SCHEME & SYLLABUS
B.Tech, Civil Engineering
Choice Based Credit System
Department of Civil Engineering

University Institute of Engineering and Technology
Sant Baba Bhag Singh University
2022

SEMESTER – I/II

Scheme for B. Tech. 1st Year (Common to all disciplines) (Chemistry Group)

I. Theory Subjects

S. No.	Course Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	BS	MAT151	Engineering Mathematics-I	3:1:0	3:1:0	4	4
2	BS	CHM105	Engineering Chemistry	3:1:0	3:1:0	4	4
3	ES	CSE111	Programming for Problem Solving	3:0:0	3:0:0	3	3
4	HS	ENG121	Communication Skill-I	2:0:0	2:0:0	2	2

II. Practical Subjects

S. No.	Course Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	BS	CHM107	Engineering Chemistry Lab	0:0:3	0:0:1.5	3	1.5
2	ES	CSE113	Programming for Problem Solving Lab	0:0:4	0:0:2	4	2
3	HS	ENG123	Communication Skills-I Lab	0:0:2	0:0:1	2	1
4	ES	ME105	Workshop/Manufacturing Practices	1:0:4	1:0:2	5	3
5	MC	PT101/PT 103/PT10 5	Physical Training-I NSO/NCC/NSS	0:0:2	NC	2	NC

Total Contact Hours: 29

Total Credit Hours: 20.5

SEMESTER – I/II

Scheme for B. Tech. 1st Year (Common to all disciplines) (Physics Group)

I. Theory Subjects

S. No.	Course Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	BS	MAT152	Engineering Mathematics–II	3:1:0	3:1:0	4	4
2	BS	PHY105	Engineering Physics	3:1:0	3:1:0	4	4
3	ES	EE102	Basic Electrical Engineering	3:1:0	3:1:0	4	4
4	ES	ME101	Engineering Graphics and Design	1:0:4	1:0:2	5	3

II. Practical Subjects

S. No.	Course Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	BS	PHY107	Engineering Physics Lab	0:0:3	0:0:1.5	3	1.5
2	ES	EE104	Basic Electrical Engineering Lab	0:0:2	0:0:1	2	1
3	MC	PT102/PT104/PT106	Physical Training-II(NSO/NCC/NSS)	0:0:2	NC	2	NC

Total Contact Hours: 24

Total Credit Hours: 17.5

SEMESTER – III

I. Theory Subjects

S. No.	Course Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	BS	MAT251	Engineering Mathematics-III	3:1:0	3:1:0	4	4
2	**BS**	**BOT002**	**General Biology**	**2:1:0**	**2:1:0**	**3**	**3**
3	ES	EE001	Basic Electronics Engineering	1:0:0	1:0:0	1	1
4	ES	ME221	Engineering Mechanics	3:1:0	3:1:0	4	4
5	ES	CE213	Computer-aided Civil Engineering Drawing	1:0:0	1:0:0	1	1
6	**ES**	**EE003**	**Energy Science & Engineering**	**1:1:0**	**1:1:0**	**2**	**2**
7	ES	BOT233	Life Science	1:0:0	1:0:0	1	1
8	HS	ENG205	Professional Communication Skills	3:0:0	3:0:0	3	3
9	HS	CE215	Introduction to Civil Engineering	2:0:0	2:0:0	2	2

II. Practical Subjects

S. No.	Course Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	**ES**	**EE002**	**Basic Electronics Laboratory**	**0:0:2**	**0:0:2**	**2**	**1**
2	ES	CE217	Computer-aided Civil Engineering Drawing Laboratory	0:0:2	0:0:2	2	1
3	ES	BOT235	Life Science Laboratory	0:0:2	0:0:2	2	1
4	MC	PT201/PT203/PT205	Physical Training-III (NCC/NSS/NSO)	0:0:2	NC	2	NC

Total Contact Hours: 29

Total Credit Hours: 24

SEMESTER – IV

I. Theory Subjects

S. No.	Course Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PC	CE220	Engineering Geology	2:1:0	2:1:0	3	3
2	PC	CE222	Introduction to Fluid Mechanics	2:1:0	2:1:0	3	3
3	PC	CE224	Introduction to Solid Mechanics	2:1:0	2:1:0	3	3
4	PC	CE226	Surveying & Geometics	2:1:0	2:1:0	3	3
5	PC	CE228	Structural Engineering	2:1:0	2:1:0	3	3
6	PC	CE230	Construction engineering & Management	2:1:0	2:1:0	3	3
7	HS	SSC007	Universal Human Values Understanding Harmony	3:0:0	3:0:0	3	3
8	HS	EVS002	Environmental Sciences	3:0:0	NC	3	NC

II. Practical Subjects

S. No.	Course Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PC	CE232	Engineering Geology Laboratory	0:0:2	0:0:1	2	1
2	PC	CE234	Surveying & Geometics Laboratory	0:0:2	0:0:1	2	1
3	PC	CE236	Introduction to Fluid Mechanics Laboratory	0:0:2	0:0:1	2	1
5	MC	PT202/ PT204/ PT206	Physical Training-IV (NCC/NSS/NSO)	0:0:2	NC	2	NC

Total Contact Hours: 32

Total Credit Hours: 24

SEMESTER – V

I. Theory Subjects

S. No.	Course Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PC	CE313	Mechanics of Materials	3:0:0	3:0:0	3	3
3	PC	CE319	Geotechnical Engineering	3:0:0	3:0:0	3	3
4	PC	CE323	Environmental Engineering	2:2:0	2:2:0	4	3
5	PC	CE325	Transportation Engineering	3:0:0	3:0:0	3	3
3	PE		Professional Elective-I	3:0:0	3:0:0	3	3
6	HS	SSC006	Human Values & Professional Ethics	3:0:0	3:0:0	3	3
7	MC	LAW005	Constitution of India	3:0:0	3:0:0	3	NC

II. Practical Subjects

S. No.	Course Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PC	CE327	Geotechnical Engineering Laboratory	0:0:2	0:0:1	2	1
2	PC	CE329	Transportation Engineering Laboratory	0:0:2	0:0:1	2	1
3	MC	PT301/PT303/PT305	Physical Training-V (NCC/NSS/NSO)	0:0:2	NC	2	NC

Total Contact Hours: 28

Total Credit Hours: 20

Professional Elective-I

S. No.	Course Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PE	CE331	Geotechnical Design	3:0:0	3:0:0	3	3
2	PE	CE333	Foundation Engineering	3:0:0	3:0:0	3	3
3	PE	CE335	Offshore Engineering	3:0:0	3:0:0	3	3
4	PE	CE337	Railway Engineering	3:0:0	3:0:0	3	3

SEMESTER – VI

I. Theory Subjects

S. No.	Course Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PC	CE318	Hydraulic Engineering	2:1:0	2:1:0	3	3
2	PC	CE312	Engineering Economics, Estimation & Costing	2:1:0	2:1:0	3	3
3	OE	SSC008	Gender Culture & Development	3:0:0	3:0:0	3	3
4	PE		Professional Elective-II	3:0:0	3:0:0	3	3
5	PE		Professional Elective-III	3:0:0	3:0:0	3	3
6	OE		Open Elective-II	3:0:0	3:0:0	3	3
7	MC	MGT007	Organizational Behaviour	3:0:0	3:0:0	3	NC

