total Practical						12	8
TOTAL (THEORY + PRACTICAL)			17	3	12	32	28

Syllabus for B.Tech. (Civil Engineering)

FIFTH SEMESTER

Sl. No	Field	Theory/Practical	Field Contact Hours Per Week				Credit Points
			L	T	P	Total	
A: THEORY							
1	HU501	Principles of Management	2	0	0	2	2
2	CE501	Concrete Technology	3	0	0	3	3
3	CE502	Design of RCC Structure	3	1	0	4	4
4	CE503	Soil Mechanics – I	3	1	0	4	4
5	CE504	Water Supply Engineering	3	1	0	4	4
6	CE505	Structural Analysis – II	3	0	0	3	3
Total Theory						20	20
B: PRACTICAL							
7	CE591	Solid Mechanics Lab	0	0	3	3	2
8	CE592	Soil Mechanics Lab – I	0	0	3	3	2
9	CE593	Concrete Lab – I	0	0	3	3	2
10	CE594	Structural Design and Drawing – I	0	0	3	3	2
Total Practical						12	8
TOTAL (THEORY + PRACTICAL)			17	3	12	32	28

SIXTH SEMESTER

Sl. No	Field	Theory/Practical	Field Contact Hours Per Week				Credit Points
			L	T	P	Total	
A: THEORY							
1	CE601	Design of Steel Structure	3	1	0	4	4
2	CE602	Soil Mechanics – II	3	1	0	4	4
3	CE603	Transportation Engineering – I	3	1	0	4	4
4	CE604	Waste Water Engineering	3	1	0	4	4
5	CE605	Structural Dynamics & Earthquake Engg.	3	1	0	4	4
Total Theory						20	20
B: PRACTICAL							
6	CE691	Soil Mechanics Lab – II	0	0	3	3	2
7	CE692	Concrete Lab – II	0	0	3	3	2
8	CE693	Environmental Engineering Lab	0	0	3	3	2
9	CE694	Structural Design and Drawing – II	0	0	3	3	2
Total Practical						12	8
TOTAL (THEORY + PRACTICAL)			15	5	12	32	28

Industrial training to be conducted after 6th semester

Syllabus for B.Tech. (Civil Engineering)
SEVENTH SEMESTER

Sl. No	Field	Theory/Practical	Field Contact Hours Per Week				Credit Points
			L	T	P	Total	
A: THEORY							
1	HU701	Financial Management and Accounts	3	0	0	3	3
2	CE701	Foundation Engineering	3	1	0	4	4
3	CE702	Advanced Design of RCC Structure	3	1	0	4	4
4	CE703	Water Resource Engineering	3	0	0	3	3
5	CE704	Transportation Engineering – II	3	1	0	4	4
Total Theory						18	18
B: PRACTICAL							
6	CE791	Highway & Transportation Engg. Lab	0	0	3	3	2
7	CE792	Computer Programming in Civil Engineering	0	0	3	3	2
8	CE793	Estimation, Spec. & Departmental Procedure	0	0	3	3	2
9	CE794	Project – I	0	0	3	3	2
10	CE781	Industrial Training Evaluation	0	0	3	3	2
Total Practical						15	10
TOTAL (THEORY + PRACTICAL)			15	3	15	33	28

EIGHTH SEMESTER

Sl. No	Field	Theory/Practical	Field Contact Hours Per Week				Credit Points
			L	T	P	Total	
A: THEORY							
1	CE801	Construction Management and Technique	3	1	0	4	4
2	CE802	Elective – I	3	1	0	4	4
3	CE803	Elective – II	3	1	0	4	4
4	CE804	Groundwater & Well Hydraulics	3	1	0	4	4
Total Theory						16	16
B: PRACTICAL							
6	CE891	Grand Viva Voce	0	0	3	3	2
7	CE892	Project – II	0	0	3	3	2
8	CE893	Seminar	0	0	3	3	2
9	CE894	Computer Application in Civil Engineering	0	0	3	3	2
Total Practical						12	8
TOTAL (THEORY + PRACTICAL)			12	4	12	28	24

Elective – I:

CE802A Finite Element Method, CE802B Design of tall building, CE802C Prestressed Concrete, CE802D Hydraulic Structure, CE802E Bridge Engineering, CE802F Space structures.

Elective – II: CE803A Advance Foundation Engg, CE803B Dynamics of soil and foundation, CE803C Air Pollution & Control Engg, CE803D Pavement design, CE803E Water resources system planning and management, CE803F Ground Improvement Techniques.

Code	Sub.	Contact Hrs./Week		Code	Sub.	Contact Hrs./Week	
		L –T- P-TO	Cr.			L –T- P-TO	Cr.
HU-101	English Language & Technical Communication	2-0-0-2	2	HU-202	Economics for Engineers	3-0-0-3	3
PH-101	Physics – I	3-1-0-4	4	EE-201	Basic Electrical Engineering	3-1-0-4	4
CS-101	Principles of Computer Programming .	3-1-0-4	4	CH-201	Chemistry-I	3-1-0-4	4
M-101	Mathematics-I	3-1-0-4	4	M-201	Mathematics-II	3-1-0-4	4
ME-101	Engineering Mechanics	3-1-0-4	4	EC-201	Basic Electronics Engineering	3-1-0-4	4
PH-191	Physics-I Lab.	0-0-3-3	2	EE-291	Basic Electrical Engg. Lab.	0-0-3-3	2
CS-191	Principles of Computer Programming Lab.	0-0-3-3	2	CH-291	Chemistry-I Lab.	0-0-3-3	2
ME-191	Engineering Drawing. & Graphics	0-0-3-3	2	EC-291	Basic Electronics Engineering Lab.	0-0-3-3	2
HU-181	English Language & Technical Communication Lab	0-0-3-3	2	ME-292	Workshop Practice	0-0-3-3	2
XC-181	Extra Curricular Activities(NSS/ NSO/NSO ETC)	0-0-2-2	1				
		14-4-14-32	27			15-4-12-31	27
HU-301	Value & Ethics in Profession	3-0-0-3	3	M – 402	Mathematics – III	3-1-0-4	4
CE – 301	Engineering Geology and Rock Mechanics	4-0-0-4	4	M(CS) – 401	Numerical Methods	2-0-0-2	2
CE – 302	Solid Mechanics	3-1-0-4	4	CH – 401	Basic Environmental Engineering & Elementary Biology	3-0-0-3	3
CE – 303	Fluid Mechanics	3-0-0-3	3	CE – 401	Structural Analysis – I	3-1-0-4	4
CE – 304	Building Material & Construction	4-0-0-4	4	CE – 402	Hydraulics & Hydraulic Machines	3-0-0-3	3
CE – 305	Engineering Survey – I	3-1-0-4	4	CE – 403	Engineering Survey – II	3-1-0-4	4
CE – 391	Engineering Geology Lab	0-0-3-3	2	M(CS) – 491	Numerical Methods Lab	0-0-3-3	2
CE – 392	Survey Practice – I Lab.	0-0-3-3	2	HU – 481	Technical Report Writing & Language Lab Practice	0-0-3-3	2
CE – 393	Building Design & Drawing	0-0-3-3	2	CE – 491	Fluid Mechanics Lab	0-0-3-3	2
				CE – 492	Survey Practice – II	0-0-3-3	2
		20-2-9-31	28			17-3-12-32	28
HU– 501	Principles of Management	2-0-0-2	2	CE – 601	Design of Steel Structure	3-1-0-4	4
CE – 501	Concrete Technology	3-0-0-3	3	CE – 602	Soil Mechanics – II	3-1-0-4	4
CE – 502	Design of RCC Structure	3-1-0-4	4	CE – 603	Transportation Engineering – I	3-1-0-4	4
CE – 503	Soil Mechanics – I	3-1-0-4	4	CE – 604	Waste Water Engineering	3-1-0-4	4
CE – 504	Water Supply Engineering	3-1-0-4	4	CE – 605	Structural Dynamics & Earthquake Engg.	3-1-0-4	4
CE – 505	Structural Analysis – II	3-0-0-3	3	CE – 691	Soil Mechanics Lab – II	0-0-3-3	2
CE – 591	Solid Mechanics Lab	0-0-3-3	2	CE – 692	Concrete Lab – II	0-0-3-3	2
CE – 592	Soil Mechanics Lab – I	0-0-3-3	2	CE – 693	Environmental Engineering Lab	0-0-3-3	2
CE – 593	Concrete Lab – I	0-0-3-3	2	CE – 694	Structural Design and Drawing – II	0-0-3-3	2
CE – 594	Structural Design and Drawing – I	0-0-3-3	2				
		17-3-12-32	28			15-5-12-32	28
HU– 701	Financial Management and Accounts	3-0-0-3	3	CE – 801	Construction Management and Technique	3-1-0-4	4
CE – 701	Foundation Engineering	3-1-0-4	4	CE – 802	Elective – I	3-1-0-4	4
CE – 702	Advanced Design of RCC Structure	3-1-0-4	4	CE – 803	Elective – II	3-1-0-4	4
CE – 703	Water Resource Engineering	3-0-0-3	3	CE – 804	Groundwater & Well Hydraulics	3-1-0-4	4
CE – 704	Transportation Engineering – II	3-1-0-4	4	CE – 891	Grand Viva Voce	0-0-3-3	2
CE – 791	Highway & Transportation Engg. Lab	0-0-3-3	2	CE – 892	Project – II	0-0-3-3	2
CE – 792	Computer Programming in Civil Engineering	0-0-3-3	2	CE – 893	Seminar	0-0-3-3	2
CE – 793	Estimation, Spec. & Departmental Procedure	0-0-3-3	2	CE – 894	Computer Application in Civil Engineering	0-0-3-3	2
CE – 794	Project – I	0-0-3-3	2				
CE-781	Industrial Training Evaluation	0-0-3-3	2				
		15-3-15-33	28			12-4-12-28	24

Elective-I-CE – 802: A) Finite Element Method B) Design of tall buildingC) PrestressedConcrete D) Hydraulic StructureE) Bridge Engineering F) Space structures.
Elective-II-CE – 803 A) Advanced Foundation Engg B) Dynamics of soil and foundation C) AirPollution & Control Engg D) Pavement design E) Water resources system planning and management F) Ground Improvement Techniques.

Detailed Syllabus:

1ST SEMESTER:

HU101 English Language & Technical Communication 2-0-0-2-2:

Guidelines for Course Execution:

Objectives of the Course: This Course has been designed

1. To impart advanced skills of Technical Communication in English through Language Lab. Practice Sessions to 1st Semester UG students of Engineering & Technology.
2. To enable them to communicate confidently and competently in English Language in all spheres.

Desired Entry Behaviour:

The students must have basic command of English to Talk about day-to-day events and experiences of life. Comprehend Lectures delivered in English. Read and understand relevant materials written in English. Write grammatically correct English. Strategies for Course Execution:

1. It is a Course that aims to develop Technical Communication Skills. It is, therefore, *Lab-* based and practical in orientation. Students should be involved in Practice Sessions.
2. The content topics should be conveyed through real-life situations. Lecture classes should be conducted as Lecture cum Tutorial classes.
3. Keeping in view the requirements of students, the teachers may have to prepare some learning aids task materials.
4. Some time should be spent in teaching stress and intonation.
5. In teaching 'Speaking skill,' emphasis should be on *clarity, intelligibility, fluency, (as well as accepted pronunciation)*.
6. Micro Presentation and Group Discussion Sessions should be used for developing Communicative Competence
7. The Language Lab, device should be used for giving audio-visual inputs to elicit students' responses by way of Micro-Presentation, Pair Conversation, Group Talk and Class Discussion.
8. The teacher must function as *a creative monitor in the Language Lab for the following:*

A. Developing Listening Comprehension Skill;

1. Developing Listening Comprehension through Language Lab Device
2. Developing sub skills of the Listening Skill by Conversational Practice Sessions
3. Focusing on intelligent and advanced Listening Sessions e.g. Seminars, Paper Presentation, Mock Interviews etc.
4. Conducting Conversational Practice: Face to Face & Via Media (Telephone, Audio, Video + Clips)

B. Developing Speaking Competence:

a) Helping students in achieving *clarity and fluency*; manipulating paralinguistic features of speaking (*voice modulation, pitch, tone stress, effective pauses*)

Conducting *Task oriented interpersonal, informal and semiformal Speaking / Classroom Presentation* 4

b) *Teaching strategies for Group Discussion*

Teaching Cohesion and Coherence

Teaching effective communication & strategies for handling criticism and adverse remarks

Teaching strategies of Turn-taking, effective intervention, kinesics (use of body language) and courtesies and all components of softskills.

C. Developing Reading Comprehension Skill:

a) Developing Reading Skill through Non Technical (Literary) Texts (See Recommended Book 5)

1. The Thief by Ruskin Bond
2. The Open Window by Saki
3. Marriage is a private Affair by Chinua Achebe
4. The Moon in the Earthen Pot by Gopini Karunakar

b) Developing Reading Skill through Radio Commentary, Technical Texts and Case Studies (Refer to Recommended Book 1.) * Freedom by G. B. Shaw (Radio Commentary)

a) Guiding students for Intensive & Extensive Reading (See Recommended Book 1)

D. Developing Writing Competence:

a) Teaching all varieties of Technical Report, Business Letters and Job Application (Expressing Ideas within restricted word limit through paragraph division, Listing Reference Materials through Charts, Graphs, Tables and Diagrams);

b) Teaching correct Punctuation & Spelling, Semantics of Connectives, Modifiers and Modals, variety of sentences and paragraphs

c) Teaching Organizational Communication: Memo, Notice, Circular, Agenda / Minutes etc.

SYLLABUS -- DETAILED OUTLINES

A. ENGLISH LANGUAGE GRAMMAR: 5L

Correction of Errors in Sentences, Building Vocabulary, Word formation, Single Word for a group of Words, Fill in the blanks using correct Words, Sentence Structures and Transformation, Active & Passive Voice, Direct & Indirect Narration, (MCQ Practice during classes)

B. READING COMPREHENSION:

Strategies for Reading Comprehension 1L
Practicing Technical & Non Technical Texts for Global/Local/Inferential/Referential comprehension; 3L
Precis Writing

C. TECHNICAL COMMUNICATION

The Theory of Communication –Definition & Scope, Barriers of Communication, Different Communication Models, Effective Communication (Verbal / Non verbal), Presentation / Public Speaking Skills 5L
(MCQ Practice during classes) 5

D. MASTERING TECHNICAL COMMUNICATION

Technical Report (formal drafting) 3L
Business Letter (formal drafting) 4L
Job Application (formal drafting) 3L
Organizational Communication (see page 3) 3L
Group Discussion –Principle & Practice 3L
Total Lectures 30

MARKS SCHEME (Written Examination) Total Marks 70

1. 10 Multiple Choice Questions(Communication & Eng. Language-Vocabulary & Syntax) Marks 10
2. Short Questions & Precis writing on unseen passages Marks 15 (10+5)
3. 3 Essay type Questions on Technical Communication (Technical Report / Business Letter / Job Application / Organizational Communication etc.) Marks 45-15*3

MARKS SCHEME (Internal Examination) Total Marks 30

1. Attendance Marks 5
2. Testing Speaking Ability Marks 5
3. Testing Listening Ability Marks 5
4. 2 Unit Tests Marks 15

PH101 Physics-I 3-1-0-4-4:

Module 1: Oscillation:

- 1.1 Simple Harmonic motion: Preliminary concepts, Superposition of Simple Harmonic motions in two mutually perpendicular directions: Lissajous figure.
- 1.2 Damped vibration: Differential equation and its solution, Logarithmic decrement, Quality Factor.
- 1.3 Forced vibration: Differential equation and its solution, Amplitude and velocity resonance, Sharpness of resonance. Application in L-C-R circuit. (2L+3L+3L)

Module 2: Optics I:

- 2.1 Interference of electromagnetic waves: Condition for sustained interference, double slit as an example. Qualitative idea of Spatial and Temporal Coherence, conservation of energy and intensity distribution, Newton's ring.
- 2.2 Diffraction of light: Fresnel and Fraunhofer class. Fraunhofer diffraction for single slit and double slit. Intensity distribution of N-slits and plane diffraction grating (No deduction of the intensity distributions for N-slit), Missing orders. Rayleigh criterion, resolving power of grating and microscope. (3L+5L)

Module3: Optics II

- 3.1 Polarization: General concept of polarization, Plane of vibration, Qualitative discussion on plane, circularly and elliptically polarized light. Polarization through reflection and Brewster's law. Double refraction (birefringence) – Ordinary and Extra-ordinary rays. Nicol's prism, Polaroid, Half wave and quarter wave plate.
- 3.2 Laser: Spontaneous and Stimulated emission of radiation, Population inversion, Einstein's A & B co-efficient (derivation of the mutual relation), Optical resonator and condition necessary for active Laser action, Ruby Laser, He-Ne Laser, application of laser.
- 3.3 Holography: Theory of holography, viewing of hologram, applications. (4L+4L+3L)

Module 4: Quantum Physics:

- 4.1 Concept of dependence of mass with velocity, mass energy equivalence, energy-momentum relation (no deduction required), Blackbody radiation: Rayleigh Jean's law (derivation without the calculation of number of states), Ultraviolet catastrophe, Wien's law, Planck's radiation law (calculation of average energy of the oscillator), Derivation of Wein's law and Stephan's law from Planck's radiation law. Rayleigh Jean's law and Wien's law as limiting case of Planck's law. Compton's effect (calculation of Compton wavelength is required).
- 4.2 Wave-particle duality and de Broglie's hypothesis. Concept of matter waves, Davission-Germer experiment, Concept of wave packets and Heisenberg's uncertainty principle. (5L+4L)

Module 5:

Crystallography:

- 5.1 Elementary ideas of crystal structure: Lattice, Basis, Unit cell, fundamental types of lattice-Bravais Lattice, simple cubic, FCC and BCC lattices (use of models in class during teaching is desirable), Miller indices and Miller planes, coordination number and atomic packing factor.
- 5.2 X-rays: origin of characteristic and continuous x-rays, Bragg's law (no derivation), determination of lattice constant.

CS101 Principles of Computer Programming

3-1-0-4-4:

- Fundamentals of Computer:** History of Computer, Generation of Computer, Classification of Computers 2L
 Basic Anatomy of Computer System, Primary & Secondary Memory, Processing Unit, Input & Output Devices 3L
 Binary & Allied number systems representation of signed and unsigned numbers. BCD, ASII. Binary Arithmetic & logic gates 6L
 Assembly language, high level language, compiler and assembler (basic concepts) 2L
 Basic concepts of operating systems like MS DOS, MS WINDOW, UNIX, Algorithm & flow chart 2L
C Fundamentals: The C character set identifiers and keywords, data type & sizes, variable names, declaration, statements 3L
Operators & Expressions: Arithmetic operators, relational and logical operators, type, conversion, increment and decrement operators, bit wise operators, assignment operators and expressions, precedence and order of evaluation. Input and Output: Standard input and output, formatted output -- printf, formatted input scanf. 5L
Flow of Control: Statement and blocks, if - else, switch, loops - while, for do while, break and continue, go to and labels 2L
Fundamentals and Program Structures: Basic of functions, function types, functions returning values, functions not returning values, auto, external, static and register variables, scope rules, recursion, function prototypes, C preprocessor, command line arguments. 6L
Arrays and Pointers: One dimensional arrays, pointers and functions, multidimensional arrays. 6L
 Basic of structures, structures and functions, arrays of structures, bit fields, formatted and unformatted files. 5L

Recommended reference Books:

- | | |
|---|--|
| Introduction To Computing (TMH WBUT Series), E. Balagurusamy, TMH | |
| Kerninghan, B.W. | The Elements of Programming Style |
| Yourdon, E. | Techniques of Program Structures and Design |
| Schied F.S. | Theory and Problems of Computers and Programming |
| Gottfried | Programming with C Schaum |
| Kerninghan B.W. & Ritchie D.M. | The C Programming Language |
| Rajaraman V. | Fundamental of Computers |
| Balaguruswamy | Programming in C |
| Kanetkar Y. | Let us C |
| M.M.Oka | Computer Fundamentals, EPH |
| Leon | Introduction to Computers, Vikas |
| Leon- | Fundamental of Information Technology, Vikas |
| Ram B. | Computer Fundamentals, New Age International |
| Ravichandran D. | Programming in C, New Age International |
| Xavier C. C | Language & Numerical Methods, New Age Inter. |
| Xavier C. | Introduction to Computers, New Age International |
| Rao S.B. | Numerical Methods with Programs in Basic Fortran Pascal & C++, |
| Dutta N. | Computer Programming & Numerical Analysis, Universities Press |

ME101 Engineering Mechanics 3-1-0-4-4:

Module – I: Importance of mechanics in Engg.; Introduction to Statics; Concept of particle and Rigid Body; Types of Forces: 2L

Introduction to Vector Algebra; Parallelogram Law; Triangle and Polygon Law; Addition and Subtraction of Vector; Dot product and Cross product of Vectors; Unit Vector; Dot product and Cross product of Vectors and their applications. Types of Vectors (Sliding Vector, Bound Vector). 4L+1T

Two dimensional force system, Resolution of forces; Moments; Varignon's theorem; Couple; Equivalence of Force and Force – Couple system. 4L+2T

Module – II: Equilibrium of a body under two dimensional force system and under two dimensional force-moment system; Free body diagram; Lami's Theorem. 3L+1T

Friction; Co-efficient of friction; Laws of friction; Angle of Repose; Wedge friction. 3L+1T

Module – III: Centroid and Centre of Gravity; Centroid of Triangle, Quadrant of a circle and rectangle; Centroid of a composite area. 3L+1T

Moment of Inertia of a plane figure about Co-planer axes; Parallel axis theorem; Polar Moment of Inertia; Mass Moment of Inertia of cylinder, sphere and cone about the axis of symmetry. 3L+1T

Module – IV: Introduction to Dynamics; Kinematics and Kinetics; Newton's Laws of motion; Plane rectilinear motion under uniform and non-uniform acceleration; 3L+1T

x-t, v-t and a-t graphs; Motion under gravity; Plane Curvilinear motion; Circular motion; Projectile motion. 3L+1T

Module – V: Kinetics of particles; Newton's second Law; D' Alembert's principle; Principle of work, Energy and power; Principle of conservation of energy. 3L+1T

Module – VI: Concept of stresses and strains; Normal stress; Shear stress; Normal strain; Shear strain; Hooke's Law; Poisson's ratio; Stress-strain diagram of ductile material and brittle material; Elastic Modulus and Shear Modulus; Factor of safety-basic idea; bulk Modulus; Volumetric strain. 3L+1T

Books Recommended :

1. Engineering mechanics : Statics and dynamics by I.H. Shames, 4th ed. – PHI.
2. Engineering mechanics by Timoshenko, Young and Rao, Revised 4th ed. – TMH.
3. Elements of Strength of Materials by Timoshenko & Young, 5th ed. – E.W.P.
4. Fundamentals of Engineering Mechanics by Debabrata Nag & abhijit Chanda – Chhaya Prakashani.
5. Engineering Mechanics by Basudeb Bhattacharya- Oxford University press.
6. Engineering Mechanics: Statics & Dynamics by Hibbeler & Gupta, 11th ed. – pearson.
7. Engineering mechanics [vol-1 & II] by Meriam & kraige, 5th ed. – Wiley india.

M101 Mathematics-I 3-1-0-4-4:

Module I

8. **Matrix:** Determinant of a square matrix, Minors and Cofactors, Laplace's method of expansion of a determinant, Product of two determinants, Adjoint of a determinant, Jacobi's theorem on adjoint determinant. Singular and non-singular matrices, Adjoint of a matrix, Inverse of a non-singular matrix and its properties, orthogonal matrix and its properties, Trace of a matrix. Rank of a matrix and its determination using elementary row and column operations, Solution of simultaneous linear equations by matrix inversion method, Consistency and inconsistency of a system of
9. homogeneous and inhomogeneous linear simultaneous equations, Eigen values and eigen vectors of a square matrix (of order 2 or 3), Caley-Hamilton theorem and its applications. 9L

Module II

10. **Successive differentiation:** Higher order derivatives of a function of single variable, Leibnitz's theorem (statement only and its application, Problems of the type of recurrence relations in derivatives of different

orders and also to find $(\sigma_n)_0$.

2L

11. **Mean Value Theorems & Expansion of Functions:** Rolle's theorem and its application, Mean Value theorems – Lagrange & Cauchy and their application, Taylor's theorem with Lagrange's and Cauchy's form of remainders and its application, Expansions of functions by Taylor's and Maclaurin's theorem, Maclaurin's infinite series expansion of the functions: $\sin x, \cos x, e^x, \log(1+x), (a+x)^n$, n being an integer or a fraction. 5L

12. **Reduction formula:** Reduction formulae both for indefinite and definite integrals of types

$$\int \sin^n x \, dx, \int \cos^n x \, dx, \int \sin^m x \cos^n x \, dx, \int \cos^m x \sin^n x \, dx, \int \frac{dx}{(x^2 + a^2)^n}$$

13.
14. where m, n are positive integers.

2L

Module III

15. **Calculus of Functions of Several Variables:** Introduction to functions of several variables with examples, Knowledge of limit and continuity, Partial derivatives and related problems, Homogeneous functions and Euler's theorem and related problems up to three variables, Chain rules, Differentiation of implicit functions, Total differentials and their related problems, Jacobians up to three variables and related problems, Maxima, minima and saddle points of functions and related problems, Concept of line integrals, Double and triple integrals. 9L

Module IV

16. **Infinite Series:** Preliminary ideas of sequence, Infinite series and their convergence/divergence, Infinite series of positive terms, Tests for convergence: Comparison test, Cauchy's Root test, D' Alembert's Ratio test and Raabe's test (statements and related problems on these tests), Alternating series, Leibnitz's Test (statement, definition) illustrated by simple example, Absolute convergence and Conditional convergence.

5L

Module-V

17. **Vector Algebra and Vector Calculus:** Scalar and vector fields – definition and terminologies, dot and cross products, scalar and vector triple products and related problems, Equation of straight line, plane and sphere, Vector function of a scalar variable, Differentiation of a vector function, Scalar and vector point functions, Gradient of a scalar point function, divergence and curl of a vector point function, Directional derivative. Related problems on these topics. Green's theorem, Gauss Divergence Theorem and Stoke's theorem (Statements and applications). 8L

Total 40 Lectures

Suggested Reference Books

1. **Advanced Engineering Mathematics** 8e by Erwin Kreyszig is published by Wiley India
2. **Engineering Mathematics:** B.S. Grewal
5. **Calculus:** M. J. Strauss, G. L. Bradley and K. L. Smith (3PrdP Edition, 1PstP Indian Edition 2007, Pearson Education)
6. **Engineering Mathematics:** S. S. Sastry (PHI)
7. **Advanced Engineering Mathematics, 3E:** M.C. Potter, J.L. Goldberg and E.F. Abonfadel (OUP), Indian Edition.
8. **Differential Calculus,** Ghosh & Maity (Central)
9. **Integral Calculus,** Ghosh & Maity (Central)
10. **Higher Algebra-Classical & Modern,** J.G. Chakravorty and P.R. Ghosh(U.N. Dhur)
11. **Vector Analysis (Schaum Series),** M. R. Spiegel (MGH)

PH191 Physics-I Lab. 0-0-3-3-2:

Group 1: Experiment from Higher Secondary knowledge of Physics

1. Determination of thermal conductivity of a good conductor by Searle's method.
2. Determination of thermal conductivity of a bad conductor by Lees and Charlton's method.
3. Determination of dispersive power of the material of given prism.
4. Use of Carry Foster's bridge to determine unknown resistance.

5.

Group 2: Experiments on General properties of matter

6. Determination of Young's modulus by Flexure method and calculation of bending moment and shear force at a point on the beam.
7. Determination of modulus of rigidity by static / dynamic method.
8. Determination of co-efficient of viscosity by Poiseuille's capillary flow method.

Group 3: Optics

9. Determination of wavelength of light by Newton's ring method.
10. Determination of wavelength of light by Fresnel's bi-prism method.
11. Determination of wavelength of light by Laser diffraction method.
12. Determination of numerical aperture and the energy losses related to optical fibre experiment.

Innovative experiment:

One more experiment designed by the student or the concerned teacher or both.

CS191 Principles of Computer Programming Lab 0-0-3-3-2:

Exercises should include but not limited to:

1. DOS System commands and Editors (Preliminaries)
2. UNIX system commands and vi (Preliminaries)
3. Simple Programs: simple and compound interest. To check whether a given number is a palindrome or not, evaluate summation series, factorial of a number , generate Pascal's triangle, find roots of a quadratic equation
4. Programs to demonstrate control structure : text processing, use of break and continue, etc.
5. Programs involving functions and recursion
6. Programs involving the use of arrays with subscripts and pointers
7. Programs using structures and files.

ME191 Engineering Drawing & Graphics Lab. 0-0-3-3-2:

A. THEORETICAL PART

1. Introduction to Lines , Lettering, Dimensioning, Scales. – 1L
2. Geometrical Construction and curves. – 1L
3. Projection of points, Lines and Surfaces. – 2L
4. Projection of solids. – 2L
5. Isometric Views. – 1L
6. Sectional Views. - 1L
7. Development of Surfaces. – 1L
8. Introduction to Computer Aided Drafting. – 3L

B. PRACTICAL PART

1. LINES, LETTERING, DIMENSIONING, SCALES: Plain scale, Diagonal scale. - 6hrs.
2. GEOMETRICAL CONSTRUCTION AND CURVES : Construction of Polygons, Parabola, Hyperbola , Ellipse. – 6 hrs.
3. PROJECTION OF POINTS, LINES, SURFACES : Orthographic projection – 1st and 3rd angle projection, Projection of lines and surfaces – Hexagon. – 3 hrs.
4. PROJECTION OF SOLIDS : Cube, Pyramid, prism, Cylinder, Cone. – 6 hrs.
5. DRAWING ISOMETRIC VIEW FROM ORTHOGONAL / SECTIONAL VIEWS OF SIMPLE SOLID OBJECTS. – 3 hrs.
6. FULL AND HALF SECTIONAL VIEWS OF SOLIDS. – 3 hrs.
7. DEVELOPMENT OF SURFACES : Prism , Cylinder, Cone. – 3 hrs.

Books Recommended :

1. Narayana, K.L. and Kannaiah, P. Text Book of engineering Drawing “ Engineering Graphics”, scitech Publication.
2. Bhatt, N.D. “Elementary Engineering Drawing”, Charotar Book Stall, Anand,1998.
3. Lakshminarayanan, v. and Vaish Wanar, R.S., “ Engineering Graphics”, Jain brothers, New Delhi,1998.
4. Chandra, A.M. and Chandra Satish, “ Engineering Graphics”, Narosa, 1998.
5. Jolhe, “ Engineering Graphics”, Tata Mc Graw –Hill – WBUT Series.

6. Gill, P.S., “ A Text Book of Engineering Drawing”, Katson Publishing House (Kataria and Sons).
7. Venugopal, K., “ Engineering Drawing & Graphics+ AUTO CAD”, New Age International.
8. Venkata Reddy K., “ Text Book of Engineering Drawing (2nd Edition)”, BS Publication.

HU181 English Language & Technical Communication Lab 0-0-3-3-2:

1. a) Honing ‘Listening Skill’ and its sub skills through Language Lab Audio device; 3P
 - b) Honing ‘Speaking Skill’ and its sub skills; 2P
 - c) Helping them master Linguistic/Paralinguistic features (Pronunciation/Phonetics/Voice modulation/ Stress/ Intonation/ Pitch & Accent) of connected speech; 2P
 - d) Honing ‘Conversation Skill’ using Language Lab Audio –Visual input; Conversational Practice Sessions (Face to Face / via Telephone , Mobile phone & Role Play Mode); 2P
 - e) Introducing ‘Group Discussion’ through audio –Visual input and acquainting them with key strategies for success; 2P
 - f) G D Practice Sessions for helping them internalize basic Principles (turn- taking, creative intervention, by using correct body language, courtesies & other soft skills) of GD; 4P
 - g) Honing ‘Reading Skills’ and its sub skills using Visual / Graphics/Diagrams /Chart Display/Technical/Non Technical Passages; Learning Global / Contextual / Inferential Comprehension; 2P
 - h) Honing ‘Writing Skill’ and its sub skills by using Language Lab Audio –Visual input; Practice Sessions
- Total Practical Classes 17

Books Recommended:

2. Dr. D. Sudharani: Manual for English Language Laboratory Pearson Education (WB edition),2010
3. Board of Editors: Contemporary Communicative English for Technical Communication Pearson Longman, 2010

XC181 Extra Curricular Activities 0-0-2-2-1:

- a) Creating awareness in social issues
- b) Participating in mass education programmes
- c) Proposal for local slum area development
- d) Waste disposal
- e) Environmental awareness
- f) Production Oriented Programmes
- g) Relief & Rehabilitation work during Natural calamities

Creating awareness in social issues:

1. Women’s development – includes health, income-generation, rights awareness.
2. Hospital activities – Eg. writing letters for patients, guiding visitors
3. Old age home – visiting the aging in-mates, arranging for their entertainment.
4. Children’s Homes - visiting the young in-mates, arranging for their entertainment
5. Linking with NGOs to work on other social issues. (Eg. Children of sex-workers)
6. Gender issues- Developing an awareness, to link it with Women’s Cell of college

Participating in mass education programmes

1. Adult education
2. Children’s education

Proposal for local slum area development

One or two slums to be identified and according to the needs, activities to be developed and proposals and reports are to be submitted.

Environmental awareness

- Resource conservation – Awareness to be developed on water, energy, soil.
- Preservation of heritage monuments- Marches, poster campaigns
- Alternative energy consciousness amongst younger school-children.
- Plantation and beautification- Plantation of trees, their preservation and upkeep, developing NSS parks.
- Waste disposal- Proper methods of domestic waste disposal.

Production Oriented Programmes

5. Working with people and explaining and teaching improved agricultural practices

6. Rodent control and pest control practices;
7. Soil-testing, soil health care and soil conservation;
8. Assistance in repair of agriculture machinery;
9. Work for the promotion and strengthening of cooperative societies in villages;
10. Assistance and guidance in poultry farming, animal husbandry, care of animal health etc.;
11. Popularization of small savings and
12. Assistance in procuring bank loans

Relief & Rehabilitation work during Natural calamities

- g) Assisting the authorities in distribution of rations, medicine, clothes etc.;
- h) Assisting the health authorities in inoculation and immunization, supply of medicine etc.;
- i) Working with the local people in reconstruction of their huts, cleaning of wells, building roads etc.;
- j) Assisting and working with local authorities in relief and rescue operation; Collection of clothes and other materials, and sending the same to the affected areas;

2ND SEMESTER:

HU202 Economics for Engineers 3-0-0-3-3:

1. **Financial Accounting:** Meaning, Nature and scope of Financial Accounting, Accounting concepts & conventions, Business Transactions, Different types of Vouchers, Analysis of Transactions, Recording in Journals and cash books, Posting of Ledgers, Preparation of Trial balance, Preparation of Final Accounts (Trading Account, Profit & Loss A/C and Balance Sheet)
2. **Cost Accounting:** Introduction, Classification of Costs; Break-even Analysis; Budgeting & Budgetary Control, Objectives, Advantages & Limitations of Budgeting, Cash Budget, Flexible Budget, Master Budget, etc
3. **Financial Management:** Cost of Capital: Capital Budgeting, Working Capital Management
4. **Economics**

Introduction: Scarcity and Choice. Definition and Scope of Economics. Concept of Equilibrium. Concept of Market.

Demand and Revenue Analysis: Meaning of demand, Determinants of demand, Exception to the law of demand. Elasticity of demand- Meaning, Price Elasticity of demand. Price Elasticity of Supply.

Cost and Production Analysis: Cost concept: Classification of cost- Cost output relationship- Cost function and its determinants, uses of Cost function. Production: Meaning, Factors of production- Land, Labour, capital and organization.

References

- 1 Modern Accountancy A. Mukherjee & M. Hanif Tata McGraw- Hill
- 2 Accountancy (Vol.1) Dr. S.K. Paul New Central Book Agency
- 3 Practice in Accountancy S. P. Basu & Monilal Das Rabindra Library
- 4 Modern Economic Theory K.K. Dewett S.Chand
- 5 Fundamentals of Economic Principles and problems : A. Banerjee & D. Maumder; ABS Publishing House
- 6 Economics for Business John Sloman & Mark Sutcliffe Pearson Education
- 7 Management Accounting R.K. Sharma & S. Gupta Kalyani Publishers
- 8 Financial Management Dr. S. Kr. Paul New Central Book Agency
- 9 Financial Management Dr. D. Majumder; Sk. Raju Ali & Lutfun Nesha; ABS Publishing
10. S. A. Sherlekar & V.S. Sherlekar : Modern Business Organization & Management, Himalay Publishing House

CH201 Chemistry 3-1-0-4-4:

Module 1: Chemical Thermodynamics

Concept of Thermodynamic system: Definition with example of diathermal wall, adiabatic wall, isolated system, closed system, open system, extensive property, intensive property.

Introduction to first law of thermodynamics: Different statements, mathematical form.

Internal energy: Definition, example, characteristics, physical significance, mathematical expression for change in internal energy, expression for change in internal energy for ideal gas.

Enthalpy: Definition, characteristics, physical significance, Mathematical expression for change in Enthalpy, Expression for change in enthalpy for ideal gas. **3L**

Heat Capacity: Definition, classification of heat capacity (C_p and C_v): Definition and general expression of C_p - C_v . Expression of C_p - C_v for ideal gas.

Reversible and irreversible processes: Definition, work done in isothermal reversible and isothermal irreversible process for ideal gas, adiabatic changes: Work done in adiabatic process, interrelation between thermodynamic parameters (P, V and T), slope of P-V curve in adiabatic and isothermal process.

Application of first law of thermodynamics to chemical processes: exothermic, endothermic processes, law of Lavoisier and Laplace, Hess's law of constant heat summation, Kirchhoff's law. **3L**

2nd law of thermodynamics: Statement, mathematical form of 2nd law of thermodynamics (Carnot cycle). Joule Thomson and throttling processes; Joule Thomson coefficient for ideal gas, concept of inversion temperature. Evaluation of entropy: Characteristics and expression, entropy change in irreversible cyclic process, entropy change for irreversible isothermal expansion of an ideal gas, entropy change of a mixture of gases. **2L**

Work function and free energy: Definition, characteristics, physical significance, mathematical expression of ΔA and ΔG for ideal gas, Maxwell's Expression (only the derivation of four different forms), Gibbs Helmholtz equation, condition of spontaneity and equilibrium reaction. **2L**

Module 2: Industrial Chemistry and Polymerization

Industrial chemistry:

Solid Fuel: Coal, classification of coal, constituents of coal, carbonization of coal (HTC and LTC), coal analysis: Proximate and ultimate analysis.

Liquid fuel: Petroleum, classification of petroleum, refining, petroleum distillation, thermal cracking, octane number, cetane number, aviation fuel (aviation gasoline, jet gasoline), and bio-diesel.

Gaseous fuels: Natural gas, water gas, coal gas, bio-gas. **5L**

Polymerization: Concepts, classifications and industrial applications

Polymer molecular weight (number avg. weight avg. viscosity avg.: Theory and mathematical expression only), Poly dispersity index (PDI). Polymerization processes (addition and condensation polymerization), degree of polymerization, copolymerization. Preparation, structure and use of some common polymers: plastic (PE: HDPE, LDPE), rubber (natural rubber, SBR), fibre (nylon 6.6). Vulcanization, conducting and semi-conducting polymers. **3L**

Module 3: Reaction dynamics, and structure and reactivity of organic molecules

Reaction dynamics: Reaction laws: rate and order; molecularity; zero, first and second order kinetics.

Pseudounimolecular reaction, Arrhenius equation. Mechanism and theories of reaction rates (Transition state theory, Collision theory:). Catalysis: Homogeneous catalysis (Definition, example, mechanism, kinetics). **3L**

Structure and reactivity of Organic molecules: Electronegativity, electron affinity, hybridisation, Inductive effect, resonance, hyperconjugation, electromeric effect, carbocation, carbanion and free radicals. Brief studies on some addition, elimination, and substitution reactions. **3L**

Module 4: Electrochemistry

Conductance: Conductance of electrolytic solutions, specific conductance, equivalent conductance, molar conductance and ion conductance, effect of temperature and concentration (strong and weak electrolyte). Kohlrausch's law of independent migration of ions, transport numbers, and hydration of ions.

Conductometric titrations: SA vs SB & SA vs WB; precipitation titration KCl vs AgNO₃. **2L**

Electrochemical cell: Cell EMF and its thermodynamic derivation of the EMF of a Galvanic cell (Nernst equation), single electrode potentials, hydrogen half cell, quinhydrone half cell and calomel half cell (construction, representation, cell reaction, expression of potential, discussion, application).

Storage cell, fuel cell (construction, representation, cell reaction, expression of potential, discussion, application). Application of EMF measurement on (a) ascertain the change in thermodynamic function (ΔG , ΔH , ΔS) (b) ascertain the equilibrium constant of a reversible chemical reaction (c) ascertain the valency of an ion. **3L**

Module 5: Solid state and coordination chemistry

Solid state Chemistry: Introduction to stoichiometric defects (Schottky & Frenkel) and non - stoichiometric defects (Metal excess and metal deficiency). Role of silicon and germanium in the field of semiconductor. **2L**

Coordination chemistry: Double salt, complex salt, Werner's theory of coordination compounds, coordination number, ligand, chelate, stability constant: stepwise and overall. **2L**

Reference Books

1. P. C. Rakshit, Physical Chemistry, Sarat Book House (7th Edition).
2. S. Glasstone, Text Book of Physical Chemistry, Macmillan India Limited.
3. S. Pahari, Physical Chemistry, New Central Book Agency.
4. S. Sarkar, Fuels and Combustion, Taylor & Francis (3rd Edition), 2009
5. P. Ghosh, Polymer Science and Technology of Plastics and Rubbers, Tata McGraw Hill Publishing Company Limited.
6. F.W. Billmeyer: Textbook of Polymer Science is published by Wiley India (is now an Indian print).
7. Joel R. Fried, Polymer Science and Technology, Pearson Education (2nd Edition).
8. I. L. Finar, Organic Chemistry, Addison Wesley Longman, Inc.
9. Physical Chemistry, Atkins, 6th Edition, Oxford Publishers.
10. Organic Chemistry, Mark Loudon, 4th Edition, Oxford Publishers.
11. Inorganic Chemistry–R. L. Dutta, Current Distributors

EE201 Basic Electrical Engineering 3-1-0-4-4

Introduction: Overview of Source of energy, Generation, Transmission and Distribution of Electric Power.