II. Practical Subjects

S. No.	Course Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PC	CE316	Engineering Economics Estimation & Costing Laboratory	0:0:2	0:0:1	2	1
2	PC	CE320	Hydraulic Engineering Laboratory	0:0:2	0:0:1	2	1
3	MC	PT302/PT304/PT306	Physical Training-VI (NCC/NSS/NSO)	0:0:2	NC	2	NC

Total Contact Hours: 27

Total Credit Hours: 20

Professional Elective-II

S. No.	Course Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PE	CE324	Structural Analysis	3:0:0	3:0:0	3	3
2	PE	CE326	Concrete Technology	3:0:0	3:0:0	3	3
3	PE	CE328	Bridge Engineering	3:0:0	3:0:0	3	3
4	PE	CE336	Design of Structural Systems	3:0:0	3:0:0	3	3

Professional Elective-III

S. No.	Course Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PE	CE330	Reinforced Concrete	3:0:0	3:0:0	3	3
2	PE	CE332	Structural Dynamics	3:0:0	3:0:0	3	3
3	PE	CE334	Design of Concrete Structures	3:0:0	3:0:0	3	3

4	PE	CE338	Industrial Structures	3:0:0	3:0:0	3	3

SEMESTER – VII

I. Theory Subjects

S. No.	Course Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PC	CE409	Hydrology & Water Resources Engineering	3:1:0	3:1:0	4	4
2	PE		Professional Elective-IV	3:0:0	3:0:0	3	3
3	OE		Open Elective-III	3:0:0	3:0:0	3	3
4	OE		Open Elective-IV	3:0:0	3:0:0	3	3
5	HS	CE405	Civil Engineering – Societal & Global Impact	2:0:0	2:0:0	2	2
6	PC	CE419	Disaster Preparedness & Planning Management	1:1:0	1:1:0	2	2

II. Practical Subjects

S. No.	Course Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	Project	CE407	Project	0:0:12	0:0:6	12	6

Total Contact Hours: 29

Total Credit Hours: 23

Professional Elective-IV

S. No.	Course Type	Subject Code	Subject Name	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours
1	PE	CE411	Design of Steel Structures	3:0:0	3:0:0	3	3
2	PE	CE413	Pre-stressed Concrete	3:0:0	3:0:0	3	3
3	PE	CE415	Airport Planning & Design	3:0:0	3:0:0	3	3
4	PE	CE417	Pavement Design	3:0:0	3:0:0	3	3

SEMESTER – VIII

I. Practical Subjects

S. No.	Course Type	Subject Code	Subject Name	Total Credit Hours
1	Project	CE406	Six Months Industrial Training	20

Total Credit Hours: 20

List of Open Electives offered by Civil Engineering

S. No	Open Elective Type	Course Code	Course Title	Contact Hours (L:T:P)	Credits (L:T:P)	Total Contact Hours	Total Credit Hours	Semester
1	OE-I	CE340	Construction Practice	3:0:0	3:0:0	3	3	6th
2		CE421	Metro System & Engineering	3:0:0	3:0:0	3	3	6th
3		CE423	Environmental Systems	3:0:0	3:0:0	3	3	6th
4	OE-II	CE420	Environmental Law & Policy	3:0:0	3:0:0	3	3	7th
5		CE422	Ecological Engineering	3:0:0	3:0:0	3	3	7th
6		CE424	Air and Noise Pollution Control	3:0:0	3:0:0	3	3	7th
7		CE426	Engineering Materials for Sustainability	3:0:0	3:0:0	3	3	7th
8	OE-III	CE428	Solid & Hazardous Waste Management	3:0:0	3:0:0	3	3	7th
9		CE430	Rural Water Supply & Onsite Sanitation Systems	3:0:0	3:0:0	3	3	7th
10		CE432	Transport of Water and Waste Water	3:0:0	3:0:0	3	3	7th
11		CE434	Groundwater Engineering	3:0:0	3:0:0	3	3	7th

Semester I

Course Code	**MAT151**
Course Title	**Engineering Mathematics-I**
Type of Course	**BS**
LTP	**3 1 0**
Credits	**4**
Course Prerequisite	**+2 Non-Medical**
Course Objective (CO)	**The course aims to equip the students with standard concepts and tools of mathematics at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.**
Course Outcome(CO)	**By the end of the course, students will be able to:** **1. Understand the essential tool of matrices and linear algebra in a comprehensive manner.** **2. To deal with functions of several variables that IS essential in most branches of engineering.** **3. Comprehend tool of power series and Fourier series for learning advanced Engineering Mathematics.** **4. Appreciate the fall outs of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.** **5. To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.**

SYLLABUS

UNIT-I

Algebra of matrices, inverse and rank of a matrix, rank-nullity theorem; System of line are equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigen values a deign vectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Orthogonal transformation and quadratic to canonical forms.

UNIT-II

Limit, continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence

UNIT-III

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Hal frangesine and cosine series, Parseval's theorem

UNIT-IV

Evolutes and Involutes, Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface area sand volumes of revolutions. Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna Publishers
2	Fourier Series and Boundary Values Problems	Churchill	Mc Graw Hill.
3	Complex Variables & Applications	Churchill	Mc Graw Hill.
4	Advanced Engineering Mathematics (6^{th}edition,1995)	Wylie and Barren	Mc Graw Hill.
5	Advanced Engineering Mathematics (10^{th}Edition)	Erwin Kreyszig	Wiley

Course Code	**CHM105**
Course Title	**Engineering Chemistry**
Type of Course	**BS**
LTP	**3 1 0**
Credits	**4**
Course Prerequisite	**NA**
Course Objective (CO)	**The objectives of the engineering chemistry are to relate the students with basic concepts of chemistry. Some new topics have been introduced to the SYLLABUS for the development of the right attitudes by the engineering students to cope with new.**
Course Outcome(CO)	**The course will enable the student to:** **1. Analyze microscopic chemistry in terms of atomic and molecular orbital and intermolecular forces. Rationalize bulk properties and processes using thermodynamic considerations.** **2. Distinguish the ranges of the electromagnetic spectrums for exciting different molecular energy levels in various spectroscopic techniques** **3. Rationalize periodic properties such as ionization potential, electro negativity, oxidation states and electro negativity.** **4. List major chemical reactions that are used in the synthesis of molecules.**

SYLLABUS

UNIT-I

Atomic and molecular structure Schrodinger equation. Particle in a box solutions and their applications for conjugated molecules and nano particles. Form soft hehydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multi center orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene andaromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

UNIT-II

Spectroscopic techniques and applications: Principles of spectroscopy and selection rules. Electronic spectro scopy. Fluorescence and its applications in medicine. Vibrational and rotational spectroscopy of diatomic molecules. Applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques. Diffraction and scattering

Inter molecular forces and potential energy surfaces: Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of H_3, H_2F and HCN and trajectories on these surfaceS.

UNIT-III

Use of free energy in chemical equilibrium: Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications. Acid base, oxidation reduction and solubility equilibria. Water chemistry. Corrosion. Use of free energy consideration sin metallurgy through Ellingham diagrams.

Periodic properties: Effective nuclear charge, penetration of orbitals, variations of s, p, d and f

orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electro negativity, polarizability, oxidation states, coordination numbers and geometries, hard of acids and bases, molecular geometries.