DC Network: Introduction of Electric Circuit, Loop Analysis, Node-voltage analysis. Star - Delta & Delta-star Transformations, Superposition Theorem, Thevenin's Theorem, Norton's theorems, Analysis of dc network in presence of one non-linear element, Transients in R-L, R-C and R-L-C circuits.

Single-phase AC Network: Single-phase AC Circuits, Generation of Sinusoidal Voltage Waveform (AC) and Some Fundamental Concepts, Representation of Sinusoidal Signal by a Phasor, Current and Resonance in R-L-C Series and parallel Circuits.

Three-phase AC Network: Three-phase AC Circuits, Three-phase Balanced Supply, Three-phase Delta-Connected Balanced Load, Power in a Three-phase Circuit.

Magnetic Circuits: Magnetic circuits, Core losses, Eddy Current & Hysteresis Loss.

Transformer: Ideal & Practical Transformer, Testing, Efficiency & Regulation, Three Phase Transformer, Auto-Transformer, Problem solving on Transformers

Three-phase Induction Motor: Construction, Principle of Operation, Rotating Magnetic Field, Equivalent Circuit, Power Flow Diagram, Torque-Slip (speed) Characteristics in Three-phase Induction Motor, Starters for Induction Motor.

DC Machines: , Constructional Features, Principle of Operation, EMF & Torque Equation of D.C Machines, D.C Generators, D.C Motors, Losses, Efficiency and Testing of D.C. Machines, Problem Solving on D.C Machines.

Measuring Instruments: Study of DC-AC Measuring Instruments, Study of Electro-Dynamic Type Instrument, Study of Single Phase Induction Type Energy Meter.

General structure of electrical power system: Power generation to distribution through overhead lines and under ground cables with single lone diagram.

Text books:

1. Basic Electrical engineering, D.P Kothari & I.J Nagrath, TMH, Second Edition
2. Fundamental of electrical Engineering, Rajendra Prasad, PHI, Edition 2005.
3. Basic Electrical Engineering, V.N Mittle & Arvind Mittal, TMH, Second Edition
4. Basic Electrical Engineering, J.P. Tewari, New age international publication

Reference books:

1. Basic Electrical Engineering(TMh WBUT Series), Abhijit Chakrabarti & Sudipta Nath, TMH
2. Electrical Engineering Fundamental, Vincent.D.Toro, Pearson Education, Second Edition.
2. Hughes Electrical & Electronics Technology, 8/e, Hughes, Pearson Education.
3. Basic Electrical Engineering, T.K. Nagsarkar & M.S. Sukhija, Oxford
4. Introduction to Electrical Engineering, M.S. Naidu & S, Kamakshaiyah, TMH
5. Basic Electrical Engineering, J.J. Cathey & S.A Nasar, TMH, Second Edition.

EC201 Basic Electronics Engineering 3-1-0-4-4:

Pre-requisite: Knowledge of class XII level Physics and Mathematics

Introduction: Basic ideas on different circuit components (Resistor, Inductor, Capacitor) 1L**Module – 1: Semiconductors: 4L**

Crystalline material: Mechanical properties, Conductors, Semiconductors and Insulators: electrical properties. Energy band theory, Fermi levels; Semiconductors: intrinsic and extrinsic, energy band diagram, electrical conduction phenomenon, P-type and N-type semiconductors, drift and diffusion carriers.

Module – 2: Diodes and Diode Circuits: 3L+3L = 6L

Formation of P-N junction, energy band diagram, built-in-potential, forward and reverse biased P-N junction, formation of depletion region, Junction capacitance, V-I characteristics of diode, Simple diode circuits, load line, linear piecewise model; Rectifier circuits: half wave, full wave, (PIV, DC voltage and current, ripple factor, efficiency), idea of regulation, rectifier filter circuits, clipper, clamper, voltage multiplier circuits, breakdown mechanism of diodes, Zener diode, Varactor diode.

Module – 3: Bipolar Junction Transistors : 5L+2L=7L

Formation of PNP / NPN junctions, energy band diagram; current flow diagram, transistor mechanism and transistor principles, CE, CB, CC configuration, transistor input output characteristics: amplification factors for CB, CC and CE modes. Biasing and Bias stability: calculation of stability factor; small signal analysis, h-parameter model.

Module – 4: Field Effect Transistors: 5L

Concept of Field Effect Transistors (channel width modulation), Gate isolation types, JFET Structure and characteristics, MOSFET Structure and characteristics, depletion and enhancement type; CS, CG, CD amplifier configurations, FET parameters, small signal equivalent circuits for different configurations; CMOS: Basic Principles.

Module – 5: Feed Back Amplifier and Operational Amplifiers: 4L+4L = 8L

Positive and negative feed back, close loop gain, open loop gain, topologies of feed back amplifier, output impedance, input impedance, sensitivities (qualitative), bandwidth stability; effect of positive feed back: instability and oscillation, condition of oscillation, Barkhausen criteria. Introduction to integrated circuits, open loop characteristics of operational amplifier; Application of operational amplifier; inverting and non-inverting mode of operation, Adders, Subtractors, Constant gain multiplier, Voltage follower, Comparator, Integrator, Differentiator. OPAMP parameters: CMRR, OFFSET parameters, slew rate.

Module – 6: Special Semiconductor devices: 3L

SCR, DIAC, TRIAC, UJT, IGBT- structure, characterization, principle of operation and applications.

Module – 7: Cathode Ray Oscilloscope (CRO) 4L

CRT structure, block diagram, operation, Deflection systems, sweep circuit operation, basic block of CRO, applications of CRO, Frequency, phase and amplitude measurement using CRO, Lissajous figure.

Module – 8: Digital Electronics: 2L

Introduction to binary number; Basic Boolean algebra; De Morgan's Theorem, Logic gates.

Outcome: The students will be able to select proper electronics component and device depending on the requirement. The student should be able to use required rectifier circuit and to calculate its different parameters. The students must be able to design a transistor amplifier.

Recommended Books:**Text.**

1. Chattopadhyay & Rakshit: Electronics Fundamentals & Applications
2. Millman & Halkias: Integrated Electronics References:
 1. Boylestad & Nashelsky: Electronic Devices & Circuit Theory
 2. Sanjeev Gupta: Electronics Devices Circuits
 3. Malvino: Electronic Principle

M201 Mathematics-II 3-1-0-4-4:**Module I**

1. **Ordinary differential equations (ODE)- First order and first degree:** Exact equations, Necessary and sufficient condition of exactness of a first order and first degree ODE (statement only), Rules for finding Integrating factors, Linear equation, Bernoulli's equation. General solution of ODE of first order and higher degree (different forms with special reference to Clairaut's equation).
6L

Module II

-
2. **ODE- Higher order and first degree:** General linear ODE of order two with constant coefficients, C.F. & P.I., D-operator methods for finding P.I., Method of variation of parameters, Cauchy-Euler equations, Solution of simultaneous linear differential equations. **7L**

Module III

3. **Partial Differential Equations:** Origin of PDE, its order and degree, concept of solution in PDE. Solution of First Order Partial differential equation by Lagrange's Method, Integral Surfaces passing through a given curve, Solution of non-linear first order partial differential equations by Charpit's method, Solution of Second order Linear partial Differential equations with constant coefficients and with variable coefficients. **14L**

Module IV

4. **Improper Integral:** Basic ideas of improper integrals, working knowledge of Beta and Gamma functions (convergence to be assumed) and their interrelations. **3L**
5. **Laplace Transform (LT):** Definition and existence of LT, LT of elementary functions, First and second shifting properties, Change of scale property; LT of $\frac{f(t)}{t}$, $t^n f(t)$, $f^{(n)}(t)$ and $\int f(u)du$. Evaluation of improper integrals using LT, LT of periodic and step functions, Inverse LT: Definition and its properties; Convolution Theorem (statement only) and its application to the evaluation of inverse LT, Solution of linear ODE with constant coefficients (initial value problem) using LT **10L**

Total 40 Lectures

Suggested Reference Books:

1. **Advanced Engineering Mathematics**, Erwin Kreyszig, (Wiley Eastern)
2. **Engineering Mathematics:** B.S. Grewal (S. Chand & Co.)
3. **Engineering Mathematics (Volume 2):** S. S. Sastry (Prentice-Hall of India)
4. **Advanced Engineering Mathematics, 3E:** M.C. Potter, J.L. Goldberg and E.F. Abonfadel (OUP), Indian Edition
5. **An Introduction to Differential Equations**, R.K. Ghosh and K.C. Maity (New Central Book Agency)
6. **Elements of Partial Differential Equations**, I. N. Sneddon, (McGraw-Hill International)
7. **Laplace Transforms**, M. R. Spiegel(MGH)

CH291 Chemistry Lab.

0-0-3-3-2:

List of Experiments

1. To Determine the alkalinity in a given water sample.
2. Redox titration (estimation of iron using permanganometry)
3. To determine calcium and magnesium hardness of a given water sample separately.
4. Estimation of available chlorine in bleaching powder.
5. To determine chloride ion in a given water sample by argentometric method (using chromate indicator solution).
6. Heterogeneous equilibrium (determination of partition coefficient of acetic acid between n-butanol and water)
7. Viscosity of solutions (determination of percentage composition of sugar solution from viscosity)
8. Conductometric titration for determination of the strength of a given HCl solution by titration against a standard NaOH solution.
9. pH- metric titration for determination of strength of a given HCl solution against a standard NaOH solution.
10. Determination of dissolved oxygen present in a given water sample.
11. Estimation of available oxygen in pyrolusite.

EE291 Basic Electrical Engineering Lab. 0-0-3-3-2

List of Experiments:

1. Characteristics of Fluorescent lamps
2. Characteristics of Tungsten and Carbon filament lamps
3. (a) Verification of Thevenin's theorem.
(b) Verification of Norton's theorems.
4. Verification of Maximum power theorem.
5. Verification of Superposition theorem

6. Study of R-L-C Series circuit
7. Study of R-L-C parallel circuit
8. Calibration of ammeter and voltmeter.
9. Open circuit and Short circuit test of a single phase Transformer.
10. No load characteristics of D.C shunt Generators
11. Starting and reversing of speed of a D.C. shunt
12. Speed control of DC shunt motor.
13. Measurement of power in a three phase circuit by two wattmeter method

EC291 Basic Electronics Engineering Lab. 0-0-3-3-2:

There will be a couple of familiarization lectures before the practical classes are undertaken where basic concept of the instruments handled Eg: CRO, Multimeters etc will be given.

List of Experiments:

1. Familiarisation with passive and active electronic components such as Resistors, Inductors, Capacitors, Diodes, Transistors (BJT) and electronic equipment like DC power supplies, multimeters etc.
2. Familiarisation with measuring and testing equipment like CRO, Signal generators etc.
3. Study of I-V characteristics of Junction diodes.
4. Study of I-V characteristics of Zener diodes.
5. Study of Half and Full wave rectifiers with Regulation and Ripple factors.
6. Study of I-V characteristics of BJTs.
7. Study of Characteristic curves for CB, CE and CC mode transistors
8. Study of I-V characteristics of Field Effect Transistors.
9. Determination of input-offset voltage, input bias current and Slew rate of OPAMPs.
10. Determination of Common-mode Rejection ratio, Bandwidth and Off-set null of OPAMPs.
11. Study of OPAMP circuits: Inverting and Non-inverting amplifiers, Adders, Integrators and Differentiators.

ME292 Workshop Practice 0-0-3-3-2:

Jobs:

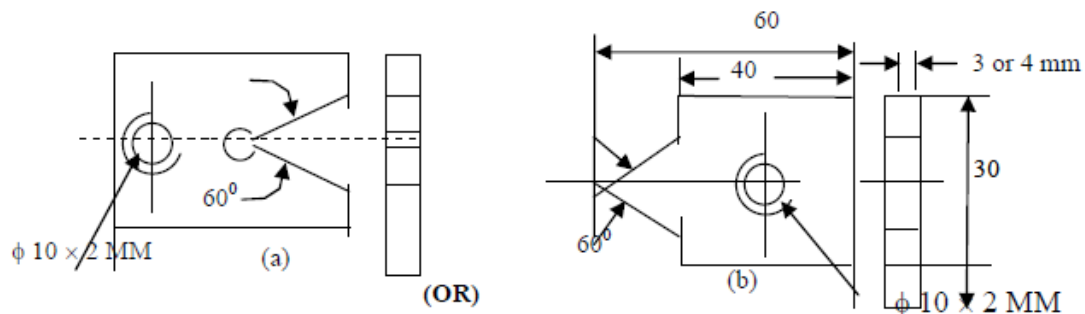


Fig.1: Job for fitting practice

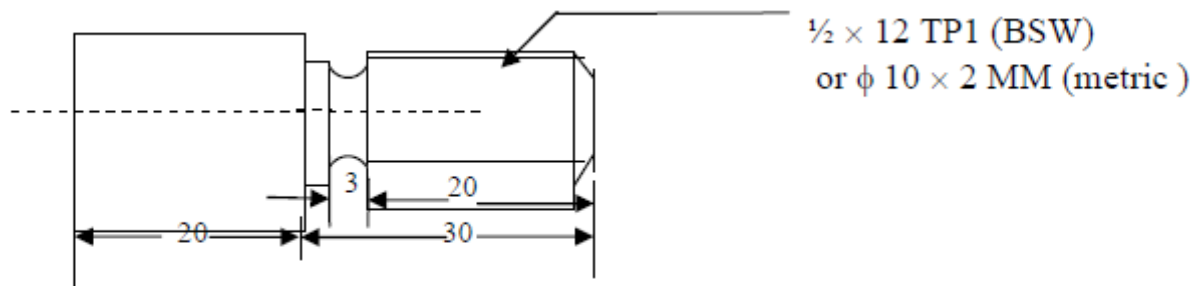


Fig.2: Job for practice on a lathe

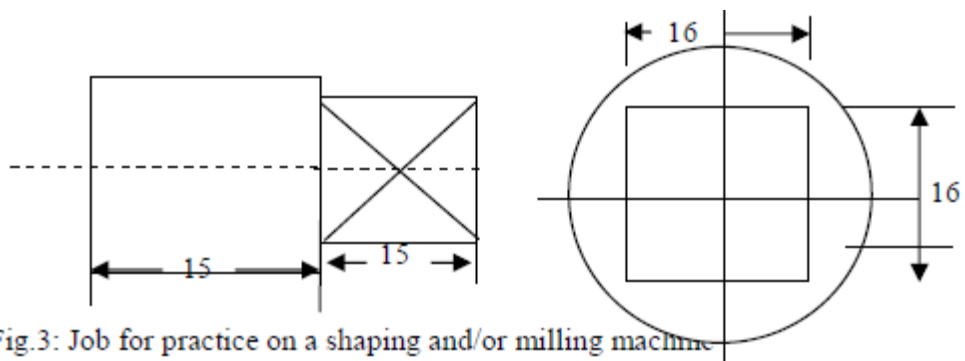
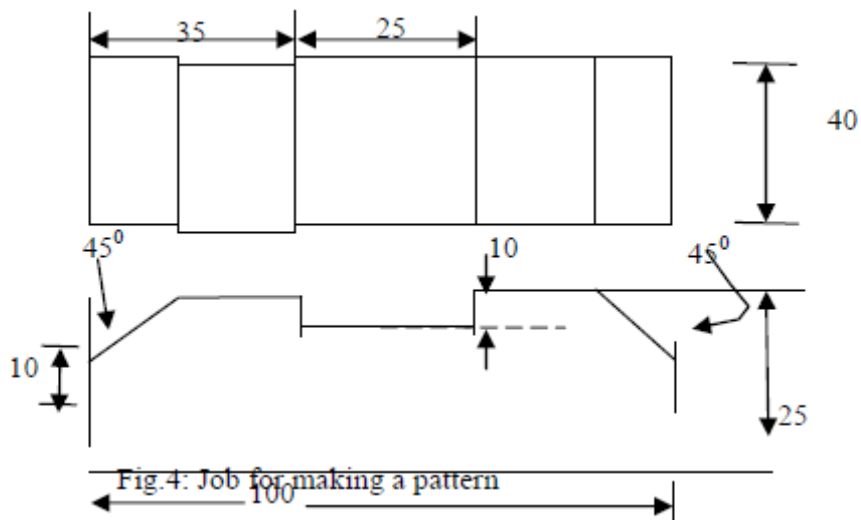


Fig.3: Job for practice on a shaping and/or milling machine



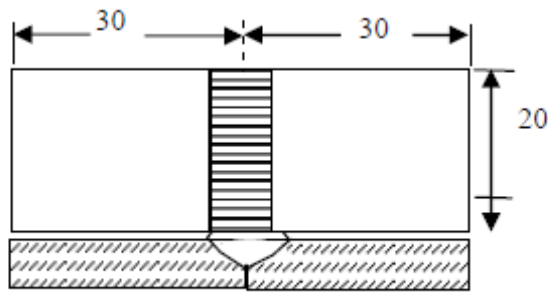


Fig.5: Welding specimen for practice

1. FITTING : Making a gauge from MS plate as shown in Fig.1.
Operations required:
 - a. Squaring and finishing of the blank by filing
 - b. Making the Vee-portion by sawing and filing
 - c. Drilling (in machine) and tapping (hand)
2. MACHINING : To make a pin as shown in Fig.2 from a $\square 20$ mm mild steel rod in a lathe.
3. MACHINING : To make a MS prism as shown in Fig.3 from a $\square 20$ mm mild steel rod in a shaping and / or milling machine.
4. PATTERN MAKING, SAND MOULDING AND CASTING: To make a wooden pattern and a sand mould with that pattern for casting a cast iron block as shown in Fig.4.
5. WELDING (GAS WELDING): To join two thin mild steel plates or sheets (1 to 3mm thick) as shown in Fig. 5 by gas welding.
6. WELDING (ARC WELDING) : To join two thick (6mm) MS plate as shown in Fig. 5 by arc welding.
7. SHEET METAL WORK (in 1 day or 3 hours); Forming a cone, for example.

3RD SEMESTER

HU301 VALUES & ETHICS IN PROFESSION 3-0-0-3-3:

Science, Technology and Engineering as knowledge and as Social and Professional Activities.

Effects of Technological Growth: Rapid Technological growth and depletion of resources, Reports of the Club of Rome. Limits of growth: sustainable development

Energy Crisis: Renewable Energy Resources, Environmental degradation and pollution. Eco-friendly Technologies.

Environmental Regulations, Environmental Ethics,

Appropriate Technology Movement of Schumacher; later developments Technology and developing notions.

Problems of Technology transfer, Technology assessment impact analysis.

Human Operator in Engineering projects and industries. Problems of man, machine, interaction, Impact of assembly line and automation. Human centered Technology.

Ethics of Profession: Engineering profession: Ethical issues in Engineering practice, Conflicts between business demands and professional ideals. Social and ethical responsibilities of Technologists. Codes of professional ethics.

Whistle blowing and beyond, Case studies.

Profession and Human Values: Values Crisis in contemporary society

Nature of values: Value Spectrum of a good life

Psychological values: Integrated personality; mental health

Societal values: The modern search for a good society, justice, democracy, secularism, rule of law, values in Indian Constitution.

Aesthetic values: Perception and enjoyment of beauty, simplicity, clarity

Moral and ethical values: Nature of moral judgements; canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility.

Books:

1. Stephen H Unger, Controlling Technology: Ethics and the Responsible Engineers, John Wiley & Sons, New York 1994 (2nd Ed)

2. Deborah Johnson, Ethical Issues in Engineering, Prentice Hall, Englewood Cliffs, New Jersey 1991.

21 | Page Jalpaiguri Government Engineering College, (An Autonomous Government College), B.Tech. (CE) Syllabus implemented from the Academic Year 2013-14 (for the new batch only)

3. A N Tripathi, Human values in the Engineering Profession, Monograph published by IIM, Calcutta 1996.

CE301 Engineering Geology and Rock Mechanics 4-0-0-4-4:

Geology and its importance in Civil Engineering.

Mineralogy: Definition, internal and external structure of minerals, study of crystals, Classification and physical properties of minerals.

Classification of rocks: Igneous rocks: Origin, mode of occurrence, forms & texture, classification and engineering importance.

Sedimentary rocks: Process of sedimentation, classification and engineering importance. Metamorphic rocks: Agents and types of metamorphism, classification and engineering importance.

Weathering of rocks: Agents and kinds of weathering, soil formation & classification based on origin.

Geological work of rivers: Origin and stages in the system, erosion, transportation and deposition. Structural geology: Introduction to structural elements of rocks, dip & strike, definition, description, classification of folds, faults and joints, importance of geological structures in Civil Engineering.