UNIT-IV

Stereo chemistry Representations of 3 dimensional structures, structural isomers and stereo isomers, configurations and symmetry and chirality, enantiomers, disastereomers, optical activity, absolute configurations and conformation alanalysis. Isomer is min transitional metal compounds.

Organic reactions and synthesis of a drug molecule: Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule. Evolutes and Involutes, Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface area sand volumes of revolutions. Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Engineering chemistry	J. C. Curiacose and J. Raja Ram	Tata Mc graw-Hill Co. New Delhi.
2	Inorganic Chemistry,	Gary L. Miessler, Paul J. Fischer and Donald A. Tarr, (2013).	Pearson
3	Introduction to spectroscopy	Pavia, D. L., Lampman, G. M., Kriz, G. S., and Vyvyan, J. A.	CengageLearning.
4	Principles of Organic Synthesis	Norman and Coxon	CRC Press

Course Code	**CSE111**
Course Title	**Programming for Problem Solving**
Type of Course	**ES**
LTP	**3 0 0**
Credits	**3**
Course Prerequisite	**Basics of computer and knowledge of any high-level language**
Course Objective (CO)	**To familiarize the students of all branches in engineering with computer organization, operating systems, problem solving and programming in C++.**
Course Outcome(CO)	**The student will learn to-** **1. To formulate simple algorithms for arithmetic and logical problems.** **2. To translate the algorithms to programs (in C language).** **3. To test and execute the programs and correct syntax and logical errors.** **4. To implement conditional branching, iteration and recursion.** **5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.** **6. To use arrays, pointers and structures to formulate algorithms and programs.** **7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.** **8. To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.**

SYLLABUS

UNIT-I

Introduction to Programming: Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.) Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flow chart/Pseudo code with examples. From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

UNIT-II

Arithmetic expressions and precedence: Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching Iteration and loops, Arrays: Arrays (1-D,2-D), Character arrays and Strings. Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required).

UNIT-III

Function and Recursion: Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference. Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

UNIT-IV

Structure and Pointers: Structures, Defining structures and Array of Structures. Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

File handling (can be done in lab).

REFRENCE BOOKS

S. No	Name	Author(s)	Publisher
1	Schaum's Outline of Programming with C	Byron Gottfried	Mc Graw-Hill
2	Programming in ANSIC	E. Balaguru swamy	Tata McGraw-Hill

Course Code	**ENG121**
Course Title	**Communication Skill-I**
Type of Course	**HS**
LTP	**200**
Credits	**2**
Course Prerequisite	**NA**
Course Objective (CO)	**The objective of this course is to:** **1. Assist the students to acquire proficiency, both in spoken and written language.** **2. To develop comprehension, improve writing skills and enhance skills in spoken English.**
Course Outcome (CO)	**The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.**

SYLLABUS

UNIT-I

1. **Vocabulary Building:**

1.1 The concept of Word Formation
1.2 Root words from for eign languages and their use in English
1.3 Acquaintance with prefixes and suffixes from for eign languages in English to form derivatives.
1.4 Synonyms, antonyms and standard abbreviations.

UNIT-II

2. **Basic Writing Skills**

2.1 Sentence Structures
2.2 Use of phrases and causes in sentences
2.3 Importance of proper punctuation
2.4 Creating coherence
2.5 Organizing principles of paragraphs in documents
2.6 Techniques for writing precisely

3. **Identifying Common Errors in Writing**

3.1 Subject-verb agreement
3.2 Noun-pronoun agreement
3.3 Misplaced modifiers
3.4 Articles
3.5 Prepositions
3.6 Redundancies
3.7 Clichés

UNIT-III

4. **Nature and Style of sensible Writing**

4.1 Describing
4.2 Defining
4.3 Classifying
4.4 Providing examples or evidence
4.5 Writing introduction and conclusion

5. **Writing Practices**

5.1 Comprehension
5.2 Précis Writing
5.3 Essay Writing

UNIT-IV

6. **Oral Communication**

(This unit involves interactive practice sessions in Language Lab)

1. Listening Comprehension
2. Pronunciation, Intonation, Stress and Rhythm
3. Common Everyday Situations: Conversations and Dialogues
4. Communication at Workplace
5. Interviews
6. Formal Presentations

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Effectual Communication Skills	Bhupender Kour	S. K. Kataria and Sons
2	Communications Skills	R. Datta Roy and K. K. Dheer	Vishal Publishing Company
3	The Essence of Effective Communication	Ludlow and Panthon	Prentice Hall of India
4	Essentials of Business Communication	Pal and Rorualling	S. Chand and Sons. New Delhi

Course Code	**CHM107**
Course Title	**Engineering Chemistry Lab**
Type of Course	**BS**
LTP	**00 3**
Credits	**1.5**
Course Prerequisite	**NA**
Course Objective (CO)	**The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering.**
Course Outcome(CO)	**The students will earn to:** **1. Estimate rate constants of reactions from concentration of reactants/Products as a function of time** **2. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.** **3. Synthesize as mall drug molecule and analyse a salt sample**

SYLLABUS

UNIT-I

1. Determination of surface tension and viscosity of liquids.
2. Determination of viscosity of oil by means of Red Wood Viscometer.
3. Thin layer chromatography: Determination of Rf value of a mixture by TLC.
4. Separation of methyl orange and phenolphthale in from given mixture by paper chromatography
5. Ion exchange column for removal of hardness of water/Determination of total hardness of water by EDTA method.
6. Determination of Total Residual Chlorine in water sample.
7. Colligative properties using freezing point depression
8. Determination of the rate constant of a reaction
9. Determination of cell constant and conductance of solutions
10. Potentiometry-determination of redox potentials and emfs:
11. Determine the strength of a solution pH metrically.
12. Synthesis of a polymer/drug: Preparation of Urea Form aldehyde Resin;
13. Synthesis of paracetamol
14. To bring catalysed condensation or to prepare a pure sample of dibenzalpropane
15. Saponification/ acid value of an oil
16. Chemical analysis of a salt
17. Lattice structures and packing of spheres
18. Models of potential energy surfaces
19. Chemical oscillations-Iodine clock reaction
20. Determination of the partition coefficient to of a substance between two immiscible liquids
21. Adsorption of acetic acid by charcoal
22. Use of the capillary viscosity meters to the demonstrate of the iso-electric point as the pH of

minimum viscosity for gelat in sol sand/or coagulation of the white part of egg.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Vogel's Qualitative Inorganic Analysis (7th Edition).	G S Vehla	Prentice Hall
2	Laboratory Manual in Organic Chemistry	R. K. Bansal,	Wiley Eastern
3	Advanced Experimental Chemistry. Vol. I	Physical, J. N. Gurtuand R. Kapoor	S. Chand & CO.
4	Vogel's Qualitative Inorganic Analysis	S Vehla	Orient Longman
5	Vogel's Textbook of Quantitative Inorganic Analysis (revised),	J. Basseff, R. C. Dennery, G. H. Jeffery and J.	ELBS

Course Code	**CSE113**
Course Title	**Programming for Problem Solving Lab**
Type of Course	**ES**
LTP	**0 0 4**
Credits	**2**
Course Prerequisite	**Basics of computer and knowledge of any high level language**
Course Objective (CO)	**To familiarize the students of all branches in engineering with computer organization, operating systems, problem solving and programming in C++.**
Course Outcome(CO)	**The learner will be able to-** **1. Understand the basic building blocks of general purpose digital computer system like computer hardware/software, memory and peripheral devices, internet applications and services.** **2. Understand the program development life cycle using various tools like flow charts and algorithms and pseudo-code.** **3. Classify operators, expressions, character set, data types and control structures.** **4. Design and develop modular programming and code reusability using library functions.**

SYLLABUS

Familiarization with the Computer System:

1) To explain the part of the computer system such as system unit, input devices, output devices connected to the computer.