Earthquakes and seismic hazards: Causes and effects, seismic waves and seismographs, Mercalli's intensity scale and Richter's scale of magnitude. Engineering properties of rocks: Porosity, permeability, compressive strength, tensile strength and abrasive resistance.

Rocks as construction materials: Qualities required for building and ornamental stones, foundations, concrete aggregate, railway ballast, road metal, pavement, flooring and roofing.

Geophysical exploration: Methods of Geophysical Exploration, electrical resistivity method field procedure – sounding and profiling, electrode configuration, and interpretation of resistivity data. Geophysical surveys in ground water and other Civil Engg. Projects.

Applied Geology: Surface and subsurface geological and geophysical investigations in major Civil Engg. Projects. Geological studies of Dams and reservoir sites, Geological studies for selection of tunnels and underground excavations.

Landslides: Types of landslides, causes, effects and prevention of landslides.

CE302 Solid Mechanics 3-1-0-4-4:

<i>Sl No.</i>	<i>Topic</i>	<i>Hours</i>
1	Fundamental of Stresses: Simple stresses and strain, modulus of elasticity, modulus of rigidity, bulk modulus, their relationship, strain energy due to direct stresses, impact loads, shearing stresses, factor of safety, permissible stress, proof stress	5
2	Beam Statics: Support reactions, concepts of redundancy, definitions, axial force, shear force and bending moment diagrams for concentrated, uniformly distributed, linearly varying load, concentrated moments in simply supported beams, cantilever and overhanging beams	7
3	Symmetric Beam Bending: Basic kinematic assumption, moment of inertia, elastic flexure formulae and its application, moment carrying capacity, Shear stress Distribution in beams section	4
4	Deflection of beams by Double Integration: Elastic curve, moment Curvature relationship, governing differential equation, boundary conditions, direct integration solution for simple beams	4
5	Torsion: Pure torsion, torsion of circular solid shaft and hollow elastic bars, torsional equation, torsional rigidity, closed coil helical spring	4
6	Two Dimensional Stress Problems: Principal stresses, maximum shear stresses, Mohr's circle of stresses, construction of Mohr's circle	5
7	Introduction to thin cylindrical shells: Hoop stress and meridional stress and volumetric changes	2
8	Columns: Fundamentals, criteria for stability in equilibrium, column buckling theory, Euler's load for columns with different end conditions, limitations of Euler's theory – problems, eccentric load and secant formulae, Rankine & IS code formulae	5

Reference:

<i>Sl No</i>	<i>Title of Book</i>	<i>Author</i>	<i>Publisher</i>
1	Engineering Mechanics of Solids	E. P. Popov	PHI
2	Strength of Materials	S S Bhavikatti	Vikas Publishing
3	Strength of Materials	R. Subramanian	Oxford University
4	Elements of Strength of Material	Timoshenko & Young	EWP
5	Strength of Material	A. Pytel & F. L. Singer	AWL Inc
6	Strength of Material	Ramamrutham	
7	Engineering Mechanics I	J. L. Mariam	John Willey
8	Engineering Mechanics College		

CE 303 Fluid Mechanics**3-0-0-3-3:**

<i>Sl No.</i>	<i>Topic</i>	<i>Hours</i>
1	Properties of Fluid: Introduction, Definition of fluid, Ideal fluid, Real fluid, Units of measurement, Basic definitions, Newton's law of viscosity, Rheological diagram, Problems.	4
2	Fluid Pressure and Its Measurement: Fluid pressure at a point, variation of a pressure in a fluid, Atmospheric, Absolute, Gage and Vacuum pressure, Measurement of pressure, Manometers-simple and differential, Mechanical gauges, Problems.	4
3	Hydrostatic Forces on Surfaces: Total pressure and centre of pressure, Total pressure and centre of pressure on plane and curved surfaces, Problems.	4
4	Buoyancy and Flotation: Buoyancy, Buoyant force and centre of buoyancy, Metacentre, Metacentric height, Stability of submerged and floating bodies, Problems.	4
6	Dynamics of Fluid: Equation of motion, Euler's equation of motion, Bernoulli's equation, Practical application of Bernoulli's equation- Venturimeter, Orifice meter and Pitot tube, Problems.	5
7	Flow through Orifice and Mouthpiece: Definition, Classifications, Orifice Coefficients-definitions, relationship, and experimental determinations, Flow through large rectangular orifice, submerged orifice, Partially submerged orifice, Flow through external cylindrical mouthpiece, Time of emptying a tank, Problems.	6
8	Flow over Notches and Weir: Rectangular, triangular, Cippoletti, sharp crested and broad crested weirs, submerged weirs, Problems.	5
9	Dimensional Analysis and Models Studies: Dimensions and dimensional homogeneity, Importance and use of dimensional analysis. Rayleigh's theorem, Buckingham's Pi theorem with applications. Geometric, Kinematic and Dynamic similarity. Non Dimensional Numbers, Problems.	4

References:

<i>Sl No</i>	<i>Title of Book</i>	<i>Author</i>	<i>Publisher</i>
1	Hydraulics and Fluid Mechanics	Modi and Seth	Standard Book House
2	Fluid Mechanics	F. M. White	McGraw Hill series in Mechanical Engg
3	Fluid Mechanics and Hydraulics	Jagdish Lal	Metropolitan Book Co. Pvt. Ltd.
4	Fluid Mechanics and Fluid Power Engg.	D. S. Kumar	Katson Book
5	A Text Book of Fluid Mechanics and Hydraulic Machines	R. K. Bansal	Laxmi Publications
6	Fluid Mechanics with Engineering Applications	Daugherty,	McGraw Hill

		Franzini and Finemore	
7	Fluid Mechanics	V. L. Streeter & E. B. Wilie	McGraw Hill

CE304 Building Material and Construction 4-0-0-4-4:

<i>Sl no.</i>	<i>Topic</i>	<i>Hours</i>
1	Bricks: Classification, Characteristics of good bricks, ingredients of good brick earth, Harmful substance in brick Earth, Different forms of bricks, Testing of bricks as per BIS. Defects of bricks.	3
2	Aggregates: Classification, Characteristics, Deleterious substances, Soundness, Alkali –aggregates reaction, Fine aggregates, Coarse aggregates, Testing of aggregates	3
3	Lime: Impurities in limestone, Classification, Slaking and hydration, Hardening, Testing, Storage, Handling	2
4	Cement: OPC: Composition, PPC, Slag cement, Hydration, setting time Concrete: Types, ingredients, W/C ratio, Workability, Different grades in cement concrete, Tests on cement concrete	4
5	Mortars: Classification, Uses, Characteristics of good mortar, Ingredients. Cement mortar, Lime mortar, Lime cement mortar, special mortars	2
6	Wood and Wood Products: Classification of Timber, Structure, Characteristics of good timber, Seasoning of timber, Defects in Timber, Diseases of timber, Decay of Timber, Preservation of Timber Testing of Timber, Veneers , Plywood, Fibre Boards, Particle Boards, Chip Boards , Black Boards, Button Board and Laminated Boards, Applications of wood and wood products	3
7	Paints, Enamels and Varnishes: Composition of oil paint, characteristic of an ideal paint, preparation of paint, covering power of paints, Painting: Plastered surfaces, painting wood surfaces, painting metal Surfaces. Defects, Effect of weather, enamels, distemper, water wash and colour wash, Varnish , French Polish, Wax Polish	4
8	Foundations: Function of Foundations, Essential requirement of good foundation, Different types of shallow and deep Foundations	4
9	Brick masonry: Definitions, Rules for bonding, Type of bonds – stretcher bond, Header bond, English bond, Flemish Bond, Comparison of English Bond and Flemish Bond (one and one and half brick thick wall)	3
10	Wall, Doors and Windows: Load bearing wall, Partition wall, Reinforced brick wall Common types of doors and windows of timber and metal	3
11	Stairs: Technical Terms, Requirements of good stair, Dimension of steps, Classification, Geometric design of a dog legged stair case	3
12	Flooring: Components of a floor, selection of flooring materials, Brick flooring, Cement concrete flooring, mosaic, marble, Terrazzo flooring, Tiled roofing	3
13	Plastering and Pointing: Plastering with cement mortar, Defects in plastering, pointing, white washing, colour washing, Distempering.	3
14	Roofs: Types, Pitched roofs and their sketches, Lean – to roof, King Post – Truss, Queen post truss and Simple steel Truss, Roof Covering materials: AC sheets GI sheet.	3

References:

<i>Sl No</i>	<i>Title of Book</i>	<i>Author</i>	<i>Publisher</i>
1	Building Materials	Rangawala	
2	Building Materials and Construction	B. C. Punmia	

3	Building Construction and Foundation Engineering	Jha and Sinha	
4	Concrete Technology	M. S. Shetty	
5	Building Materials	S. K. Duggal	
6	Building Materials	P.C. Varghese	PHI

CE305 Engineering Survey – I 3-1-0-4-4:

<i>Sl No.</i>	<i>Course content</i>	<i>Hours</i>
1	Introduction: Definition, classification of surveying, objectives, principles of surveying. Chain surveying: Chain surveying: Chain and its types, optical square, cross staff. Reconnaissance and site location, locating ground features by offsets – field book. Chaining for obtaining the outline of structures, methods for overcoming obstacles, conventional symbols, plotting chain survey and computation of areas, errors in chain surveying and their elimination – problems	9
2	Compass surveying: Types of compasses, use and adjustments, bearings, local attraction and adjustments. Chain and compass surveying of an area, booking and plotting. Adjustments of traverse, errors in compass surveying and precautions - problems.	8
3	Plane table surveying: Equipment, leveling, orientation, different methods of survey, two and three point problems, errors and precautions.	4
4	Leveling: Introduction, basic definitions, leveling instruments and their features, temporary adjustment of levels, sensitiveness of bubble tube. Methods of leveling – differential, profile & fly leveling, cross sectional and reciprocal leveling. Effect of curvature and refraction, Reduction of errors and eliminating mistakes in leveling. Permanent adjustments of dumpy level. Modern levels – Tilting level, Automatic levels, precise levels. Plotting longitudinal sections and cross sections. Measurement of area and volume	8
5	Contouring: Topographic map, characteristics of contour, contour interval. Methods of locating contours, Interpolation of contours. Measurement of area and volume from contour maps.	4
6	Minor Instruments: Clinometers, Planimeter (mechanical and digital)	3

References:

<i>Sl No</i>	<i>Title of Book</i>	<i>Author</i>	<i>Publisher</i>
1	Surveying, Vol. I, II and III	K.R. Arora	Standard Book House., 1995
2	Surveying: Theory and Practice	J.M. Anderson, E.M. Mikhail	McGraw Hill.,1998
3	Engineering Surveying, 6th Ed	W. Schofield, M. Breach	BH 2007

CE391 Engineering Geology Lab 0-0-3-3-2:

<i>Sl No.</i>	<i>Topic</i>
1	Study of Physical Properties of Minerals
2	Study of Different Group of Minerals
3	Identification of Minerals: Actinolite, Apatite, Asbestos, Augite, Biotite, Calcite, Chlorite, Corundum, Fluorite, Galena, Garnet, Graphite, Gypsum, Hematite, Hornblende, Jasper, Kyanite, Magnetite, Microcline, Muscovite, Olivine, Opal, Orthoclase, Plagioclase, Quartz, Staurolite, Talc, Topaz, Tourmaline
4	Identification of Igneous Rocks: Andesite, Anorthosite, Aplite, Basalt, Diorite, Dolerite, Dunite, Gabbro, Granite, Granodiorite, Obsidian, Nephelinite, Norite, Pegmatite, Peridotite, Syenite, Volcanic Tuff

5	Identification of Sedimentary Rocks: Breccia, Conglomerate, Limestone, Sandstone, Shale
6	Identification of Metamorphic Rocks: Amphibolites, Charnockite, Gneiss, Granulites, Khondalite, Marble, Phyllite, Quartzite, Schist, Slate
7	Study of Topographical Features from Geological Maps, Identification of Symbols in Maps

CE392 Survey Practice – I 0-0-3-2:

<i>Sl No.</i>	<i>List of Experiments</i>
1	Measurement of distance by chaining and ranging
2	Determination of area of a polygon by chain and cross staff survey.
3	Measurement of bearings of sides of traverse with prismatic compass and computation of correct included angle.
4	Determination of elevation of various points with dumpy level by collimation plane method and rise & fall method.
5	Measurement of horizontal angles with theodolite by method of repetition.
6	Measurement of vertical angles with theodolite.
7	Locating given building by plain table traversing.
8	Three point problem in plane table traversing.
9	Contour plan of given area.

CE 393 Building Design & Drawing 0-0-3-3-2:

<i>Sl No.</i>	<i>Course Content</i>	<i>Hours</i>
1	Foundations: Spread foundation for walls and columns; footing for a RCC column, raft and pile foundations;	6
2	Doors and Windows: Glazed and paneled doors of standard sizes; Glazed and paneled windows of standard sizes; special windows and ventilators.	6
3	Stairs: Proportioning and design of a dog-legged, open well RCC stair case for an office / Residential building; Details of reinforcements for RCC stair cases; Plan and elevation of straight run, quarter turn, dog-legged and open well stair cases.	6
4	Roofs and Trusses: Types of sloping roof, lean-to roofs, RCC roof with details of reinforcements, King post and Queen post trusses.	6
5	Functional Design of Buildings: To draw the line diagram, plan, elevation and section of the following: Residential Buildings (flat, pitched and combined roofs), Office Buildings (flat roof), School. The designs must show positions of various components including lift well and their sizes.	12
6	Introduction to drawing by using software package.	4

References:

Sl no.	Name	Author	Publishers
1	Principles of Building Drawing	Shah & Kale	
2	Text Book of Building Construction	Sharma & Kaul	
3	Building Construction	B C Punmia	

4TH SEMESTER

M-402 Mathematics-III 3-1-0-4-4:

Fourier Series: Introduction, Periodic functions: Properties, Even & Odd functions: Properties, Special wave forms: Square wave, Half wave Rectifier, Full wave Rectifier, Saw-toothed wave, Triangular wave.

Euler's Formulae for Fourier Series, Fourier Series for functions of period 2π , Fourier Series for functions of period $2l$, Dirichlet's conditions, Sum of Fourier series. Examples. Theorem for the convergence of Fourier Series (statement only). Fourier Series of a function with its periodic extension. Half Range Fourier Series: Construction of Half range Sine Series, Construction of Half range Cosine Series. Parseval's identity (statement only). Examples.

Fourier Transform: Fourier Integral Theorem (statement only), Fourier Transform of a function, Fourier Sine and Cosine Integral Theorem (statement only), Fourier Cosine & Sine Transforms. Fourier, Fourier Cosine & Sine Transforms of elementary functions. Properties of Fourier Transform: Linearity, Shifting, Change of scale, Modulation. Examples. Fourier Transform of Derivatives. Examples. Convolution Theorem (statement only), Inverse of Fourier Transform, Examples.

Calculus of Complex Variable : Complex functions, Concept of Limit, Continuity and Differentiability. Analytic functions, Cauchy-Riemann Equations (statement only). Sufficient condition for a function to be analytic. Harmonic function and Conjugate Harmonic function, related problems. Construction of Analytic functions: Milne Thomson method, related problems.

Concept of simple curve, closed curve, smooth curve & contour. Some elementary properties of complex Integrals. Line integrals along a piecewise smooth curve. Examples. Cauchy's theorem (statement only). Cauchy-Goursat theorem (statement only). Examples. Cauchy's integral formula, Cauchy's integral formula for the derivative of an analytic function, Cauchy's integral formula for the successive derivatives of an analytic function. Examples. Taylor's series, Laurent's series. Examples.

Zero of an Analytic function, order of zero, Singularities of an analytic function. Isolated and non-isolated singularity, essential singularities. Poles: simple pole, pole of order m . Examples on determination of singularities and their nature. Residue, Cauchy's Residue theorem (statement only), problems on finding the residue of a given function, evaluation of definite integrals:

$$\int_0^{\infty} \frac{\sin x}{x} dx, \int_0^{2\pi} \frac{d\theta}{a + b \cos \theta + c \sin \theta}, \int_C \frac{P(z)}{Q(z)} dz$$

(elementary cases, $P(z)$ & $Q(z)$ are polynomials of 2nd order or less).

Concept of transformation from z -plane to w -plane. Concept of Conformal Mapping. Idea of some standard transformations. Bilinear Transformation and determination of its fixed point.

Probability: Classical definition of probability and its limitation. Axiomatic definition of probability. Conditional probability. Independent events and related problems. Baye's theorem (Statement only) & related problems. One dimensional random variable. Probability distributions-discrete and continuous. Expectation and Variance. Binomial, Poisson, Uniform, Exponential, Normal distributions and related problems.

Partial Differential Equation (PDE): Solution by Separation of variables and Integral Transform(Laplace & Fourier transform) methods:(i) One dimensional Wave equation (ii) One dimensional Heat equation, (iii) Two dimensional Laplace equation.

Series solution of Ordinary Differential Equation (ODE): Validity of the series solution of an ordinary differential equation. General method to solve $a_0(x)y'' + a_1(x)y' + a_2(x)y = 0$ and related problems. Series solution, Bessel function, recurrence relations of Bessel's Function of first kind. Legendre's equation: Series solution, Legendre function, recurrence relations and orthogonality relation.

Text Books:

1. Brown J.W and Churchill R.V: Complex Variables and Applications, McGraw-Hill.
2. Das N.G.: Statistical Methods, TMH.
3. Grewal B S: Higher Engineering Mathematics, Khanna Publishers.
4. James G.: Advanced Modern Engineering Mathematics, Pearson Education.

5. Lipschutz S., and Lipson M.L.: Probability (Schaum's Outline Series), TMH.

References:

1. Sneddon, I. N.: Elements of Partial Differential Equations, McGraw-Hill International
2. Kreyzig E.: Advanced Engineering Mathematics, John Wiley and Sons.
3. Potter M.C, Goldberg J.L and Aboufadel E.F.: Advanced Engineering Mathematics, OUP.
4. Ramana B.V.: Higher Engineering Mathematics, TMH.
5. Spiegel M.R. , Lipschutz S., John J.S., and Spellman D., : Complex Variables, TMH.
6. Sneddon, I. N.: Fourier Transforms, Dover
7. Sneddon, I. N.: Use of Integral Transforms, MGH
8. Bhatia, R, Fourier Series, MAA

M(CS)-401 NUMERICAL METHODS

2-0-0-2-2:

Approximation in numerical computation: Truncation and rounding errors, Fixed and floating-point arithmetic, Propagation of errors.

Interpolation: Newton forward/backward interpolation, Lagrange's and Newton's divided difference Interpolation.

Numerical integration: Trapezoidal rule, Simpson's 1/3 rule, Expression for corresponding error terms.

Numerical solution of a system of linear equations: Gauss elimination method, Matrix inversion, LU Factorization method, Gauss-Seidel iterative method.

Numerical solution of Algebraic equation: Bisection method, Regula-Falsi method, Newton-Raphson method.

Numerical solution of ordinary differential equation: Euler's method, Runge-Kutta methods, Predictor-Corrector methods and Finite Difference method.

Text Books:

1. C.Xavier: C Language and Numerical Methods.
2. Dutta & Jana: Introductory Numerical Analysis.
3. J.B.Scarborough: Numerical Mathematical Analysis.
4. Jain, Iyengar , & Jain: Numerical Methods (Problems and Solution).

References:

1. Balagurusamy: Numerical Methods, Scitech.
2. Baburam: Numerical Methods, Pearson Education.
3. N. Dutta: Computer Programming & Numerical Analysis, Universities Press.
4. Soumen Guha & Rajesh Srivastava: Numerical Methods,OUP.
5. Srimanta Pal: Numerical Methods, OUP.

CH401 Environmental Engineering 3-0-0-3-3:

Basic ideas of environment, basic concepts, man, society & environment, their interrelationship.

Mathematics of population growth and associated problems, Importance of population study in environmental engineering, definition of resource, types of resource, renewable, non-renewable, potentially renewable, effect of excessive use vis-à-vis population growth, Sustainable Development.

Materials balance: Steady state conservation system, steady state system with non conservative pollutants, step function. Environmental degradation: Natural environmental Hazards like Flood, earthquake, Landslide-causes, effects and control/management; Anthropogenic degradation like Acid rain-cause, effects and control. Nature and scope of Environmental Science and Engineering.

Ecology: Elements of ecology: System, open system, closed system, definition of ecology, species, population, community, definition of ecosystem- components types and function. Structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems, Mangrove ecosystem (special reference to Sundar ban); Food chain , Food web. Biogeochemical Cycle- definition, significance, flow chart of different cycles with only elementary reaction [Oxygen, carbon, Nitrogen, Phosphate, Sulphur]. Biodiversity- types, importance, Endemic species, Biodiversity Hot-spot, Threats to biodiversity, Conservation of biodiversity.

Air pollution and control : Atmospheric Composition: Troposphere, Stratosphere, Mesosphere, Thermosphere, Tropopause and Mesopause.

Energy balance: Conductive and Convective heat transfer, radiation heat transfer, simple global temperature model [Earth as a black body, earth as albedo], Problems.