2) To explore the outside view of the system unit that includes the panels on front and ports at the rear.

3) To explore the inside view of the system unit that includes them other board, processor, expansion slots, various add-on cards, storage devices, power supply, fans.

4) To understand the booting process that includes witching on the system, execution of POST routine, then boots trap loader, and loading of the operating system, and getting it ready for use.

5) To introduce the graphical user interface (desktop) of Windows operating System to explain the various elements of the desktop such as taskbar, icons (My Computer, Recycle Bin, etc.), shortcuts, notification area.

6) To configure the desktop that includes electing the wallpaper, selecting the screen saver with or

without pass word protection, selecting the screen resolution and color quality.

Explore Office automation

1) Creating, Formatting documents with Word, explore the various tool bar options, Mail Merge, Spell Check, Word–Art.
2) Creating Power Point presentations with Power Point, Explore various views of PPT, Charts, Graphs, animation, multimedia. Creating Sheets in Excel using formulas, chart and graphs

Programming using C++

1) Implement programs using various operator sin C++
2) Implement various Branch statements: if, if-else, nested if, switch
3) Implement various loop statements: for, while, do-while
4) Implement other control statements: go-to, exit function, continue
5) Implement various programs using array sand string
6) Implement various programs classes and objects
7) Implement various programs using Pointers and structures
8) Implement various programs using File operations

Computer Aided Tools and Internet

1) Exercise with CAD
2) Internet surfing and E-mail

Course Code	**ENG123**
Course Title	**Communication Skills-I Lab**
Type of Course	**HS**
LTP	**0 0 2**
Credits	**1**
Course Prerequisite	**NA**
Course Objective (CO)	**The objective of this course is to provide the students sufficient practice for speaking and writing English efficiently.**
Course Outcome(CO)	**The learner will be able to-** **1. Listen to oral instructions in order to Performa given task. (The skills of Listening will be taught and tested through specially prepared materials)** **2. The skills of Speaking will be developed conducting various communicative Activities-Role play, conversations, extempore etc.** **3. The Reading Skills will be enhanced through comprehending and unseen texts.** **4. The skills of Writing will be developed and assessed on Text based writing.**

SYLLABUS

UNIT-I

Speaking and Discussion Skills: Oral Presentation, Planning and organizing content for presentation, Use of audio /Visual Aids, Making Slides for presentation, Group Discussion, Debate, Extempore speaking, Interview Skills, Mock interview, Mock Dialogues (Pair Speaking),Cue Card Speaking, Meeting/Conferences.

UNIT-II

Listening Skills: Listening to any recoded material and asking oral/written questions for listening comprehension.

Reading Skills: Active Reading of passages for Reading comprehensions, paraphrase, Summary writing.

UNIT-III

Writing Skills: Guidelines of effective writing, Paragraph Writing, Email Writing

UNIT-IV

Grammar and Vocabulary: Parts of Speech, Tenses, GRE words (List of50Words)

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Course Code	**ME105**
Course Title	**Workshop/Manufacturing Practices**
Type of Course	**ES**
LTP	**1 0 4**
Credits	**3**
Course Prerequisites	
Course Objectives	**Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.**
Course Outcome (CO)	**1. Understanding different manufacturing techniques and their relative advantages/ disadvantages with respect to different applications with selection of a suitable technique for meeting a specific fabrication need.** **2. Acquireaminimumpracticalskillwithrespecttothedifferentmanufacturing methods and develop the confidence to design & fabricate small components for their project work.** **3. Introduction to different manufacturing methods in different fields of engineering.** **4. Practical exposure to different fabrication techniques and Creation of simple components using different materials.**

SYLLABUS

LECTURES

1. Manufacturing Methods-casting, forming, machining, joining, advanced manufacturing methods.
2. Fitting operations & power tools
3. Electrical & Electronics
4. Carpentry
5. Metal casting
6. Welding(arc welding & gas welding), brazing

WORKSHOP PRACTICE

1. Machine shop
2. Fitting shop
3. Carpentry
4. Electrical & Electronics
5. Welding shop
6. Casting
7. Smithy
8. Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above

REFERNCE BOOKS:

S. No	Name	Author(S)	Publisher
1	Workshop Technology	HS Bawa	McGraw-Hill Publishing Company Limited
2	Workshop Technology I, II, III	S K Hajra, Choudhary and A K Choudhary	Media Promoters and Pulishers Pvt. Ltd., Bombay
3	Manual on Workshop Practice	K Venkata Reddy	Mac Millan India Ltd. New Delhi
4	Basic Workshop Practice Manual	T Jeyapoovan	Vikas Publishing House (P)Ltd.,NewDelhi

Semester II

Course Code	**MAT152**
Course Title	**Engineering Mathematics–II**
Type of Course	**BS**
LTP	**3 1 0**
Credits	**4**
Course Prerequisite	**+2 with Non-Medical, B.Tech Ist semester**
Course Objective (CO)	**The objective of this course is to familiarize the prospective engineers with techniques in multi variate integration, ordinary and partial differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.**
Course Outcome(CO)	**By the end of the course, students will be able to:** **1. Comprehend the mathematical too is needed in evaluating multiple integrals and their usage.** **2. Use mathematical tools for the solutions of differential equations that model physical processes.** **3. Practice the tools of differentiation and integration of functions of a complex variable that are used in various techniques, dealing engineering problems.**

SYLLABUS

UNIT-I

Double integrals (Cartesian), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian), orthogonal. curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallel epipeds; Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.

UNIT-II

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for 'p', equations solvable for 'y', equations solvable for 'x' and Clairaut's type. Second order linear differential equations with constant coefficients, method of variation of parameters, Cauchy-Euler equation.

UNIT-III

Complex Variable – Differentiation: Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings. Mobius transformations and their properties.

UNIT-IV

Complex Variable – Integration: Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum- Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Higher Engineering Mathematics	Grewal, B.S.	Khanna Publishers, Delhi.
2	Advanced Engineering Mathematics	Jain, R.K and Iyengar	Narosa Publishing Company
3	Advanced Engineering Mathematics (Fifth Edition)	Erwin Kreyszig	John Wiley– 1999
4	A textbook of Engineering Mathematics	N.P. Bali and Manish Goyal	Laxmi Publications(Reprint 2010)

Course Code	**PHY105**
Course Title	**Engineering Physics**
Type of Course	**BS**
LTP	**3 1 0**
Credits	**4**
Course Prerequisite	
Course Objective (CO)	**The aim of the subject is to enhance the knowledge of students about various aspects of fundamental of physics including mechanics, optics, wave optics, quantum mechanics; solid-state physics and its applications.**
Course Outcome(CO)	**Students will able:** **1. To get to know about fundamentals of physics.** **2. To gain basic knowledge of optics, mechanics, optics, wave optics, quantum mechanics; solid state physics and its applications.** **3. To understand the basics of optical devices.** **4. To gain knowledge in basic concepts of physics relevant to engineering applications.**

SYLLABUS

UNIT-I

Forces in Nature: Newton's laws of motions and its completeness in describing particle motion; Potential energy function; F = - Grad V, equipotential surfaces and meaning of gradient; Conservative and non-conservative forces, curl of a force field; Central forces; Conservation of Angular Momentum; Kepler problem; Application: Satellite manoeuvres; Non-inertial frames of reference, Rotating coordinate system: Five-term acceleration formula- Centripetal and Coriolis accelerations; Applications: Weather systems, Foucault pendulum.

UNIT-II

Simple harmonic motion: damped and forced simple harmonic oscillator Mechanical and electrical simple harmonic oscillators, complex number notation and phasor representation of simple harmonic motion, damped harmonic oscillator – heavy, Critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators, electrical and mechanical impedance, steady state motion of forced damped harmonic oscillator, power absorbed by oscillator.

UNIT-III

Optics: Light as an electromagnetic wave; Reflectance of light; total internal reflection, and evanescent wave; Mirrors and lenses and optical instruments based; Interference of light; Huygens' principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer, Mach-

Zehnder interferometer. Farunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power; LASER: He-Ne LASER, ruby LASER, CO2 LASER, Properties of laser beams, applications of lasers in science, engineering and medicine.

UNIT-IV

Wave nature of particles and the Schrodinger equation: Introduction to Quantum mechanics, Wave nature of Particles, Time-dependent and time- independent Schrodinger equation for wave function, Born interpretation, probability current, Expectation values, Free- particle wave function and wave-packets, Uncertainty principle; Free electron theory of metals, Fermi level, density of states, Bloch's theorem for particles in a periodic potential, Kronig- Penney model and origin of energy bands. **Atomic and molecular structure** Schrodinger equation. Particle in a box solutions and thei applications for conjugated molecules and nano particles. Form soft hehydrogen atom wave functions and the plots of these functions to explore their spatial variations. Molecular orbitals of diatomic molecules and plots of the multi center orbitals. Equations for atomic and molecular orbitals. Energy level diagrams of diatomics. Pi-molecular orbitals of butadiene and benzene andaromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Engineering Mechanics	MK Harbola	2nd ed.Cengage2012
2	Theory of Vibrations with Applications	WT Thomson	George Allen & UnwinLtd2008
3	Optics	A. Ghatak	Tata McGraw-Hill Education, 2005
4	Quantum mechanics	D.J. Griffiths	2nd Edn, Cambridge India,2016

Course Code	**EE102**
Course Title	**Basic Electrical Engineering**
Type of Course	**ES**
LTP	**3 1 0**
Credits	**4**
Course Prerequisite	
Course Objective (CO)	**1. To understand and analyse basic electric and magnetic circuits.** **2. To study the working principles of electrical machines and power converters.** **3. To introduce the components of low-voltage electrical installations.**
Course Outcome(CO)	

SYLLABUS

UNIT-I

DC Circuits Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first order RL and RC circuits.

UNIT-II

AC Circuits and Transformers Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections. Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT-III

Electrical Machines and Power Converters Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators. DC-DC buck and boost converters, duty ratio control. Single-phase and three-phase voltage source inverters; sinusoidal modulation.

UNIT-IV

Electrical Installations Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Basic Electrical Engineering	D.P. Kothari and I.J. Nagrath	Tata Mcgraw Hill.

2	Basic Electrical Engineering	D.C. Kulshreshtha	McGraw Hill, 2009.
3	Electrical and Electronics Technology	L.S. Bobrow	Pearson, 2010.
4	Electrical Engineering Fundamentals	V.D. Toro	Satya Prakashan, Delhi

Course Code	**ME101**
Course Title	**Engineering Graphics & Design**
Type of Course	**ES**
LTP	**1 0 4**
Credits	**3**
Course Prerequisite	
Course Objective (CO)	**To prepare you to design a system, component, or process to meet desired needs with in realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability to prepare you to communicate effectively to prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice**
Course Outcome(CO)	**The student will learn:** **1. Introduction to engineering design and its place in society and engineering communication** **2. Exposure to the visual aspects and engineering graphics of engineering design standard Exposure to solid modeling.** **3. Exposure to computer-aided geometric design and creating working drawings**

SYLLABUS

UNIT-I

Introduction to Engineering Drawing Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid, and Involute; Scales – Plain, Diagonal and Vernier Scales. Orthographic Projections Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes.

UNIT-II

Projections of Regular Solids Inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale.Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Sections and Sectional Views of Right Angular Solids Covering Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

UNIT-III

Isometric Projections: Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions. Overview of Computer

Graphics: Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software, conventional and AutoDesk Fusion 360. The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

UNIT-IV

Customisation & CAD Drawing Consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles; Annotations, layering & other Functions Applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to create drawings, Create, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, solid, surface, and wireframe models. Part editing and twodimensional documentation of models. Planar projection theory, including sketching of perspective, isometric, multiview, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerancing techniques; dimensioning and scale multi views of dwelling. Hands-on-Practice of above Drawings in softwares such as AutoCad and AutoDesk Fusion 360.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Engineering Drawing	Bhatt N.D., Panchal V.M.& Ingle P.R., (2014)	Charotar Publishing House
2	Engineering Drawing and Computer Graphics	Shah, M.B. & Rana B.C.(2008)	Pearson Education
3	Engineering Graphics	Agrawal B. & Agrawal C.M.(2012)	TMH Publication
4	Textbook on Engineering Drawing	Narayana, K.L. & P Kannaiah (2008)	Scitech Publishers

Course Code	**PHY107**
Course Title	**Engineering Physics Lab**
Type of Course	**BS**
LTP	**0 0 3**
Credits	**1.5**
Course Prerequisite	**10+2 with physics as core subject.**
Course Objective (CO)	**The aim of the subject is to enhance the Practical knowledge of students about various aspects of fundamental of physics including mechanics, optics, wave optics, quantum mechanics; solid-state**
Course Outcome(CO)	**Students will able:** **1. Measure the Magnetic effects along axis of circular coil, magnetic dipole moment of a bar magnet.** **2. Infer the characteristics, wavelength & diffraction of laser beam using Michelson interferometer, grating elements.** **3. Determine numerical aperture, attenuation and propagation losses in optical fiber, various crystal structures, polarizability of dielectric substance.** **4. Determine the resistivity, band gap of semi conductor materials.**

SYLLABUS

1 .To study the variation of magnetic field with distance along the axis of a circular coil carrying current.
2. To determine the magnetic dipole moment of a bar magnet and horizontal intensity of earth's magnetic field using a deflection galvanometer.
3. To study B-H curve using CRO.
4. To study the laser beam characteristics like divergence using diffraction grating aperture.
5. To determine the wavelength of a laser using Michelson interferometer.
6. To study diffraction using laser beam and thus to determine the grating element.
7. To find the refractive index of a material using spectrometer.
8. To find the refractive index of a liquid using a hollow prism and spectrometer.
9. To determine numerical aperture of an optical fiber.
10. To determine attenuation and propagation losses in optical fibers.
11. To study various crystal structures.
12. To find out polarizability of a dielectric substance.
13. To set up and observe Newton's rings.
14. To Determine Energy Band Gap of Semiconductor.
15. To determine the number of lines per millimeter of the grating using the green line of the mercury spectrum.
16. To calculate the wavelength of the other prominent lines of mercury by normal incidence method.
17. To find the acceleration of the cart in the simulator(Newton 2nd law)
18. To determine the resistivity of semiconductors by four probe