Green house effects: Definition, impact of greenhouse gases on the global climate and consequently on sea water level, agriculture and marine food. Global warming and its consequence, Control of Global warming. Earth's heat budget.

Lapse rate: Ambient lapse rate Adiabatic lapse rate, atmospheric stability, temperature inversion (radiation inversion). Atmospheric dispersion: Maximum mixing depth, ventilation coefficient, effective stack height, smokestack plumes and Gaussian plume model. Definition of pollutants and contaminants, Primary and secondary pollutants: emission standard, criteria pollutant. Sources and effect of different air pollutants- Suspended particulate matter, oxides of carbon, oxides of

nitrogen, oxides of sulphur, particulate, PAN. Smog, Photochemical smog and London smog.

Depletion Ozone layer: CFC, destruction of ozone layer by CFC, impact of other green house gases, effect of ozone modification.

Standards and control measures: Industrial, commercial and residential air quality standard, control measure (ESP. cyclone separator, bag house, catalytic converter, scrubber (ventury), Statement with brief reference).

Water Pollution and Control :Hydrosphere, Hydrological cycle and Natural water. Pollutants of water, their origin and effects: Oxygen demanding wastes, pathogens, nutrients, Salts, thermal application, heavy metals, pesticides, volatile organic compounds. River/Lake/ground water pollution: River: DO, 5 dayBOD test, Seeded BOD test, BOD reaction rate

constants, Effect of oxygen demanding wastes on river[deoxygenation, reaeration], COD, Oil, Greases, pH. Lake: Eutrophication. Ground water: Aquifers, hydraulic gradient, ground water flow.

Standard and control: Waste water standard [BOD, COD, Oil, Grease], Water Treatment system [coagulation and flocculation, sedimentation and filtration, disinfection, hardness and alkalinity, softening] , Waste water treatment system, primary and secondary treatments [Trickling filters, rotating biological contractor, Activated sludge, sludge treatment, oxidation ponds] tertiary treatment definition. Water pollution due to the toxic elements and their biochemical effects: Lead, Mercury, Cadmium, and Arsenic.

Land Pollution: Lithosphere; Internal structure of earth, rock and soil Solid Waste: Municipal, industrial, commercial, agricultural, domestic, pathological and hazardous solid wastes; Recovery and disposal method- Open dumping, Land filling, incineration, composting, recycling. Solid waste management and control (hazardous and biomedical waste).

Noise Pollution : Definition of noise, effect of noise pollution, noise classification [Transport noise, occupational noise,

neighbourhood noise], Definition of noise frequency, noise pressure, noise intensity, noise threshold limit value, equivalent noise level, Noise pollution control. L

Environmental Management: Environmental impact assessment, Environmental Audit, Environmental laws and protection act of India, Different international environmental treaty/ agreement/ protocol. 2L

References/Books

1. Masters, G. M., "Introduction to Environmental Engineering and Science", Prentice-Hall of India Pvt. Ltd., 1991.
2. De, A. K., "Environmental Chemistry", New Age International.

CE401 Structural Analysis – I 3-1-0-4-4:

<i>Sl No.</i>	<i>Topic</i>	<i>Hours</i>
1	Review of Basic Concept of Mechanics: Equilibrium, Free body diagram, Determinate and Indeterminate structures, Degree of indeterminacy for different types of structures: Beams, Frames, Trusses	3
2	Determinate Plane Trusses: Analysis by method of joints, method of section and graphical method	3
3	Analysis of Determinate Portal Frames:	4
4	Deflection Analysis of Beams: Area-moment theorem and Conjugate beam theory	3
5	Strain Energy: Due to axial load, bending and shear, Torsion; Castiglino's theorems, theorem of minimum potential energy, principle of virtual work, Betti's law, Maxwell's theorem of reciprocal deflection, Unit- Load method	8
6	Use of energy principles for deflection analysis of determinate beams, trusses and simple	7

	portal frames	
7	Influence Line Diagrams: Statically determinate beams and trusses under series of concentrated and uniformly distributed rolling loads, criteria for maximum and absolute maximum moments and shears	8

Reference:

<i>Sl No</i>	<i>Title of Book</i>	<i>Author</i>	<i>Publisher</i>
1	Engineering Mechanics of Solid	E. P. Popov	Pearson
2	Basic Structural Analysis	C.S. Reddy	
3	Statically Indeterminate Structures	C.K. Wang	
4	Elementary Structural Analysis	Norris & Wilber	
5	Structures	Schodek	Pearson
6	Elementary Structural Mechanics	Tung Au	
7	Indeterminate structural analysis	Kinney	
8	Elastic Analysis of Structures	Kennedy & Madugula	Harper & Row
9	Elements of Structural Mechanics	N.C. Sinha & S.K. Sen Gupta	S. Chand
10	Elementary Theory of Structures	Jindal	
11	Structural Analysis	Ramamurtham	
12	Analysis of Structures – Vol. I & II	Vazirani & Ratwani	

CE402 Hydraulics and Hydraulic Machines 3-0-0-3-3

<i>Sl No.</i>	<i>Topic</i>	<i>Hours</i>
1	Kinematics of Fluid Flow: Types of fluid flow, Description of flow pattern-stream line, equipotential line, path line and streak line. Principle of fluid flow-conservation of mass, energy and momentum, Problems.	4
2	Flow Through Pipes: Introductions, Two types of flow: Reynold's experiments, Laws of Fluid Friction for Laminar and Turbulent Flow, Froude's experiments, Equation for major head loss in pipes due to friction- Darcy Weisbach equation and Chezy's, Manning's & Hazen William's formula. Minor losses in pipes, Hydraulic grade line and Total energy line, Pipe in series and parallel, equivalent pipes, Branched pipes, Head loss due to friction in tapering pipes, Transmission of power through pipes, Flow through nozzles at end of pipes, Economic diameter of pipe, Water hammer in pipes, Pipe network- Hardy Cross loop balancing method, Problems.	12
3	Flow in Open Channels: Introductions, Types of flow in channels, Geometric properties of channel section, Velocity distribution in channel section, Uniform flow-establishment of uniform flow, Uniform flow formulae-Chezy's, Manning's and Kutter's formulae. Computation of uniform flow-The Conveyance of the channel section and section factor for uniform flow computation. Most economical channel section-rectangular, trapezoidal, triangular and circular. Critical flow- Its computation and application, characteristics, section factor for critical flow computation, critical flow in rectangular flow. Specific energy and critical depth- Specific energy curve-critical, subcritical and supercritical flow, Alternate depths, Specific force. Non-uniform flow in channels-Introduction, G.V.F.-Basic assumptions, Dynamic equations of G.V.F., Classifications of bottom slope, Characteristics of flow profile, R.V.F.- Hydraulic Jump, Energy loss equations, Length height of the jump, types of jump, Problems.	12
4	Introduction to Hydraulic Turbines: Working Principles of Pelton, Francis and Kaplan turbines, Problems.	4

5	Pumps: Centrifugal pumps, performance characteristic graph – design flow rate. Working principles of positive displacement pumps, gear, reciprocating pumps, Problems.	4
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References:

<i>Sl No</i>	<i>Title of Book</i>	<i>Author</i>	<i>Publisher</i>
1	Hydraulics and Fluid Mechanics	Modi and Seth	Standard Book
2	Open-Channel Hydraulics	Ven Te Chow	McGraw Hill
3	Fluid Mechanics and Hydraulics	Jagdish Lal	Metropolitan Book Co. Pvt. Ltd.
4	Fluid Mechanics	V.L. Streeter & E.B. Wilie	McGraw Hill
5	A Text Book of Fluid Mechanics and Hydraulic Machines	R.K. Bansal	Laxmi Publications
6	Principles of Fluid Mechanics and Fluid Mechanics	Pillai and Ramakrishnan	University Press
7	Open Channel Flow	M. Hanif Choudhury	Prentice Hall
8	Flow in Open Channels	K. Subramanya	Tata McGraw Hill
9	Fluid Machines and Fluid Power Engineering	D.S. Kumar	Katson Book
10	Fluid Mechanics	A.K. Jain	Khanna Publishers

CE403 Engineering Survey – II 3-1-0-4-4

<i>Sl no.</i>	<i>Course content</i>	<i>Hours</i>
1	Theodolite surveying: Components of a Theodolite, Adjustments, Horizontal and vertical angle measurements, Trigonometric leveling, problems on height and distances, traverse table, co-ordinates	6
2	Tachometer: Definition, Principles of stadia, tangential systems, Details of stadia system. Analytic tachometer, Horizontal and inclined sight with staff vertical and normal for both fixed and movable hair tachometer, Errors in tachometer methods.	6
3	Triangulation: Adjustments of station and figure, Leveling adjustment, Method of equal shifts.	4
4	Curve surveying : (1) Simple curves Definition, Notations Designations, Elements of simple curve, Setting out by linear methods and Rankine's tangential method. Two Theodolite and tachometric method, (2) Introduction to Compound and reverse curves, vertical curve: types (3) Transition curves: lemniscates, cubic spiral, cubic parabola, setting out	12
5	Hydrographic surveying: Vertical control Datum: tide measurement, Horizontal Control: Shore line surveying, Sounding: Location of sounding and reduction, Three point problems, Nautical sextant and station pointer.	4
6	Remote Sensing: Introduction to remote sensing and its application in civil engineering, Photographic Survey: Introduction to terrestrial and aerial photogrammetry, determination of true north	4

References:

<i>Sl No</i>	<i>Title of Book</i>	<i>Author</i>	<i>Publisher</i>
1	Surveying, Vol. I, II and III	K.R. Arora	Standard Book House.,

			1995
2	Surveying: Theory and Practice	J.M. Anderson, E.M. Mikhail	McGraw Hill.,1998
3	Engineering Surveying, 6th Ed	W. Schofield, M. Breach	Butterworth-Heinemann., 2007

M(CS)491 NUMERICAL METHODS 0-0-3-3-2:

1. Assignments on Newton forward /backward, Lagrange's interpolation.
2. Assignments on numerical integration using Trapezoidal rule, Simpson's 1/3 rule, Weddle's rule.
3. Assignments on numerical solution of a system of linear equations using Gauss elimination and Gauss-Seidel iterations.
4. Assignments on numerical solution of Algebraic Equation by Regular-falsi and Newton Raphson methods.
5. Assignments on ordinary differential equation: Euler's and Runge-Kutta methods.
6. Introduction to Software Packages: Matlab / Scilab / Labview / Mathematica.

HU481 Technical Report Writing & Language Lab. Practice 0-0-3-3-2:

Guidelines for Course Execution:

Objectives of this Course: This course has been designed:

1. To inculcate a sense of confidence in the students.
2. To help them become good communicators both socially and professionally.
3. To assist them to enhance their power of Technical Communication.

Detailed Course Outlines:

Technical Report Writing:

1. Report Types (Organizational / Commercial / Business / Project)
2. Report Format & Organization of Writing Materials
3. Report Writing (Practice Sessions & Workshops)

Interview Sessions;

- a) Training students to face Job Interviews confidently and successfully
- b) Arranging Mock Interviews and Practice Sessions for integrating Listening Skill with Speaking Skill in a formal situation for effective communication

4. Presentation:

- a) Teaching Presentation as a skill
- b) Strategies and Standard Practices of Individual /Group Presentation
- c) Media & Means of Presentation: OHP/POWER POINT/ Other Audio-Visual Aids

5. Competitive Examination:

- a) Making the students aware of Provincial /National/International Competitive Examinations
- b) Strategies/Tactics for success in Competitive Examinations
- c) SWOT Analysis and its Application in fixing Target

Books – Recommended:

1. Nira Konar: English Language Laboratory: A Comprehensive Manual PHI Learning, 2011
2. D. Sudharani: Advanced Manual for Communication Laboratories & Technical Report Writing Pearson Education (W.B. edition), 2011

CE491 Fluid Mechanics Lab 0-0-3-3-2

<i>Module</i>	<i>Topic</i>
1	Determination of Orifice co-efficient.
2	Calibration of Orifice meter.
3	Calibration of V- Notch.
4	Measurement of velocity of water in an open channel using a Pitot tube.
5	Measurement of water surface profile for flow over Broad Crested Weir.
6	Preparation of Discharge Rating Curve for a sluice.

7	Measurement of water surface profile for a Hydraulic jump.
8	Determination of efficiency of a Centrifugal pump.
9	Determination of efficiency of a Reciprocating pump.
10	Determination of efficiency of a Pelton wheel Turbine.
11	Determination of efficiency of a Francis Turbine.
12	Measurement of Evaporation loss of water by using ISI Standard Pan.
13	Measurement of Rainfall by using Symon's Raingauge .

Note: Students will have to study the Layout of the experimental units in the laboratory.

References:

<i>Sl No</i>	<i>Title of Book</i>	<i>Author</i>	<i>Publisher</i>
1	Laboratory Instruction Sheets. (The Sheets have been prepared by strictly following the relevant IS Code of Practices)		

CE492 Survey Practice – II 0-0-3-3-2

<i>Sl. No.</i>	<i>Name of the Experiment</i>
1.	Traversing by using Theodolite
2.	Traversing by using Total Station
3.	Use of Total Station for leveling and Contouring
4.	Setting out of Simple Curves

5TH SEMESTER

HU501 PRINCIPLE OF MANAGEMENT 3-0-0-3-3:

Basic concepts of management: Definition – Essence, Functions, Roles, Level.

Functions of Management: Planning – Concept, Nature, Types, Analysis, Management by objectives; Organization Structure – Concept, Structure, Principles, Centralization, Decentralization, Span of Management; Organizational Effectiveness.

Management and Society– Concept, External Environment, CSR, Corporate Governance, Ethical Standards.

People Management– Overview, Job design, Recruitment & Selection, Training & Development, Stress Management. Managerial Competencies– Communication, Motivation, Team Effectiveness, Conflict Management, Creativity, Entrepreneurship

Leadership: Concept, Nature, Styles.

Decision making: Concept, Nature, Process, Tools & techniques.

Economic, Financial & Quantitative Analysis– Production, Markets, National Income, Accounting, Financial Function & Goals, Financial Statement & Ratio Analysis, Quantitative Methods – Statistical Interference, Forecasting, Regression Analysis, Statistical Quality Control.

Customer Management– Market Planning & Research, Marketing Mix, Advertising & Brand Management.

Operations & Technology Management– Production & Operations Management, Logistics & Supply Chain Management, TQM, Kaizen & Six Sigma, MIS.

Text Books:

1. Management: Principles, Processes & Practices – Bhat, A & Kumar, A (OUP).
2. Essentials for Management – Koontz, Revised edition, Tata McGraw Hill (TMH)
3. Management – Stoner, James A. F. (Pearson)

CE501 Concrete Technology 3-0-0-3-3

<i>Sl no.</i>	<i>Course content</i>	<i>Hours</i>
1	Concrete as a Structural Material, Chemical Composition of Cement, Hydration of Cement, Heat of Hydration and Strength, Tests on Cement and Cement Paste – fineness, consistency, setting time, soundness, strength, Quality of Water: Mixing Water, Curing Water, Harmful Contents	6
2	Types of Portland Cement: ordinary, Rapid hardening, low-heat, sulphate resisting, Portland slag, Portland pozzolana, super sulphated cement, white cement	6
3	Aggregates: Classification, Mechanical and Physical Properties, Deleterious Substances, Alkali-Aggregate Reaction, Sieve Analysis, Grading Curves, Fineness modules, Grading Requirements. Testing of Aggregates: Flakiness, Elongation Tests, Aggregate Crushing Value, Ten Percent Fines Value, Impact Value, Abrasion Value	6
4	Properties of Fresh Concrete: Workability, Factors Affecting Workability, Slump Test, Compacting Factor Test, Flow Table Test, Segregation, Bleeding, Setting Time, Mixing and Vibration of Concrete, Mixers and Vibrators, Curing methods, Maturity.	6
5	Strength of Concrete: Water/Cement ratio, Gel/Space ratio, Strength in Tension, Compression, Effect of Age on Strength, Relation between Compressive and Tensile Strength, Fatigue Strength, Stress Strain Relation and Modulus of Elasticity, Poisson's Ratio, Shrinkage and Creep, Compression Test on Cubes, Cylinders, Introduction to Non-Destructive Tests (Rebound hammer & Ultrasonic pulse velocity)	4
6	Admixtures – Different types, effects, uses, Retarders and Super plasticizers. Mix Design by I.S. 20262 (2009). Light-weight, Polymer and Fibre-reinforced concrete	8

References:

<i>Sl No</i>	<i>Title of Book</i>	<i>Author</i>	<i>Publisher</i>
1	Concrete Technology	Neville	Pearson Education
2	Concrete Technology	M.S. Shetty	S.Chand
3	Concrete Technology	A. R. Santakumar	Oxford University Press
4	Concrete Technology	M.L. Gambhir	Tata McGraw Hill

CE502 Design of RCC Structures 3-1-0-4-4

<i>Sl no.</i>	<i>Course content</i>	<i>Hours</i>
1	Introduction: Principles of design of reinforced concrete members - Working stress and Limit State method of design	2
2	Working stress method of design: Basic concepts and IS code provisions (IS: 456 2000) for design against bending moment and shear forces - Balanced, under reinforced and over-reinforced beam/ slab sections; design of singly and doubly reinforced sections.	5
3	Limit state method of design: Basic concepts and IS code provisions (IS: 456 2000) for design against bending moment and shear forces; concepts of bond stress and development length; Use of 'design aids for reinforced concrete' (SP:16).	5
4	Analysis, design and detailing of singly reinforced rectangular, 'T', 'L' and doubly reinforced beam sections by limit state method.	5

5	Design and detailing of one-way and two-way slab panels as per IS code provisions.	6
6	Design and detailing of continuous beams and slabs as per IS code provisions	3
7	Staircases: Types; Design and detailing of reinforced concrete doglegged staircase	3
8	Design and detailing of reinforced concrete short columns of rectangular and circular cross sections under axial load. Design of short columns subjected to axial load with moments (uniaxial and biaxial bending) – using SP 16.	3
9	Shallow foundations: Types; Design and detailing of reinforced concrete isolated square and rectangular footing for columns as per IS code provisions by limit state method.	4

References:

<i>Sl No</i>	<i>Title of Book</i>	<i>Author</i>	<i>Publisher</i>
1	IS: 456- 2000: “Indian Standard for Plain and reinforced concrete – code of practice”	BIS	
2	SP:16 Design Aid to IS 456		
3	Reinforced Concrete Design	Pillai and Menon	TMH
4	Reinforced concrete Limit state design	Ashok K. Jain	
5	Limit State Design of Reinforced Concrete	P. C. Varghese	PHI
6	Reinforced Concrete	S. K. Mallick and A. P. Gupta	Oxford IBH

CE503 Soil Mechanics – I 3-1-0-4-4

<i>Sl. No</i>	<i>Details of Course Content</i>	<i>Hours</i>
1	Introduction: Origin & formation of Soil: Types, Typical Indian Soil, Fundamental of Soil Structure.	2
2	Soil Phase Relationship: Introduction, Block Diagram, Basic definition, Inter relationship of different parameters, Numerical problems.	2
3	Index properties of soil: Introduction, Various Index properties- Moisture Content, Specific Gravity, Particle Size Distribution of soil, Sieving, Sedimentation Analysis, Atterberg’s Limits, Soil Indices, Consistency of soil, Plasticity Chart, Insitu Density-Core cutter method & Sand Replace method, Relative Density or Density Index, Shrinking and Swelling of clay soils-Shrinkage ratio, Volume metric Shrinkage, Degree of Shrinkage, Expansive soils, Sensitivity, Thixotropy, Numerical Problems. Practical importance of Index properties.	6
4	Identification & Classification of soil: Introduction, Practical significance of soil classification, Field identification of soil, Soil Classification- Particle size classification, Textural classification, Highway Research board (HRB) classification, Unified Soil Classification (USC) System, and IS Classification System, Numerical Problems.	4
5	Effective Stress Principles: Introduction, Effective Stress, Neutral Stress, and Effective Stress due to different conditions, Critical hydraulic gradient, Quick Sand condition or Sand boiling, Numerical Problems.	4
6	Permeability: Introduction, Darcy’s Law, Discharge velocity and Seepage velocity, Coefficient of permeability, Determination of Co-efficient of permeability-Laboratory methods, Field methods & Indirect method, Factors effecting co-efficient of permeability, Permeability of Stratified Deposits, Numerical problems.	6

7	Soil Water: Modes of occurrence, Capillary Rise in a glass tube of constant section, Numerical Problems.	2
8	Seepage through Soils: Introduction, Laplace's Equation for two dimensional flow – assumptions, derivation, Velocity potential, Stream function, Cauchy-Riemann's equation, Flow nets- Definition, Properties of flow nets, Graphical method of construction, Confined flow problem, Unconfined flow problem, Determination of phreatic for Earthen Dams, Applications of flow net, Numerical Problems.	8
9	Stress Distribution In Soils: Introductions, Boussinesq's & Westergaard's formulae for point loads, Comparison of Boussinesq's & Westergaard's equations, Isobar, pressure bulb, Stress beneath the corner of a rectangular footing, Stress under uniformly loaded circular footing, Newmark's charts- Use for determination of stress due to arbitrarily loaded areas, 2:1 method, Numerical problems.	8

References:

<i>Sl No</i>	<i>Title of Book</i>	<i>Author</i>	<i>Publisher</i>
1	Principles of Geotechnical Engineering	B. M. Das	Thomson Book Store
2	Text book of Soil Mechanics & Foundation Engineering	V.N.S. Murthy	CBS Publisher's & Distributors
3	Geotechnical Engineering – Principles and Practice	Coduto	Pearson Education
4	Soil Mechanics	Lambe & Whitman.	WIE
5	Basic & Applied Soil Mechanics	Gopal Ranjan & A.S.R.Rao	Willes Eastern Ltd
6	Soil Mechanics and Foundations	Dr. B. C. Punmia	Laxmi publication Pvt. Ltd.
7	SP 36 (Part I)		

CE504 Water Supply Engineering 3-1-0-4-4

<i>Sl. No</i>	<i>Details of Course Content</i>	<i>Hours</i>
1	Water demands: Types of demands for domestic, commercial, industrial, fire, public use and losses, per capita demand, variations in demand, factors affecting demand. Design period. Forecasting population, different methods and their suitability.	4
2	Sources of water: Surface water: Rivers, streams, lakes and impounded reservoirs, determination of quantity of water in the above sources. Underground sources: Springs, wells and infiltration galleries, measurement of yield of open wells, tube wells, artesian wells and infiltration galleries.	6
3	Quality of water: Pollution and contamination of water. Sources, classification and prevention of pollution. Water borne diseases. Impurities in water. Water analysis Physical chemical and biological tests, standards for potable water.	6
4	Collection and conveyance of water: Intakes-river, lake, reservoir and canal. Hydraulic design of pressure pipes. Hydrostatic tests on pipes.	4
5	Treatment of water: Aeration, Plain sedimentation, sedimentation with coagulation-coagulant feeding devices, optimum dosage of coagulant. Filters and their different types, disinfection, water softening. The functional design of treatment unit. Removal of iron, manganese, colour, odour and taste, Fluoridation, desalination.	8

6	Distribution: Systems of distribution, layout of distribution system, Pressure in distribution system, Storage and distribution reservoirs. Capacity of reservoirs. Type of reservoirs. Detection and presentation of leakages.	8
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References:

<i>Sl No</i>	<i>Title of Book</i>	<i>Author</i>	<i>Publisher</i>
1	Envirmental Engineering	S.K. Garg	Khanna Publication
2	Water Supply & Waste Water Disposal	G.M. Fair , J.C. Geyer, D.A.Okun.	Jhon Wiley & Sons .
3	Water Supply Engineering Volume I	Kshirasagar.	
4	Manual of Water Supply & treatment		A Govt. of India Pub.
5	Water Supply and Sanitary Engineering	G.S. Birdi.	
6	Water supply engineering	Babbit& Doland	

CE505 Structural Analysis – II 3-0-0-3-3

<i>Sl. No</i>	<i>Details of Course Content</i>	<i>Hours</i>
1	Energy methods in structural analysis: Basic concepts; Principle of Virtual work; Principle of Virtual Displacements; Principle of Minimum Potential energy; Castigliano's first and second theorems; Betti-Maxwell's Reciprocal theorem.	8
2	Matrix force method: Introduction; General procedure; Analysis of beams, trusses and frames; Three-moment equation; Temperature stress; Lack of fit and settlement of supports.	4
3	Matrix Displacement method: Introduction; General procedure; Analysis of beams, trusses and frames; Slope-deflection equations; Temperature stresses; Lack of fit and settlement of supports.	4
4	Analysis of Portal frames and Box-culverts: Slope deflection method, Method of three moments, castigliano's method.	4
5	Analysis of Arches: Introduction, Types of arches, Analysis of Three hinged arch, Analysis of Two hinged arch, Analysis of Suspended cables, Analysis of rings.	6
6	Column analogy: Method, Application	4
7	Un-symmetrical bending, Kani's method: application to indeterminate beams and frames.	6

References:

<i>Sl No</i>	<i>Title of Book</i>	<i>Author</i>	<i>Publisher</i>
1	Theory of structures	S.P. Timoshenko	MHI
2	Elementary Structural Analysis	Utku, Norris and Wilbur	MHI
3	Theory of structures	S.Ramamurthum	
4	Statically indeterminate structures	C.K.Wang	
5	Structural Analysis Vol.II	S.S. Bhavikatti.	
6	Structural Analysis	Hibbeler	Pearson Education

CE591 Solid Mechanics Lab 0-0-3-3-2

<i>Sl. No.</i>	<i>Name of the Experiment</i>
1.	Tension test on Structural Materials: Mild Steel and Tor steel (HYSD bars)
2.	Compression Test on Structural Materials: Timber, bricks and concrete cubes
3.	Bending Test on Mild Steel
4.	Torsion Test on Mild Steel Circular Bar

5.	Hardness Tests on Ferrous and Non-Ferrous Metals: Brinell and Rockwell Tests
6.	Test on closely coiled helical spring
7.	Impact Test: Izod and Charpy
8.	Demonstration of Fatigue Test

CE592 Soil Mechanics Lab – I 0-0-3-3-2

<i>Sl No.</i>	<i>Topic</i>
1	Field identification of different types of soil as per Indian standards [collection of field samples and identifications without laboratory testing], determination of natural moisture content.
2	Determination of specific gravity of i) Cohesionless ii) Cohesive soil
3	Determination of In-situ density by core cutter method & sand replacement method.
4	Grain size distribution of cohesionless soil by sieving & fine grained soil by hydrometer analysis.
5	Determination of Atterberg's limits (liquid limit, plastic limit & shrinkage limit)
6	Determination of Relative Density of sand.
7	Determination of Differential Free-swell Test.
8	Determination of co-efficient of permeability by constant head permeameter (coarse grained soil) & variable head parameter (fine grained soil).

References:

<i>Sl No</i>	<i>Title of Book</i>	<i>Author</i>	<i>Publisher</i>
1	Soil Testing	T.W. Lamb	John Willey
2	Soil Mechanics Laboratory Manual	B.M. Das	Oxford University Press
3	Measurement of engineering properties of soil	E Saibaba Reddy & K. Rama Sastri	New age International publication
4	Soil Mechanics	Lambe & Whitman.	WIE
5	SP 36 (Part I & Part II)		

CE593 Concrete Lab – I 0-0-3-3-2

<i>Sl No.</i>	<i>Topic</i>
1	Tests on cement – specific gravity, fineness, soundness, normal consistency, setting time, compressive strength of cement mortar cubes
2	Tests on fine aggregate – specific gravity, bulking, sieve analysis, fineness modulus, moisture content, bulk density and deleterious materials.
3	Tests on coarse aggregate - specific gravity, sieve analysis, fineness modulus, bulk density.
4	Tests on bricks and tiles (Roofing and Flooring) - Water absorption, breaking loads.

References:

1. Relevant latest IS codes on Aggregates, Cement & Concrete [269, 383, 2386, 10262(2009), SP23]
2. Laboratory manual of concrete testing by V.V. Sastry and M. L. Gambhir

CE594 Structural Design and Drawing – I 0-0-3-3-2

RCC structures

General considerations: Design principle of R.C.C. sections. Limit state method of design Loads and stresses to be considered in the design as per I.S. code provision.

Design & detailing of a

- Simply supported R.C.C Beam
- Continuous T- Beam.

Design & Detailing of columns, isolated and combined footing

Design & detailing of a

- Simply supported one way slab
- One way Continuous slab.

Design of different units: Slab, beam column, roofing and staircase from floor plan of a multistoried frame building, typical detailing of a two way floor slab.

References:

I.S- 456-2000, SP 34, SP 16, I.S. 875, Standard text books on RCC Design.

6TH SEMESTER:

CE601 Design of Steel Structure 3-1-0-4-4

Module	Topic	Hours
1	Materials and Specification: Rolled steel section, types of structural steel, specifications	2
2	Structure connections: Riveted, welded and bolted including High strength friction grip bolted joints, Types of riveted & bolted joints, assumptions, failure of joints, efficiency of joints, and design of bolted, riveted & welded joints for axial load. Eccentric connection: Riveted & bolted joints subjected to torsion & shear, tension & shear, design of riveted, bolted & welded connection.	8
3	Tension members: Design of tension members, I.S code provisions. Permissible stresses, Design rules, Examples.	3
4	Compression members: Effective lengths about major & minor principal axes, I.S code provisions, Permissible stresses, Design rules, Design of one component, two components and built up compression members under axial load. Examples. Built up columns under eccentric loading: Design of lacing and batten plates, Different types of Column Bases- Slab Base, Gusseted Base, Connection details	8
5	Beams: Permissible stresses in bending, compression and tension. Design of rolled steel sections, plated beams. Simple Beam end connections, beam -Column connections. I.S code provisions.	4
6	Plate girders: Design of webs & flanges, Concepts of curtailment of flanges – Riveted & welded web stiffeners, web flange splices - Riveted, welded & bolted.	6
7	Gantry Girder: Design gantry girder considering lateral buckling – I.S code provisions.	5

Reference:

Sl No	Title of Book	Author	Publisher
1	Design of Steel structures	N. Subramanian	Oxford University Press
2	Design of Steel structures	S.K. Duggal	Tata McGraw Hill, New Delhi
3	Design of Steel structures	A.S.Arya & J.L.Ajmani	Nemchand & Bros.
4	Design of steel structures, Vol. I & II	Ramachandra	
5	Design of steel structures	Pasaladayaratnam	A.H.Wheeler & Co Ltd. 1990
6	Design of steel structures	B.S.Krishnamachar & D.AjithaSinha	TMH publishing Co. Delhi
7	Design of steel structures	Ramamurtham	
8	IS 800 – 2007(Latest Revised code)	Bureau of Indian Standard	
9	S.P.: 6(1) – 1964 Structural Steel Sections	Bureau of Indian Standard	

CE602 Soil Mechanics II 3-1-0-4-4

Compaction of soil: Principle, light and heavy compaction test, field compaction equipments, compaction control, CBR test as per IS code. (5L)

Compressibility and consolidation: Terzaghi's theory of one dimensional consolidation, compression index, coefficient of consolidation & volume change, rate of consolidation, Consolidation test as per IS Code, behavior of normally consolidated and over consolidated soil, over consolidation ratio, secondary consolidation. (8L)

Shear strength of soil: stress, strain and failure of soils, Triaxial apparatus and procedure, different types of test, stress controlled and strain controlled test, drained and undrained condition, direct shear test, Mohr's circle, Mohr-Coulomb failure criteria, strength parameters for sand and clay, unconfined compressive strength, drained and un-drained strength, concept of critical void ratio, dilatancy, liquefaction of saturated loose sand. (8L)

Earth Pressure: states of plastic equilibrium, earth pressure at rest, active earth pressure and passive earth pressure, Rankine's and Coulomb earth pressure theory, earth pressure for cohesive soil and cohesion less soil, effect of wall roughness on earth pressure, Earth pressure by graphical construction. (8L)

Retaining Wall: Different types of wall, forces on retaining wall, proportioning the wall, safety against sliding and overturning, determination of contact pressure, drainage provision for retaining wall, (5L)

Stability of slopes: Finite and infinite slope, slopes on cohesion less soils, general character of slides in homogeneous cohesive soil, purpose of stability computation, different procedure of stability computation, irregular slope. (5L)

Books:

Principles of soil Mech and foundation Engineering by Murthy

Soil Mechanics and foundation by Punmia

Soil Mechanics by Lambe and Whitman

CE603 Transportation Engineering – I 3-1-0-4-4

<i>Module</i>	<i>Topic</i>	<i>Hours</i>
1	Introduction to transportation Systems: Definition and objectives of transportation systems, fields of transportation, role of transportation in society, modes of travel, transportation demand and supply, planning models and mass transit systems, transportation costs.	2
2	Highway Alignment: Requirements: factors controlling alignment; engineering surveys for highway alignment and location.	2
3	Highway Geometric Design: Cross-sectional elements; design speed, passing and non-passing sight distances; PIEV theory, requirements and design principles of horizontal alignment including radius of curvature, super elevation, extra-widening, design of transition curves, curve resistance, set back distance, grade compensation and vertical alignment.	12
4	Pavement design: Evaluation of soil subgrade, sub-base, base and wearing courses; design factors for pavement thickness (including design wheel load and ESWL, strength of pavement materials and plate load tests, and effect of climatic variations) Group Index and CBR, IRC method of flexible pavement design; Westergaards analysis of wheel load stresses in rigid pavements; frictional stresses and warping stresses; IRC recommendations for design of rigid pavements; design of expansion and contraction joints. Benkelmen Beam Test, Failure of flexible and rigid pavements.	8
5	Pavement construction Technique: Types of pavement; construction of earth roads, gravel roads, WBM, bitumen and cement concrete roads; joints in cement concrete pavements.	4
6	Traffic Engineering: Traffic characteristics, theory of traffic flow, intersection design, traffic sign and signal design, highway capacity	8
7	Road Materials and Testing: Soil, Stone Aggregate, Bitumen, Marshal Stability Test	4

References:

<i>Sl no.</i>	<i>Name</i>	<i>Author</i>	<i>Publishers</i>
1	Highway Engineering	Khanna & Justo	
2	Transportation Engineering: an introduction	C.J Khisty & B.K Lall.	PHI
3	Principles of Transportation Engineering	P. Chakraborty & A. Das	
4	I.S Specifications on Concrete Aggregate &	Bureau of Indian Standard	

	Bitumen		
5	Relevant latest IRC Codes (IRC-37 – 2001, IRC 58 – 2002, IRC 73 - 1980, IRC 86 - -1983, IRC 106 – 1990, IRC 64 – 1990, IRC 15- 2002	Indian Roads Congress	

CE604 Waste Water Engineering 3-1-0-4-4

Module	Topic	Hours
1	Sewage and drainage: Definition of some common terms used in sanitary engineering. Systems of sanitation, systems of sewerages. Types of sewage. Sources of sanitary sewage. Estimating the quantity of sanitary sewage and storm sewage.	4
2	Design of sewers. Nomograms, partial flow diagrams. Testing of sewer lines Sewer appurtenances. Pumping of sewage. House drainage.	6
3	Characteristics of sewage: Physical, Chemical and Biological. Test on sewage; Solids, dissolved oxygen, biochemical oxygen demand, stability and relative stability, chlorides, sulphide, nitrogen. pH value, grease, oil and fat. Biological tests, carbon, nitrogen and sulphur cycles.	6
4	Solid waste disposal: Quality and quantity of refuse, Collection and conveyance of solid wastes. Disposal of solid waste by composting, and other methods, Salvaging, grinding and discharging into sewers.	5
5	Disposal by other methods: Oxidation pond, oxidation ditch, aerated lagoon, septic tank, Imhoff tank, Disposal by dilution, irrigation and farming, stream sanitation.	5
6	Treatment of sewage: Primary treatment - screen, grit chamber, detritus tank, skimming tank, plain sedimentation sedimentation with coagulation. Secondary treatment Filtration, normal rate trickling filters, high rate trickling filters activated sludge process, aeration units, types of activated sludge process, sludge digestion. Functional design of primary and secondary treatment units.	10

References:

Sl no.	Name	Author	Publishers
1	Envirmental Engineering	S.K. Garg	Khanna Publications
2	Water Supply , Waste Disposal & Enviornmental Pollution Engineering	A.K. Chatterjee	Khanna Publications
3	Water Supply & Waste Water Disposal	Fair, Geyer & Okun	Jhon Wiley & Sons
4	Sanitary Engineering Volume II	Kshirasagar	
5	Manual of treatment		A Government of India Publication.

CE605 Structural Dynamics & Earthquake Engineering 3-1-0-4-4

Module	Topic	Hours
1	Theory of vibrations: Degrees of freedom, Undamped single degree freedom system, Damped single degree freedom system, Natural frequency, modes of vibration, Introduction to multiple degree freedom system	8
2	Response of single degree freedom system due to harmonic loading: Undamped harmonic excitation, Damped Harmonic excitation, Base excitation.	6
3	Response due to Transient loading: Duhamel's Integral, Response due to constant force, Rectangular load, Introduction to numerical evaluation of Duhamel's integral of undamped system, Fourier series analysis.	10
4	Generalized Coordinates and Rayleigh's Method: Principles of Virtual work, Generalized SDOF system- Rigid body, Distributed elasticity, Rayleigh's method, Improved Rayleigh's method.	6

4	Elements of seismology: Fundamentals: Elastic rebound theory, Plate tectonics, Definitions of magnitude, Intensity, Epicenter etc., Seismographs, Seismic zoning, Response of Simple Structural Systems	4
5	Principles of earthquake resistant design: Terminology, General principles and Design criteria, Methods of Analysis, Equivalent lateral force method of Analysis for multistoried building as per Indian Standard Code of Practice, Modal analysis and Response Spectrum Method, Fundamental concepts of Ductile detailing	14

References:

Sl No	Title of Book	Author	Publisher
1	Structural Dynamics (Theory and Computation)	Mario Paz	CBS publishers
2	Dynamics of Structure (Theory and Application to Earthquake Engineering)	A.K. Chopra	Pearson Education
3	Elements of Earthquake Engineering	Jai Krishna, A. R. Chandrashekar and Brijesh Chandra	South Asian Publishers
4	Earthquake Resistant Design	D. J. Dowrick	J. Willey & Sons
5	IS 1893 (Part 1): 2002, IS 3920, IS 4326		BIS

CE691 Soil Mechanics Lab – II 0-0-3-3-2

Module	Topic
1	Determination of compressibility characteristics of soil by Oedometer test (co-efficient of consolidation & compression Index).
2	Determination of unconfined compressive strength of soil
3	Determination of Shear parameter of soil by Direct shear test
4	Determination of un-drained shear strength of soil by Vane shear test.
5	Determination of shear parameter of soil by Tri-axial test (UU)
6	Proctor test (Standard & Modified).
7	CBR test (Un-soaked & Soaked).
8	Auger boring, Bore-log writing & Standard Penetration Test.

Note: Experiment No. 9 by large groups in the field.

References:

Sl No	Title of Book	Author	Publisher
1	Soil Testing	T.W. Lamb	John Willey
2	Soil Mechanics Laboratory Manual	B.M. Das	Oxford University press
3	Measurement of engineering properties of soil	E Saibaba Reddy & K. Rama Sastri	New age
4	Soil Mechanics	Lambe & Whitman.	WIE
5	SP 36 (Part I & Part II)		

CE692 Concrete Lab – II 0-0-3-3-2

Sl. No	Topic
1.	Tests on Fresh Concrete: Workability : Slump, Vee-Bee, Compaction factor tests
2.	Hardened Concrete: Compressive strength on Cubes, Split tensile strength, Static modulus of elasticity, Flexure tests , Non-destructive testing (Rebound hammer & Ultrasonic pulse velocity)
3.	Mix Design of Concrete.

References:

1. Relevant latest IS codes on Aggregates, Cement & Concrete [269, 383, 2386, 10262(2009), SP23]

CE 693 Environmental Engineering Lab 0-0-3-3-2

<i>Sl No.</i>	<i>Name of the Experiment</i>	<i>Type of Test</i>
1.	Determination of turbidity for a given sample of water	Physical
2.	Determination of color for a given sample of water	
3.	Determination of solids in a given sample of water: Total Solids, Suspended Solids and Dissolved Solids	
4.	Determination of pH for a given sample of water	Chemical
5.	Determination of concentration of Chlorides in a given sample of water	
6.	Determination of carbonate, bi-carbonate and hydroxide alkalinity for a given sample of water	
7.	Determination of hardness for a given sample of water	
8.	Determination of concentration of Fluorides in a given sample of water	
9.	Determination of concentration of Iron in a given sample of water	
10.	Determination of the Optimum Alum Dose for a given sample of water through Jar Test	
11.	Determination of the Residual Chlorine in a given sample of water.	
12.	Determination of the Chlorine Demand for a given sample of water.	
13.	Determination of the Available Chlorine Percentage in a given sample of bleaching powder.	
14.	Determination of amount of Dissolved Oxygen (DO) in a given sample of water.	
15.	Determination of the Biochemical Oxygen Demand (BOD) for a given sample of wastewater.	
16.	Determination of the Chemical Oxygen Demand (COD) for a given sample of wastewater	
17.	Determination of bacteriological quality of water: presumptive test, confirmative test and Determination of MPN	

CE694 Structural Design and Drawing –II 0-0-3-3-2

Steel structures:

Problems on general consideration and basic concepts

Discussion on different loads (i.e. wind load, Dead load, live load and others) as per IS875

Design & drawing of the following components of a roof truss:

1. Members of the roof truss.
2. Joints of the roof truss members
3. Purlins
4. Gable bracings
5. Column with bracings
6. Column base plate
7. Column foundation

References:

I.S. 875, I.S. Code 800 – 2007, Standard text books on Steel Design.

7TH SEMESTER:

HU-701 Financial Management and Accounts 3-0-0-3-3:

Introduction: Financial Management, Financial Planning and Capitalization- definitions, objectives, changing roles and functions, Financial Decision.