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Advanced Practical Physics for students	B.L. Flint & H.T. Worsnop	Asia Publishing House.
2	Advanced level Physics Practicals	Michael Nelson and Jon M. Ogborn	Heinemann Educational Publishers
3	A Text Book of Practical Physics	Indu Prakash	Kitab Mahal, New Delhi

Course Code	**EE104**
Course Title	**Basics of Electrical Engineering Lab**
Type of Course	**ES**
LTP	**0 0 2**
Credits	**1**
Course Prerequisite	**Basics of Electrical Engineering**
Course Objective (CO)	**To familiarize with various AC, DC circuits, Transformer, Electrical Machine and Measuring Instruments.**
Course Outcome(CO)	

SYLLABUS

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Measuring the steady-state and transient time-response of R-L, R-C, and R-L-C circuits to a step change in voltage (transient may be observed on a storage oscilloscope). Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L-C circuits.
3. Transformers: Observation of the no-load current waveform on an oscilloscope (non- sinusoidal wave-shape due to B-H curve nonlinearity should be shown along with a discussion about harmonics). Loading of a transformer: measurement of primary and secondary voltages and currents, and power.
4. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (lineline voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.
5. Demonstration of cut-out sections of machines: dc machine (commutator-brush arrangement), induction machine (squirrel cage rotor), synchronous machine (field winging - slip ring arrangement) and single-phase induction machine.
6. Torque Speed Characteristic of separately excited dc motor.
7. Synchronous speed of two and four-pole, three-phase induction motors. Direction reversal by change of phase-sequence of connections. Torque-Slip Characteristic of an induction motor. Generator operation of an induction machine driven at super- synchronous speed.
8. Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.
9. Demonstration of (a) dc-dc converters (b) dc-ac converters – PWM waveform (c) the use of dc-ac converter for speed control of an induction motor and (d) Components of LT switchgear

Semester III

Course Code	**MAT251**
Course Title	**Engineering Mathematics–III (For ME/EE/CE)**
Type of Course	**BS**
LTP	**3 1 0**
Credits	**3**
Course Prerequisite	**+2 Mathematics, Engg. Mathematics-I, Engg. Mathematic-II**
Course Objective (CO)	**This course is an introduction to a broad range of mathematical techniques for solving problems that arise in Science and Engineering. The goal is to provide a basic understanding of the derivation, analysis and use of these techniques in engineering applications.**
Course Outcome(CO)	**By the end of the course, students will be able:** **1. To solve field problems in engineering involving PDEs.** **2. To use Numerical methods' techniques to solve ordinary differential equations and partial differential equations arising in engineering problems.** **3. Get an overview of probability and statistics to engineers**

SYLLABUS

UNIT-I

Double First order partial differential equations, solutions of first order linear and non-linear PDEs. Solution to homogenous and non-homogenous linear partial differential equations second and higher order by complimentary function and particular integral method. Flows, vibrations and diffusions, second-order linear equations and their classification, Initial and boundary conditions (with an informal description of well-posed problems), D'Alembert's solution of the wave equation; Separation of variables method to simple problems in Cartesian coordinates.

UNIT-II

Numerical Differentiation, Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules. Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. RungeKutta method of fourth order for solving first and second order equations. Milne's and Adam's predicator- corrector methods.

UNIT-III

Partial differential equations: Finite difference solution two-d i me n s i o n a l Laplace equation and Poisson equation. Implicit and explicit methods for one dimentional heat equation (BenderSchmidt and Crank –Nicholson methods), finite differences explicit method for wave equation.

UNIT-IV

Probability spaces, conditional probability, Discrete random variables, Independent random

variables, Poisson approximation to the binomial distribution, infinite sequence of Bernoulli trials, sums of independent random variables; expectation of discrete random variables, moments Variance of a Sum, Chebyshev's Inequali.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Higher Engineering Mathematics (Third Edition) Vol-II	Dr. K. R. Kachot	Mahajan Pub. House, Ahmedabad
2	Advanced Engineering Mathematics (5^{th} Edition)	Erwin Kreyszig	John Wiley– 1999
3	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna, New Delhi.
4	Elementry Differential Equations	W. E. Boyce and R.	John Wiley– 2005

Course Code	**BOT002**
	General Biology
Type of Course	**BS**
LTP	**2 1 0**
Credits	**3**
Course Prerequisite	**10+2**
Course Objective (CO)	**The main objective of this branch is to study concept of biology in relations to engineering and to acquaint the students about other field of biology like classification of organism, genetics, bio molecules, macromolecules, enzymes, metabolism and biological information system**
Course Outcome(CO)	**1. Students will learn about diverse biological systems and their functions.** **2. Students will earn about the enzymes and macromolecules works in the diverse organisms.** **3. Students will learn about the relationship of genetics and morphological features of the organism and their passage from parents to off springs** **4. Students will learn about application of the thermodynamic principles in biological system**

SYLLABUS

UNIT-I

Introduction

Bring out the fundamental differences between science and engineering by drawing a comparison between eye and camera, Bird flying and aircraft. Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples from Brownian motion and theorigin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

Classification

Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilisation -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E. coli, S. cerevisiae, D. melanogaster, C. elegance, A. thaliana, M. musculus.

UNIT-II

Genetics

Mendel's laws, Concept of segregation and independent assortment. Concept of allele. Genmapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

Biomolecules

Molecules of life. In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon units and lipids.

Enzymes

Enzymology: How to monitor enzyme catalysed reactions. How does an enzyme catalyse reactions? Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.

UNIT-III

Information Transfer

Molecular basis of information transfer. DNA as a genetic material. Hierarchy of DNA structure-from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

Macromolecular analysis

Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

UNIT-IV

Metabolism.

Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of Keq and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to CO2 + H2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge

Microbiology

Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Biology: A global approach:	Campbel l, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky,	Pearson Education Ltd
2	Outlines of Biochemistry	Conn, E. E; Stump f,P.K; Bruening, G; Doi, R.H	John Wiley and Sons
3	Principles of Biochemistry (V Edition)	By Nelson, D. L. ; and Cox, M. M. W. H.	Freeman and Company
4	Molecular Genetics (Second edition)	Stent, G. S.; and Calender, R. W.H.	Freeman and company

Course Code	**EE001**
Course Title	**Basic Electronics Engineering**
Type of Course	**ES**
LTP	**1 0 0**
Credits	**1**
Course Prerequisite	**Basics of Electrical Engineering**
Course Objective (CO)	
Course Outcome(CO)	**1. Know broadly the concepts and functionalities of the electronic devices, tools and instruments** **2. Understand use, general specifications and deploy abilities of the electronic devices, and assemblies** **3. Confidence in handling and usage of electronic devices, tools and instruments in engineering applications**