Capital Budgeting: Nature of Investment decision, Importance of Capital Budgeting, The Capital. Budgeting Process - Investment Criterion, Pay-back period, Accounting, ROR (Rate of Return) Method, Discounting Cash flow method, Net - present value method, IRR (Internal Rate of Return) method, The benefit-Cost Ratio method.

Management of Working Capital: Various concepts, Elements, Classification, Financing and importance of working capital, Investment analysis, Cash flow determination, cost of capital, capital budgeting methods.

Budgeting Control Technique: Concepts of Budget, budgeting and budgetary control, Objectives, Functions, Uses, Advantages, Limitations; Master Budget and Report.

Cost - Volume - Profit Analysis: Classification of costs, Allocation, apportionment and absorption, Cost centers, different costing systems, Cost analysis for managerial decisions, Meaning of Linear CVP analysis, Objectives, Assumptions, Break- Even analysis, determining the Break-Even point profit, Volume graph profit, Volume ratios margin of Safety.

Introduction to Accounting: Basic accounting concepts, important definitions, uses, limitations, advantages; types of Accounting, Financial statements, introduction to Journal Accounting; different types of Vouchers, double entry bookkeeping, different types of transactions related to Financial Accounting.

Financial Control: Posting of Ledgers and preparation of Trial Balance; preparation of Balance Sheet and Profit and Loss

Accounts; Controlling other departments by Financial Accounting (A practical Approach).

Books:

1. Financial Management and Accounting - P. K. Jain, S. Chand & Co.
2. Management & Accounting: Principles and Practice- R. K. Sharma & Shashi Kumar Gupta, Kalyani Publishers.
3. Advanced Management Accounting - Kaplan & Atkinson, PHI.
4. Fundamentals of Financial Management - Van Home, PE.
5. Financial Mgmt Accounting, Gupta, Pearson
6. Financial Mgmt, I.M. Pandey, Vikas
7. Financial Mgmt., Khan & Jain, TMH
8. Financial Mgmt , Mcmenamin, OUP
9. Financial Mgmt & Policy, Van Horne, PHI
10. Financial Mgmt, Kulkarni & Satyaprasad, Himalaya

CE701 Foundation Engineering

3-1-0-4-4

Sub-soil exploration: Purpose, planning of exploration, different methods, numbers of borings and depth of boring, sampling, use of collected samples, Standard Penetration Test, Static Cone Penetration Test, Dynamic Cone Penetration Test, Vane Shear Test, Plate Load Test, preparation of bore log, introduction on preparation of sub-soil investigation report. **(8L)**

Foundation: Overview of different types of foundation (shallow and deep foundation)

Shallow foundation: different modes of failure of foundation, Bearing Capacity, Terzaghi Bearing Capacity theory, effect of footing shape, depth of embedment, inclination of load, footing subjected to moment, eccentricity of load, idea of effective area. Bearing capacity as per IS 6403. **(8L)**

Settlement: Immediate and consolidation settlement, determination of settlement of footing placed on clay and sand, effect of shape, different corrections, IS 1904 and 8009 Part-1 recommendation. **(4L)**

Allowable bearing capacity: definition, determination of allowable bearing capacity from in-situ test- SPT, SCPT and Plate load test. **(2L)**

Deep Foundation: different types of deep foundations, classification based on material, installation techniques, determination of load carrying capacity of pile by static and dynamic formulae, pile group, efficiency of pile group, negative skin friction, pile load test. **(8L)**

Well foundation: different types, well sinking, problem, remedies, load carrying capacity. **(4L)**

Introduction to Ground Improvement Technique: Compaction, vibrofloatation, grouting, sand drains, geotextiles, chemical stabilisation. **(4L)**

References:

<i>Sl</i>	<i>Title of Book</i>	<i>Author</i>	<i>Publisher</i>
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No			
1	Principles of Geotechnical Engineering	B.M. Das	Thomson
2	Principles of soil Mechanics & Foundation Engineering	VNS Moorthy	UBS Publication
3	Principles of Foundation Engineering	B.M. Das	Thomson
4	Foundation Analysis & Design	J.E. Bowels	Mc Graw Hill
5	SP-36 (Part-I & II), Relevant latest IS Codes (IS 6403, IS 1904, IS 8009, IS 2911)	BIS	

CE702 Advanced Design of RCC structures 3-1-0-4-4

Sl No.	Topic	Hours
1	Single span RCC bridge: Different types, IRC loading, General consideration IRC specifications, Simple design of a solid slab bridge.	4
2	Design of water tank resting on ground: Circular and rectangular tank, permissible stresses, design example. Elevated Water Tank: Type, Intze type water tank, Design example, Conical or funnel type tank, Design example of conical tank	8
3	Bunker and Silos: Difference between bunker and silo, Design of square / rectangular type bunkers, design of circular bunkers, Design of Silos, Silos for storage of cement, Design example	6
4	Chimneys: Parts of Chimneys, Design Factors, stresses in different parts due to Wind load and temperature stresses, Foundation for chimneys, Design example.	4
5	Flat Slabs: Advantages and disadvantages, preliminary design of flat slabs, determination of minimum thickness.	4
7	Pre-stressed Concrete: Basic principle of prestressed concrete, High strength concrete and high strength steel used in pre-stressing- properties and characteristics, Stress-strain and load balancing concept, tensioning methods and end anchorages, losses of pre-stress, stresses in concrete due to pre-stress and load analysis in flexure.	6
8	Composite construction of pre-stressed and in-situ concrete, Types of construction-analysis of stresses, Deflection of composite members, Flexural and shear strength of composite members, design of continuous beams-linear transformation and concordant cable profile Or RC shell roofs: Types of shells, classification of shell selection, dimension of shells, IS code recommendation, membrane theory, Lundgren's beam method of analysis.	4

References:

Sl No	Title of Book	Author	Publisher
1	Advanced Reinforced Concrete design	N. Krishna Raju	CBS publishers
2	Advanced Reinforced Concrete design	P.C. Varghese	PHI
3	Advance RCC design (RCC vol-2)	S.S. Bhavikatti	New Age International
4	Design of Bridge Structures	Jagadish and Jayaram	PHI
5	Principles and Practice of Bridge Engg.	S.P. Brinda	Dhanpat Rai

CE703 Water Resources Engineering 3-1-0-4-4

Module	Details of Course Content	Hours
1.	Catchment area and Hydrologic cycle, Measurement of rainfall – Raingauges, Estimation of missing rainfall data, checking of consistency, Raingauge Network, Optimum number of Rain gauges. Calculation of average rainfall over area – different methods, Frequency analysis of rainfall, Intensity duration curve. Rainfall mass curve, hyetograph, Examples	4
2.	Evaporation, Evapo-transpiration and infiltration: Processes, Factors affecting, Measurement, w-index, ϕ -index, I.C Curve, Horton's Equation, Examples.	3
3.	Stream flow measurement: Direct and indirect methods, Stage-discharge relationship, Permanent Control, Shifting Control, Loop Rating Curve, Examples.	4

4.	Runoff- Direct Runoff, Base Flow. Water Year, Runoff characteristics of streams, Rainfall-Runoff Correlation, Empirical equations, Flow Mass Curve, Calculation of reservoir storage volume from Flow Mass Curve, Examples	4
5.	Hydrographs: characteristics: Base flow separation. Unit Hydrographs- Definition, Assumptions, Derivation, Uses & Limitation, Synthetic unit hydrograph, Examples.	4
6.	Floods-Definition, Estimation of magnitude of Peak Flood- Rational method, Empirical method, Unit-hydrograph technique, Flood-Frequency Studies, Flood routing- Examples	4
7.	Introduction: Definition, Necessity, Advantages, Disadvantages of Irrigation, Benefits and Ill-effects of Irrigation, Types of Irrigation Systems, Methods of Irrigation.	4
8.	Water Requirements of Crops: Base Period, Crop period, Duty, Delta, Kor-watering, Optimum Utilization of Irrigation Water, Irrigation Efficiencies, Estimation of PET, Soil-Moisture Irrigation Relationship- F.C, W.C, A.M, RAM, Soil Erosion and Conservation measures, Examples.	5
9.	Canal Irrigation: Classification of Irrigation Canals, G.C.A, C.C.A, I.I, Time factor, Capacity factor, Nominal duty, Channel Losses, Examples.	3
10.	Cross Section of Irrigation Canal: Important Terms, Balancing Depth, Examples.	3
11.	Design of unlined alluvial channels by silt theories: Kennedy's Theory, Garret's Diagram, Lacey's Theory, Methods of Prevention of Silt Deposition in Canals, Examples.	3
12.	Lining of Irrigation Canals: Objectives, Advantages and Disadvantages of Canal lining, Economics of Canal lining, Types of lining, Design of lined Canals, Examples.	3
13.	Water logging of Agricultural Lands and Land Drainage: Definition, Causes, Effects, measures for prevention of water logging, Reclamation of saline and alkaline lands, Open drains, Tile drains, Discharge and spacing of closed drains, Drainage co-efficient (D.C), Examples.	4

References:

Sl. No	Name	Author	Publishers
1.	Engineering Hydrology	K. Subramanya	Tata McGraw-Hill
2.	A Text Book of Hydrology	P. Jaya Ram Reddy	Laxmi Publications-N.Delhi
3.	Hydrology & Water Resource Engineering-	S.K Garg	Khanna Publishers
4.	Hydrology Principles, Analysis and Design	H. M. Raghunath.	New Age Int. Publishers
5.	Irrigation, Water Resource & Water Power Engineering.	Dr. P.N Modi	Standard Book House-New Delhi
6.	Irrigation Engineering & Hydraulic Structures	S.K Garg	Khanna Publishers
7.	Irrigation Engineering	G.L Aswa	Wiley Eastern-New Delhi
8.	Irrigation & Water Power Engineering- -	B.C Purnia, S Pande	Standard Publication-ND
9.	Water Resources Engineering Through Objective Questions	K. Subramanya	Tata McGraw-Hill

CE704 Transportation Engineering –II 3-1-0-4-4

Sl No.	Course content	Hours
1	<p>Railway Engineering: Introduction to Railway Engineering, Railway terminologies, survey for track alignment, railway track component parts, gauges, wheel and axle arrangements. Tractive Resistance: Resistance to traction, various resistances and their evaluation, hauling capacity and tractive effort.</p> <p>Permanent way: Permanent way component parts, rails, railway sleepers, types, railway creep, anti creep devices, check and guard rails, ballast requirements, types, specifications, formation, cross section and drainage. Geometric Design: Alignment, horizontal curves, super elevation, equilibrium cant and cant deficiency, Gradients and grade compensation</p>	12

2	Docks & Harbours : i) Harbours: Types, accessibility and size ii) Tides, wind and waves: Definitions, spring and neap tides, wave movement, littoral drift, deflection of waves, length of waves and wave action on marine structures. iii) Breakwaters : Classifications, materials used, methods of construction and protection iv) Docks: Shapes of docks and basin, location, arrangement of berth, dockwalls, dock entrances, repair dock types. v) Quays: Forces, types and design consideration. vi) Miscellaneous topics on docks and harbours, Transit sheds, warehouses, navigational aids.	8
3	Airports: Introduction to airport planning and development: General philosophy of airport planning and development, ICAO classification of airports, site selection factors, characteristics of jet aircraft. Airport design standards ; Orientation of runways, length of runways and corrections, width of runways, sight distances, gradients and clearances, taxiways and Aprons. Airport planning : Centralized and decentralized planning concepts, terminal requirements, terminal facilities and Typical layout of airports.	8
4	Traffic Engineering: Road user and vehicle characteristics; Traffic flow characteristics – Traffic Volume, Speed, Headway, Concentration and Delay; Traffic surveys & studies; Traffic estimation; Statistical applications in traffic engineering analysis; Parking; Road intersections – Basic traffic conflicts, classification of at-grade intersections, channelization, rotaries, traffic signals, signs and marking; Road Safety; Traffic System Management.	12

References:

<i>Sl no.</i>	<i>Name</i>	<i>Author</i>	<i>Publishers</i>
1	A Text Book of Railway Engineering	S.P. Arora & S.C. Saxena	
2	Docks, Harbours and Tunnels	Srinivasan	
3	Transportation Engineering	Vazirani & Chandola	
4	Airport planning and Design	S.K.Khanna & M.G.Aro	
5	Airport Transportation Planning & Design-	Virendra Kumar & Satish Chandra	Galgotia Publication Pvt. Ltd. New Delhi

CE791 Highway & Transportation Engg. Lab 0-0-3-3-2

<i>Sl No.</i>	<i>List of Experiments</i>
1	Tests on highway materials – Aggregates- Impact value, Los-Angeles Abrasion value water absorption, Elongation & Flakiness Index.
2	Bitumen & bituminous materials: Specific gravity, penetration value, ductility, softening point, loss on heating, Flash & Fire point, stripping value test.
3	CBR Test
4	Design of B.C. & S.D.B.C. Mix by Marshal method of mix design
5	Benkelman beam Test.

References:

BIS codes on Aggregates & Bituminous materials
Relevant IS & I.R.C. codes.

CE792 Computer Programming in Civil Engineering 0-0-3-3-2

Introduction and important features of a software dealing with analysis and design of structures. Analysis and design of a multistoried building using software.

Preparation of detailed drawings of different structural elements including ductility detailing.

RCC Slab, beam, column and footing design.

CE793 Estimation, Spec. & Departmental Procedure 0-0-3-3-2

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Quantity Surveying: Types of estimates, approximate estimates, items of work, unit of measurement, unit rate of payment.

Quantity estimate of a single storied building Bar bending schedule.

Details of measurement and calculation of quantities with cost, bill of quantities, abstract of quantities.

Estimate of quantities of road, Underground reservoir, Surface drain, Septic tank.

Analysis and schedule of rates: Earthwork, brick flat soling, DPC, PCC and RCC, brick work, plastering, flooring and finishing,

Specification of materials: Brick, cement, fine and coarse aggregates

Specification of works: Plain cement concrete, reinforced cement concrete, first class brickwork, cement plastering, pointing, white washing, colour washing, distempering, lime punning, painting and varnishing.

Valuation: Values and cost, gross income, outgoing, net income, scrap value, salvage value, market value, Book Value, sinking fund, capitalised value, Y. P., depreciation, obsolescence, deferred income, freehold and leasehold property, mortgage, rent fixation, valuation table .

Departmental Procedures: Administration, Technical and financial sanction, operation of PWD, Tenders and its notification, EMD and SD, Acceptance of tenders, Arbitration.

CE-781 Industrial Training Evaluation 0-0-3-3-2:

Student has to deliver a seminar on Industrial Training conducted after 6th semester

CE-794 Project-I 0-0-3-3-2:

A preliminary / short project to be carried out after discussions with project supervisor.

8TH SEMESTER:

CE801 Construction Management 3-1-0-4-4

<i>Module</i>	<i>Course content</i>	<i>Hours</i>
1	Planning: General consideration, Definition of aspect, prospect, roominess, grouping, circulation privacy, occlusion	2
2	Regulation and Bye laws : Bye Laws in respect of side space, Back and front space, Covered areas, height of building etc., Lavatory blocks , ventilation, Requirements for stairs, lifts in public assembly building, offices	4
3	Fire Protection: Fire fighting arrangements in public assembly buildings, planning , offices, auditorium	2
4	Construction plants & Equipment: Plants & equipment for earth moving, road constructions, excavators, dozers, scrapers, spreaders, rollers, their uses. Plants & Equipment for concrete construction: Batching plants, Ready Mix Concrete, concrete mixers, Vibrators etc., quality control	8
5	Planning & Scheduling of constructions Projects: Planning by CPM & PERT, Preparation of network, Determination of slacks or floats. Critical activities. Critical path, project duration .expected mean time , probability of completion of project, Estimation of critical path, problems.	8
6	Management: Professional practice, Definition, Rights and responsibilities of owner, engineer, Contractors, types of contract	4
7	Departmental Procedures: Administration, Technical and financial sanction, operation of PWD, Tenders and its notification, EMD and SD, Acceptance of tenders, Arbitration	8

* Serial 1, 2, 3 are as per National Building Code

References:

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<i>Sl no.</i>	<i>Name</i>	<i>Author</i>	<i>Publishers</i>
1	Construction Planning, Equipments and methods	R.L. Puerifoy	McGraw Hill.
2	Management in construction industry	P.P. Dharwadkar	Oxford and IBH Publishing company New Delhi
3	Construction Management, Critical path Methods in Construction	J.O. Brien	Wiley Interscience
4	PERT and CPM	L.S. Srinath	
5	Project planning and control with PERT and CPM'; Construction equipments and its management	B.C. Punmia and K.K. Kandelwal S.C. Sharma	
6	National Building code	BIS	

CE 802A Finite Element Method in Engg. 3-1-0-4-4

<i>Module</i>	<i>Topic</i>	<i>Hours</i>
1	Introduction to Finite Element Analysis: Introduction, Basic Concepts of Finite Element Analysis, Steps in Finite Element Analysis, Fundamental concepts of Elasticity.	4
2	Matrix Displacement Formulation: Concepts of Force Method, displacement method, Matrix displacement equations, solutions of matrix displacement equations	2
3	Element properties: Concepts of shape functions: Natural Coordinates, one dimensional, Triangular, Rectangular Elements, Lagrange and Serendipity Elements Isoparametric Formulation: Isoparametric Elements, Stiffness Matrix of Isoparametric Elements. Numerical Integration: One Dimensional, Two Dimensional	8
4	Formation of stiffness matrices and analysis of Truss, Continuous Beam and Simple Plane Frame	4
5	FEM for two dimensional analysis: Constant Strain Triangle, Linear Strain Triangle, Rectangular Elements, Numerical Evaluation of Element Stiffness, Computation of Stresses, solids of revolution.	4
6	FEM for Plates: Introduction to Plate Bending Problems, Finite Element Analysis of Thin Plate	4
7	FEM by Weighted Residual approach: Virtual Work and Variational Principle and formulation, Rayleigh—Ritz Method, Principles of Minimum Potential Energy, Galerkin Approach, collocation approach, Least square approach	4
8	Structural Dynamics: Dynamic Equations of Motion, Consistent and Lumped Mass Matrices, Free Vibration Analysis and Dynamic Response Using Finite Element Method	4
9	Introduction to application of standard FEM software in civil Engineering and programming in MATLAB	2

Reference:

<i>Sl No</i>	<i>Title of Book</i>	<i>Author</i>	<i>Publisher</i>
1	Fundamentals of Finite Element Analysis	David. V. Hutton	McGraw Hill
2	Concepts and Applications of Finite Element Analysis	R.D. Cook	Wiley India
3	Introduction to Finite Element in Engg	Chandrapatla&Belegundu	Pearson Education
4	The Finite Element method in Engineering	Singiresu. S. Rao	Elsevier Butterworth–Heinemann
5	An Introduction to Finite Element Method	J.N. Reddy	McGraw Hill
6	Matrix, Finite Element, Computer and Structural Analysis	M. Mukhopadhyay	Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, India
7	Finite Element Procedures	K. J. Bathe	PHI, New Delhi, India
8	Finite Element Analysis – Theory and	C. S. Krishnamoorthy	Tata Mcgraw Hill

	Programming		
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CE 802B Design of Tall Building 3-1-0-4-4

Module	Topic	Hours
1	Introduction: Necessity of Tall Buildings, Design Philosophy, Strength and Stability, Creep, Shrinkage and Temperature Effects, Fire, Foundation Settlement and Soil-Structure Interaction	6
2	Loadings: Gravity loading, Wind loading, Earthquake Loading, Combination of Loadings.	6
3	Structural Forms : Braced-Frame Structures, Rigid Frame Structures, Infilled-Frame Structures, Shear Wall Structures, Wall Frame Structures, Tubular Structures, Core Structures, Floor Systems Reinforced Concrete : One-Way slab, Two-way slab. Floor Systems Steel Framing: One-way Beam System, Two-Way Beam System, Three-Way Beam System, Composite Steel-Concrete Floor Systems	12
4	Modelling for Analysis: Approaches to analysis, Highrise behaviour, Modeling for approximate analysis, Modelling for Accurate Analysis.	4
5	Stability of High-rise buildings, Buckling analysis of Frames	4
6	Dynamic Analysis: Dynamic Response to Wind Loading, Dynamic Response to Earthquake Loading.	4

- ♣ The objective of this course is to introduce basic principles and design philosophy of tall buildings. Detail analytical treatment is not required.