SYLLABUS

UNIT-I

NIT1: Diodes and Applications Semiconductor Diode - Ideal versus Practical, Resistance Levels, Diode Equivalent Circuits, Load Line Analysis; Diode as a Switch, Diode as a Rectifier, Half Wave and Full Wave Rectifiers with and without Filters; Breakdown Mechanisms, Zener Diode – Operation and Applications; Opto-Electronic Devices – LEDs, Photo Diode and Applications; Silicon Controlled Rectifier (SCR) – Operation, Construction, Characteristics, Ratings, Applications;

UNIT-II

Transistor Characteristics Bipolar Junction Transistor (BJT) – Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Operating Point, Voltage Divider Bias Configuration; Field Effect Transistor (FET) – Construction, Characteristics of Junction FET, Depletion and Enhancement type Metal Oxide Semiconductor (MOS) FETs, Introduction to CMOS circuits;

UNIT-III

Transistor Amplifiers and Oscillators Classification, Small Signal Amplifiers – Basic Features, Common Emitter Amplifier, Coupling and Bypass Capacitors, Distortion, AC Equivalent Circuit; Feedback Amplifiers – Principle, Advantages of Negative Feedback, Topologies, Current Series and Voltage Series Feedback Amplifiers; Oscillators – Classification, RC Phase Shift, Wien Bridge, High Frequency LC and Non-Sinusoidal type Oscillators;

UNIT-IV

Operational Amplifiers and Applications Introduction to Op-Amp, Differential Amplifier Configurations, CMRR, PSRR, Slew Rate; Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal Op Amp, Concept of Virtual Ground

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Basic Electronics- Devices, Circuits and IT Fundamentals	Santiram Kal (2002)	Prentice Hall, India

2	Digital Fundamentals	Thomas L. Floyd and R. P. Jain(2009),	Pearson Education,
3	Basic Electronics	Paul B. Zbar, A.P. Malvinoand M.A. Miller(2009),	A Text-Lab. Manual, TMH
4	Introductory Electronic Devices & Circuits, Conventional Flow Version	R.T. Paynter(2009),	Pearson

Course Code	**ME221**
Course Title	**Engineering Mechanics**
Type of Course	**ES**
LTP	**3 1 0**
Credits	**4**
Course Prerequisite	**Physics**
Course Objective (CO)	**The objective of this module is to help students develop the techniques needed to solve general engineering mechanics problems. Students will learn to describe physical Systems mathematically so that their behavior can be predicted.**
Course Outcome(CO)	**1. Determine resultants in plane force systems 2. Identify and quantify all forces associated with a static framework 3. Draw Shear Force Diagram and Bending Moment Diagram in various kinds of beams subjected to different kinds of loads**

SYLLABUS

UNIT-I

Introduction to Engineering Mechanics covering, Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, Coplanar Concurrent Forces, Components in Space – Resultant- Moment of Forces and its Application; Couples and Resultant of Force System, Equilibrium of System of Forces, Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; Static Indeterminacy. Introduction to vectors and tensors and coordinate systems, Symmetric and anti-symmetric tensors; Eigenvalues and Principal axes. Friction: Concept and Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction, Angle of Repose; Coefficient of friction; Motion of Bodies, wedge friction, screw jack & differential screw jack.

UNIT-II

Centroid and Centre of Gravity covering, Centroid of simple figures from first principle, centroid of composite sections, Centre of Gravity and its implications; Area moment of inertia, Polar moment of inertia:- Definition, Principal moments and axes of inertia, Parallel and perpendicular axes theorems, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook. Basic Structural Analysis covering, Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members. Bending Moment and Torsional Motion: Beams & types of beams; Frames & Machines, Transverse loading on beams, shear force and bending moment in beams, analysis of cantilevers, simply supported beams and overhanging beams, relationships between loading, shear force and bending moment, Torsion of circular shafts, derivation of torsion equation, stress and deformation in circular and hollow shafts. Virtual Work and Energy Method- Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium.

UNIT-III

Review of particle dynamics- Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Free body diagrams, Newton's 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy. Impulse-momentum (linear, angular); Impact (Direct and oblique). Introduction to Kinetics of Rigid Bodies covering, Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simple problems; D'Alembert's principle and its applications in plane motion and connected bodies; Newton-Euler's laws of rigid body motion, Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation; Angular velocity of a rigid body, and its rate of change; Integration of angular velocity to find orientation, Angular momentum about a point; Inertia tensor, Five term acceleration formula, Three-dimensional rotation: Euler's theorem, Axis-angle formulation and Euler angles.

UNIT-IV

Mechanical Vibrations covering, Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of free vibrations without damping and single degree of freedom system, simple problems, types of pendulums, use of simple, compound and torsion pendulums; Tutorials from the above modules covering, To find the various forces and angles including resultants in various parts of wall crane, roof truss, pipes, etc.; To verify the line of polygon on various forces; To find coefficient of friction between various materials on inclined plan; Free body diagrams various systems including block-pulley; To verify the principle of moment in the disc Apparatus; Helical block; To draw a load efficiency curve for a screw jack, General planar motions. General 3-D motions. Free precession, Gyroscopes, Rolling coin.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Engineering Mechanics	Shames, I. H.	Pearson Education India (2006).
2	Vector Mechanics for Engineers, Dynamics,	Beer, Johnston, Clausen and Staab	McGraw-Hill Higher Education(2003)
3	Engineering Mechanics: Statics and Dynamics	Hibler, T.A.	Prentice Hall (2012)
4	Engineering Mechanics	Timoshenko and Young	Tata McGraw Hill Education Private Limited, (2006)

Course Code	**CE213**
Course Title	**Computer-aided Civil Engineering Drawing**
Type of Course	**ES**
LTP	**1 0 0**
Credits	**1**
Course Prerequisite	**Nil**
Course Objective (CO)	**Course will provide better understanding of the various commands used in auto cadd and of structures to be made using commands.**
Course Outcome(CO)	**1. To develop graphical skills for communicating concepts, ideas and designs of engineering products graphically/ visually as well as understand another person's designs.** **2. To get exposure to national standards relating to technical drawings using Computer Aided Design and Drafting practice.** **3. Develop Parametric design and the conventions of formal engineering drawing.** **4. Examine a design critically and with understanding of CAD - The student learn to interpret drawings, and to produce designs using a combination of 2D and 3D software.**

SYLLABUS

UNIT-I

INTRODUCTION**;** Introduction to concept of drawings, Interpretation of typical drawings, Planning drawings to show information concisely and comprehensively; optimal layout of drawings and Scales; Introduction to computer aided drawing, co- ordinate systems, reference planes. Commands: Initial settings, Drawing aids, Drawing basic entities, Modify commands, Layers, Text and Dimensioning, Blocks. Drawing presentation norms and standards.