Reference:

Sl No	Title of Book	Author	Publisher
1	Tall Building Structures: Analysis and Design	Bryan S. Smith and Alex Coull	John Wiley & Sons, Inc, New York, 1991
2	Designing Tall Buildings	Mark Sarkisian	Routledge, New York, 2012
3	Structural Frameworks	Clyde T. Morris and Samuel T. Carpenter	John Wiley
4	Reinforced Concrete design of tall buildings	Bungale. S. Taranath	CRC press Taylor & Francis
5	Structural analysis and design of tall buildings	Bungale. S. Taranath	Mcgraw Hill
6	Structural analysis and design of tall buildings: Steel & Composite Construction	Bungale. S. Taranath	CRC press Taylor & Francis

CE802C Prestressed Concrete 3-1-0-4-4

Module	Topic	Hours
1	Introduction of Prestressed concrete: Materials, prestressing system, analysis of prestress and bending stress, losses. Shear and torsional resistance: design of shear reinforcement, design of reinforcement for torsion shear and bending. Deflections of prestressed concrete members: Importance, factors, short term and long term deflection	7
2	Limit state design criteria: Inadequacy of elastic and ultimate load method, criteria for limit states, strength and serviceability. Design of sections for flexure: methods by Lin and Magnel	6
3	Anchorage Zone stresses in post tensioned members: Stress distribution in end block, anchorage zone reinforcement	5
4	Composite construction of prestressed and in-situ concrete: Types, analysis of stresses. Statically Indeterminate structures: advantages of continuous member, effect of prestressing, methods of achieving continuity and method of analysis of secondary moments	8
5	Prestressed concrete poles and sleepers: Design of sections for compression and bending	5
6	Partial prestressing and non prestressed reinforcement	5

Reference:

Sl No	Title of Book	Author	Publisher
1	Prestressed Concrete, Fourth Edition	N. Krishna Raju	McGraw Hill

2	Design of Prestressed Structures	T.Y.Lin and N.H.Burns,	Wiley Eastern Ltd
3	Fundamentals of Prestressed Concrete	N.C.Sinha and S.K.Roy	
4	Prestressed Concrete	S.Ramamurthan	

CE802D Hydraulic Structure 3-1-0-4-4

<i>Module no.</i>	<i>Course content</i>	<i>Hours</i>
1	Diversion Head works: Necessity, Difference between weir and Barrage, Type of Weirs, Selection of site, layout and description of each part, Effects of construction of a weir on the river regime, causes of failure of weirs on permeable foundation and their remedies	4
2	Theories of seepage and Design of weirs and Barrages: Failure of Hydraulic Structures Founded on Pervious foundations: i) By piping ii) By Direct uplift, Bligh's creep theory of seepage flow, Khosla's theory & concept of flownets, concept of exit gradient and critical exit gradient, Khosla's method of independent variable for determination of pressures and exit gradient for seepage below a weir or a barrage, necessary corrections, examples.	6
3	Hydraulic structures for canals: Canal falls – necessity, locations, types and description of Ogee fall, Trapezoidal-notch fall, Syphon well drop. Examples.	4
4	Cross-Drainage Works: Necessity, types, selection of a suitable type (Introduction only)	4
5	Dam (General): Definition, classification of Dams, factors governing selection of type of dam, selection of suitable site for a dam.	2
6	Earthen Dams: Introduction, Types of Earthen Dams, Methods of Construction, Causes of failure, Design Criteria, Determination of line of seepage or phreatic line in Earthen Dam, seepage control in Earthen Dam, Examples.	6
7	Gravity Dam: Definition, Typical cross- section, Forces acting on Gravity Dam, Combination of forces for design, Mode of failure and criteria for structural stability of Gravity Dams, Principal and shear stresses. Elementary profile of a Gravity Dam, Concept of High and low Gravity Dam, Examples	6
8	Spillways: Types, Location, Essential requirements, spillway capacity. Components of spillway, Energy Dissipators, Stilling basins (Indian standard).	4

References:

<i>Sl no.</i>	<i>Name</i>	<i>Author</i>	<i>Publishers</i>
1	Irrigation Engineering and hydraulic structures.	Santosh Kumar Garg	Khanna Publishers.
2	Irrigation, water Resources and Water Power Engg.	Dr.P.N. Modi	Standard Book House, Delhi-6
3	Water Resources Engineering Principle and practice	SatyaNarayana Murthy Challa.	New Age Internation (P) Ltd. Publishers. ND
4	Design of Small Dams	US Department of the Interior Bureau of Reclamation.	McGraw Hill
5	Concrete Dams	R.S. Varsney	Oxford & I & H Publishing Co. N.Delhi

CE802E Bridge Engineering 3-1-0-4-4

<i>Module</i>	<i>Course content</i>	<i>Hours</i>
1	Introduction: Definition and Basic Forms, Component of bridge, classification of bridge, short history of bridge development. I.R.C Loads. Analysis of IRC Loads, Impact factors, Other loads to be considered, Importance of Hydraulic factors in Bridge Design.	4

2	Reinforced concrete solid slab bridge: Introduction, General design features, Effective width method. Simply supported and cantilever Slab Bridge, analysis and design	8
3	Box Culvert: Introduction, Design method and Design example	2
4	Beam and Slab Bridges: Introduction, Design of interior panel of slab. Pigeauds method, Design of longitudinal girder, Calculation of longitudinal moment, design example.	6
5	Balanced Cantilever Bridges: General Features, Arrangement of supports, design features, Articulation, Design example.	5
6	Steel Bridges: General features, types of stress, Design example.	3
7	Plate Girder Bridge: Elements, design, lateral bracing, Box- girder Bridges.	3
8	Composite Bridges: General aspects, method of construction, analysis of composite section, shear connectors, design of composite beam.	3
9	Cable Stayed Bridge: General features, Philosophy of design.	2

References:

<i>Sl no.</i>	<i>Name</i>	<i>Author</i>	<i>Publishers</i>
1	Principle & Practice of Bridge Engineering	S.P. Bindra	Dhanpat Rai Pub
2	Essentials of bridge engineering	D.J. Victor	
3	Design of Bridge Structures	T.R. Jagadesh, M.A. Jayaram	
4	Bridge engineering	Krishnaraju	
5	Design of concrete bridges	Aswani, Vizirani , Ratwani	
6	Design of steel structures	Arya&Ajmani	
7	Structures design and drawing	Krishnamurthy	
8	Relevant IS & IRC codes		

CE802F Space Structures 3-1-0-4-4

<i>Module no.</i>	<i>Course content</i>	<i>Hours</i>
1	Introduction to Space Structures: Structural components, materials, Loads on different space structures; V-n diagram. □	4
2	Basic elasticity: Static equilibrium, Planar and space trusses, Concept of stress and strain.	4
3	Slender structures: Stress resultants for slender members, Bending of symmetrical sections, Bending of unsymmetrical sections, Sectional properties. □	6
4	Bending of slender structures: Deflection analysis, Temperature effects. □	4
5	Shear of beams: Shear of open sections, Shear center, Shear of closed section beams.	4
6	Torsion of thin walled structures: Torsion of solid and hollow circular sections, Concept of shear flow, Torsion of open sections, Concept of warping. Torsion of single-celled and multi-celled closed sections.	6
7	Stress state in slender members: Combined state of stress, Idealized sections, Analysis of idealized sections, Deflection analysis, Tapered sections.	4
8	Work and energy principles: Principle of virtual work, Strain energy and complementary energy, Extremum principles, Applications for analysis of indeterminate structures.	4

References:

<i>Sl no.</i>	<i>Name</i>	<i>Author</i>	<i>Publishers</i>
1	Aircraft Structures for Engg. Students	THG Megson □	Elsevier (BH).
2	Theory and Analysis of Flight Structures	RM Rivello	
3	Analysis of Aircraft Structures: An Introduction	B. Donaldson	Cambridge Univ. Press
4	Energy and Finite element methods in structural mechanics	IH Shames	New Age International Publishers Ltd.

CE803A Advanced Foundation Engineering 3-1-0—4

<i>Module</i>	<i>Course content</i>	<i>Hours</i>
1	Soil Exploration and Site Investigation: Planning of soil exploration programme, Field testing, Preparation of bore-log and soil investigation report. Geo-physical exploration: Seismic refraction survey electrical resistivity method	4
2	Shallow Foundations: Bearing Capacity from SPT and SCPT and Plate load Test data, Proportioning of footing based on settlement criteria. Beams on elastic foundation: Infinite beam, Finite beam, Modulus of sub-grade reaction and effecting parameters. Raft Foundation: Settlement and Bearing Capacity analysis, Analysis of flexible and rigid raft as per IS 2950.	10
3	Deep Foundations: Pile: Tension piles, Laterally loaded piles: Elastic continuum approach, Ultimate load Analysis, Deflection and maximum moment as per IS 2911, Pile load test Drilled Shaft: Construction procedures, Design Considerations, Load Carrying Capacity and settlement analysis Caissons: Types, Sinking and control.	8
4	Retaining walls and sheet pile structures: Gravity, cantilever and counter fort retaining walls: Stability checks and design Sheet Pile Structures: Cantilever sheet piling, Anchored sheet piling: Free and fixed earth support methods of Analysis, Braced Excavation	8
5	Design of foundation for vibration control: Elements of vibration theory, Soil- springs and damping constants, dynamic soil parameters, Types of Machine foundations, General consideration in designing dynamic bases.	4
6	Foundations on expansive soils: Problems and Remedies	2

Reference:

<i>Sl no.</i>	<i>Name</i>	<i>Author</i>	<i>Publishers</i>
1	Foundation Analysis & Design	J.E. Bowels	McGraw Hill
2	Principles of Foundation Engineering	B.M. Das	Thomson Book
3	Foundation Design Manual	N. V. Nayak	Dhanpat Rai Publication Pvt. Ltd
4	Foundations for Machines: Analysis and design	ShamsherPrakash, Vijay K Puri	Wiley Series in Geotechnical Engineering
5	Advance Foundation Engineering	N. Som & S. C. Das	
6	Hand Book of Machine Foundation	P. Sirinivashalu & C.V. Vaiddyanathan	Tata McGraw Hill
7	IS –1904, 6403, 8009, 2950, 2911 etc		Bureau of Indian Standard

CE803B Dynamics of Soil & Foundation 3-1-0-4-4

<i>Module no.</i>	<i>Course content</i>	<i>Hours</i>
1	Introduction: Types of Machine Foundations, General requirement of Machine foundations, Dimensional criteria, Design data, Permissible amplitude, Permissible Bearing pressure	2
2	Fundamental of vibrations: Degrees of freedom, Natural frequency, Undamped single degree freedom system, Damped single degree freedom system, Transmissibility, Response to ground motion, Introduction to multiple degree freedom system	8
3	Dynamic properties of Soil, Laboratory and field evaluation of soil properties as per IS codes;	8
4	Analysis and design of Block type Machine Foundation: Modes of Vibrations, Methods of Dynamic Analysis, Design considerations for dynamically loaded foundations and constructional features; Design procedures for foundations for hammers, reciprocating engines, Vibration Isolation and damping	10
5	Liquefaction of soils: Definition, Causes and effects of Liquefaction, Evaluation of Liquefaction potential, Mitigation of Liquefaction Hazards	6

6	Propagation of elastic waves in soils: Mechanism of wave propagation, Body waves, Surface waves, Rayleigh waves	2
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Reference:

<i>Sl no.</i>	<i>Name</i>	<i>Author</i>	<i>Publishers</i>
1	Hand Book of Machine Foundation	Srinivasalu & Vaidyanathan	TMH
2	Dynamics of Bases and Foundations	D. D. Barkan	Mc-Graw Hill
3	Geotechnical Earthquake Engineering	S. L. Kramer	Printice Hall
4	Earthquake Resistant Design	D. J. Dorwick	Wiley
5	Fundamentals of Soil Dynamics & Earthquake Engineering	B. B. Prasad	PHI

CE803C Air Pollution & Control Engg. 3-1-0-4-4

<i>Module no.</i>	<i>Course content</i>	<i>Hours</i>
1	Introduction: Environment. Pollution, Pollution control	2
2	Air Pollution: Air Pollutants: Types, Sources, Effects; Air Pollution Meteorology: Lapse Rate, Inversion, Plume Pattern; Air Pollution Dispersion Model: Point Source Gaussian Plume Model, Stability Classes, Stability Charts, Design of Stack Height.	8
3	Air pollution Control: Self cleansing properties of the environment; Dilution method; Engineered Control of Air Pollutants: Control of the particulates, Control of Gaseous Pollutants, Control of Air pollution from Automobiles.	8
4	Noise Pollution: Definition; Sound Pressure, Power and Intensity; Noise Measurement: Relationships among Pressure, Power and Intensity, Levels, Frequency Band, Decibel Addition, Measures of community Noise i.e. LN, Leq, Ldn., LNP; Sources, ; Effects; Control.	4
5	Water pollution: Pollution Characteristics of Typical Industries, Suggested Treatments.	4
6	Global Environmental Issues: Ozone Depletion, Acid Rain, Global Warming-Green House Effects	4
7	Administrative Control on Environment: Functions of Central and State Pollution Control Boards; Environmental Clearance Process for Industries and Infrastructural Projects	4
8	Environmental Laws: Water Act, Air Act, Motor Vehicle Act	2

References:

<i>Sl no.</i>	<i>Name</i>	<i>Author</i>	<i>Publishers</i>
1	Introduction to Environmental Engineering and Science	G. Masters, W. Ela	PHI
2	Environmental Engineering: A Design Approach	A. Sincero, G. Sincero	PHI
3	Environmental Engineering	P. V. Rowe	TMH
4	Environmental Engineering	S.K . Garg	Khanna Publishers
5	Air Pollution	Rao and Rao	TMH
6	Water Supply, Waste Disposal and Environmental Pollution Engineering	A.K.Chatterjee	Khanna Publishers.
7	Environmental Engineering, Vol.II	P. N. Modi	
8	Environmental Modelling	Rajagopalan	Oxford University Press.

CE803D Pavement Design 3-1-0-4-4

<i>Module no.</i>	<i>Course content</i>	<i>Hours</i>
1	Principles of Pavement Design: Types of Pavements, Concept of pavement performance, Structural and functional failure of pavement, Different types of pavement performance, Different pavement design approaches.	6

2	Traffic Consideration in Pavement Design: Vehicle types, Axle configurations, Contact shapes and contact stress distribution, Concept of standard axle load, Vehicle damage factor, Axle load surveys, Estimation of design traffic	6
3	Pavement Material Characterization: Identification of different type of materials Field and laboratory methods for characterization of pavement materials	8
4	Analysis and Design of Flexible Pavements : Selection of appropriate theoretical model for flexible pavements, Analysis of different layers of flexible pavements based on linear elastic theory, Different methods of design of flexible pavements, IRC guidelines(IRC-37)	6
5	Analysis and Design of Rigid Pavements : Selection of appropriate theoretical models for rigid pavements, Analysis of wheel load stresses, curling, temperature differential, Critical stress combinations, Different methods of design of rigid pavements, IRC guidelines (IRC-58)	6
6	Pavement Overlay Designs : Overlay design as per Indian Roads Congress guidelines (IRC-81), Overlay design as per AASHTO-1993 guidelines	4

References:

<i>Sl no.</i>	<i>Name</i>	<i>Author</i>	<i>Publishers</i>
1	Principles of Pavement Design	E.J.Yoder and M.W.Witczak	Wiley
2	Pavement Analysis and Design	Y. H. Huang	PHI
3	Highway Engineering	Khanna and Justo	Nem Chand
4	IRC-37, IRC-58, IRC-73, IRC-81, IRC-106 and other relevant IRC codes		Indian Roads Congress

CE803E Water Resources System, Planning and Management 3-1-0-4-4

<i>Module no.</i>	<i>Course content</i>	<i>Hours</i>
1	Planning and analysis of Water Resource Systems: Introduction, System Analysis, Engineers and Policymakers	3
2	Methods of Analysis: Introduction, Evaluation of Time streams of Benefits and Costs. Plan formulation, Planning models and solution procedures, Lagranges Multipliers, Dynamic Programming, Recursive equations, Bellmans' principle of optimality. Curse of dimensionality of discrete dynamic programming. Examples	8
3	Reservoir Operation: Sequential process, single Reservoir problem - with release as decision variable, with storage as decision variable (deterministic approach). Examples, Related Computer Programming. Multi-reservoir problems (Deterministic approach)	6
4	Water Resources Planning under Uncertainty: Introduction, probability concepts and Methods –Random variable and Distributions, Univariate probability Distributions ,properties of Random variable – Moment and Expectation (Univariate Distributions) , Moment Generating Functions, Measures of Central tendency, Measures of Dispersion, Measures of symmetry (Skewness), measures of peaked ness (kurtosis), examples	10
5	Stochastic River Basin Planning Model: Introduction, Reservoir operation, Stochastic, Dynamic programming, Operating Model, Probability Distribution of Storage volumes and Releases, examples	6
6	Water quality Management: Prediction and Simulation, Water quality Management Modeling	3

References:

<i>Sl no.</i>	<i>Name</i>	<i>Author</i>	<i>Publishers</i>
1	Applied Hydrology	V.T. Chow	Mcgraw-Hill Book
2	Hydrology	Raudkivi	

3	Stochastic Hydrology	Jayarami Reddy	
4	Water Resources Engg.	M.C. Chaturvedi	
5	Water Resources Systems Planning & Analysis	Ddenice P Loucks, Jerry R Stedinger & Douglas A Heinth	Printice Hall
6	Water Resources Engineering	Larry W Mays	John Wiley & Sons(Asia)
7	Statistical Methods in Hydrology	Charles T. Haan	Iowa State Univ. press

CE803F Ground Improvement Techniques 3-1-0-4-4

Module	Topic	Hours
1	Soil Stabilization: Introduction, Site investigation and soil stabilization, Different stabilization methods etc.	4
2	In-situ densification: Introduction, <i>Densification of granular and cohesive soil:</i> (Different types of compactions, Preloading and dewatering, Sand drains and Stone columns, Electrical and thermal methods etc.)	10
3	Geosynthetics: Over view, types and specific uses (separator, reinforcement etc.)	6
4	Grouting: Over view: Suspension and Solution grout, Grouting equipment and methods, Grout design and layout, Grout monitoring schemes.	8
5	Soil stability: Reinforced earth fundamentals, Soil nailing, Soil and Rock Anchors, Underpinning etc., case study	8

Reference:

Sl No	Title of Book	Author	Publisher
1	Foundation Analysis & Design	J.E. Bowels	McGraw Hill
2	Principles of Foundation Engineering	B.M. Das	Thomson Book
3	Foundation Design Manual	N. V. Nayak	Dhanpat Rai Publication
6	Reinforced Earth	T S Ingold	Thomas Telford
7	Designing with Geosynthetics	R M Koerner	Prentice Hall
8	Engineering Principles of Ground Modification	M.R. Hausmann	McGraw-Hill
9	Grouting and Deep Mixing	M.P. Moseley	Blackie Academic & Professional
10	Ground Control and Improvement	P.P. Xanthakos, L.W. Abramson, and D.A. Bruce	John Wiley & Sons

CE804 Ground Water and Well Hydraulics 3-1-0-4-4

Sl. No	Details of Course Content	Hours
1	Introduction, Modes of occurrence of Ground water, Empirical formulae for ground water velocity determination, Darcy's law for determining ground water velocity, Examples.	2
2	Concept of aquifer, Confined aquifer, Unconfined aquifer, Leaky or Semi-confined aquifer, Perched aquifer, aquiclude, aquitard, aquifuge, Aquifer parameters- Porosity, Specific yield, Specific retention, Storage co-efficient, Hydraulic conductivity, Transmissivity, Examples.	4
3	Steady radial flow towards wells- Dupuit- Thiem' theory of well hydraulics- for both unconfined and confined aquifers- assumptions, derivation of the mathematical expressions, Well losses, Specific capacity of well and efficiency, Interference among wells, Examples.	6
4	Unsteady radial flow towards wells- Thies non-equilibrium formula for confined aquifers, evaluation of aquifers parameters from – Cooper and Jacob method, Chow's method, Thies curve matching method, Examples.	7
5	Wells: Definition, types- Open well or Dug well, Tube well. Open well- Shallow open well, Deep open well, Cavity formation in open wells, construction of open wells, Yield of an open well-equilibrium pumping test, Recuperating test, Examples. Tube wells – Strainer type, Cavity type & Slotted type, Construction & Boring of tube wells.	7

6	Miscellaneous – Advantages & Disadvantages of ground water reservoir, artificial recharge of ground water, conjunctive use of ground water, ground water exploitation, effect of lowering ground water table, effluent stream & influent stream, Sea water intrusion in coastal aquifers-Glyben – Hertzberg’ principle, Examples.	8
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References:

<i>Sl No</i>	<i>Title of Book</i>	<i>Author</i>	<i>Publisher</i>
1	Engineering Hydrology	K. Subramanya	Tata McGraw-Hill
2	A Text Book of Hydrology	P. Jaya Ram Reddy	Laxmi Publications-ND
3	Hydrology & Water Resource Engineering	S.K Garg	Khanna Publishers
4	Hydrology Principles, Analysis and Design	H.M. Raghunath.	
5	Hydraulics of Groundwater	J. Bear	Mcgraw Hill
6	Irrigation, Water Resource & Water Power Engineering	Dr. P.N Modi	Standard Book House-ND

CE-893 Seminar 0-0-3-3-2:

Each and every student have to appear in Group Discussion, Self Introduction, Technical seminar & non-technical seminar on very recent topics.

CE- 892 Project-II 0-0-3-3-2:

A final / detailed project to be completed, a Thesis on that topic to be submitted and to be appeared in a seminar to defend the submitted final project.

CE- 894 Computer Application in Civil Engg. 0-0-3-3-2:

Some problems to be taken up from the jobs and some problems as assigned.

CE- 891 Grand - Viva 0-0-0-0-4:

Each student has to appear for final viva.

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