UNIT-II

SYMBOLS AND SIGN CONVENTIONS: Materials, Architectural, Structural, Electrical and Plumbing symbols. Rebar drawings and structural steel fabrication and connections drawing symbols, welding symbols; dimensioning standards

UNIT-III

MASONRY BONDS: English Bond and Flemish Bond – Corner wall and Cross walls - One brick wall and one and half brick wall

BUILDING DRAWING: Terms, Elements of planning building drawing, Methods of making line drawing and detailed drawing. Site plan, floor plan, elevation and section drawing of small residential buildings. Foundation plan. Roof drainage plans. Depicting joinery, standard fittings & fixtures, finishes. Use of Notes to improve clarity

UNIT-IV

PICTORIAL VIEW: Principles of isometrics and perspective drawing. Perspective view of building. Fundamentals of Building Information Modelling (BIM)

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Civil Engineering Drawing	Subhash C Sharma & Gurucharan Singh	Standard Publishers (2005)

2	Working with AUTOCAD 2000 with updates on AUTOCAD 200I	Ajeet Singh	Tata-Mc Graw-Hill Company Limited, New Delhi(2002)
3	AUTOCAD for Engineers and Designers	Sham Tickoo Swapna D	Pearson Education (2009)
4	Engineering Drawing and Graphics+AUTOCAD	Venugopal	New Age International Pvt. Ltd. (2007)
5	Building Drawing and Detailing	Balagopal and Prabhu	Spades publishing, Calicut

Course Code	**EE003**
Course Title	**Energy Science & Engineering**
Type of Course	**ES**
LTP	**1 1 0**
Credits	**2**
Course Prerequisite	
Course Objective (CO)	**To provide an introduction to energy systems and renewable energy resources, with a scientific examination of the energy field and an emphasis on alternative energy sources and their technology and application.**
Course Outcome(CO)	**1. The class will explore society's present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy** **2. The focus on alternatives, renewable energy sources such as solar, biomass (conversions), wind power, waves and tidal, geothermal, ocean thermal, hydro and nuclear.** **3. Energy conservation methods will be emphasized from Civil Engineering perspective.**

SYLLABUS

UNIT I

Introduction to Energy Science: Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment

UNIT-II

Energy Sources: Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) -past, present & future, Remedies & alternatives for fossil fuels -biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries)

UNIT III

Energy & Environment: Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; introduction to the economics of energy; How the economic system determines production and consumption; linkages between economic and environmental outcomes; How future energy use can be influenced by economic, environmental, trade, and research policy

Civil Engineering Projects connected with the Energy Sources: Coal mining technologies, Oil exploration offshore platforms, Underground and under-sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydro power stations above-ground and underground along with associated dams, tunnels, penstocks, etc.; Nuclear reactor containment buildings and associated buildings, design and construction constraints and testing procedures for reactor containment buildings; Spent Nuclear fuel storage and disposal systems

UNIT IV

Engineering for Energy conservation: Concept of Green Building and Green Architecture; Green building concepts (Green building encompasses everything from the choice of building materials to where a building is located, how it is designed and operated);LEED ratings; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates;

Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption.

REFERENCE BOOKS:

S. No	Name	Author(S)	Publisher
1	Renewable Energy (2ndedition)	Boyle, Godfrey	Oxford University Press (2004)
2	Energy Systems and Sustainability: Power for a Sustainable Future	Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.)	Oxford University Press (2004)
3	Energy and Environment Set: Mathematics of Decision Making	Jean-Philippe; Zaccour, Georges(Eds.)	Loulou, Richard; Waaub, XVIII
4	Energy & Environment: A Primer for Scientists and Engineers	EH Thorndike(1976)	Addison-Wesley Publishing Company

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Course Code	**BOT233**
Course Title	**Life Science**
Type of Course	**ES**
LTP	**1 0 0**
Credits	**1**
Course Prerequisite	
Course Objective (CO)	**To learn about work and heat interactions and balance of energy between system and its surroundings** **To learn about application of I law to various energy conversion devices** **To evaluate the changes in properties of substances in various processes** **To understand the difference between high grade and low-grade energies and II Law limitations on energy conversion**
Course Outcome(CO)	**After completing this course, the students will be able to apply energy balance to systems and control volumes, in situations involving heat and work interactions** **1. Students can evaluate changes in thermodynamic properties of substances.** **2. The students will be able to evaluate the performance of energy conversion devices** **3. The students will be able to differentiate between high grade and low-grade energies.**

SYLLABUS

UNIT I

Plant Physiology covering, Transpiration; Mineral nutrition. Ecology covering, Ecosystems- Components, types, flow of matter and energy in an ecosystem; Community ecology- Characteristics, frequency, life forms, and biological spectrum; Ecosystem structure- Biotic and a-biotic factors, food chain, food web, ecological pyramids. Population Dynamics covering, Population ecology- Population characteristics, ecotypes; Population genetics- Concept of gene pool and genetic diversity in populations, polymorphism and heterogeneity.

UNIT-II

Environmental Management covering, Principles: Perspectives, concerns and management strategies; Policies and legal aspects-Environment Protection Acts and modification, International Treaties; Environmental Impact Assessment- Case studies (International Airport, thermal power plant).

UNIT III

Molecular Genetics covering, Structures of DNA and RNA; Concept of Gene, Gene regulation, e.g., Oper on concept. Biotechnology covering, Basic concepts: Toti potency and Cell manipulation; Plant & Animal tissue culture-Methods and uses in agriculture, medicine and health; Recombinant DNA Technology-Techniques and applications.

UNIT IV

Biostatistics covering, Introduction to Biostatistics:-Terms used, types of data; Measures of Central Tendencies- Mean, Median, Mode, Normal and Skewed distributions; Analysis of Data-Hypothesis

testing and ANNOVA(single factor). Laboratory & Fieldwork Sessions covering, Comparison of stomatal index in different plants; Study of mineral crystals in plants; Determination of diversity indices in plant communities; To construct ecological pyramids of population sizes in an ecosystem; Determination of Importance Value Index of a species in a plant community; Seminar (with PPTs) on EIA of a Mega-Project(e.g., Airport, Thermal/Nuclear Power Plant/ Oil spill scenario); Preparation and extraction of genomic DNA and determination of yield by UV absorbance; Isolation of Plasmid DNA and its separation by Gel Electrophoresis; Data analysis using Bio-statistical tools.

REFERENCE BOOKS:

S. No	Name	Author(S)	Publisher
1	Principles of Biochemistry (V Edition)	Nelson, D.L.; and Cox, M. M. W. H.	Freeman and Company
2	Outlines of Biochemistry	E.E; Stump f, P. K; Bruening, G; Doi, R. H.	John Wiley and Sons
3	Biology: A global approach	Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B	Pearson Education Ltd
4	Molecular Genetics (Second edition)	Stent, G. S.; and Calender, R.W. H. Freeman and company,	CBS Publisher

Course Code	**ENG205**
Course Title	**Humanities-I (Effective Technical Communication)**
Type of Course	**HS**
LTP	**3 0 0**
Credits	**3**
Course Prerequisite	
Course Objective (CO)	**The objective of this course is to make students understand the principles and requirements of production drawings and learning how to assemble and disassemble important parts used in major Civil engineering applications. After going through this course, the student shall be able to understand the drawings of Civil components and their assemblies along with their utility for design of components.**
Course Outcome(CO)	**The student will be able to** **1. Draw the machine elements including keys, couplings, cotters, riveted, bolted and welded joints** **2. Understand the representation of materials used in machine drawing.** **3. Construct an assembly drawing using part drawings of machine components**

SYLLABUS

UNIT I

Information Design and Development- Different kinds of technical documents, Information development life cycle, Organization structures, factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media.

UNIT-II

Technical Writing, Grammar and Editing- Technical writing process, forms of discourse, Writing drafts and revising, Collaborative writing, creating indexes, technical writing style and language. Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style. Introduction to advanced technical communication, Usability, Hunan factors, Managing technical communication projects, time estimation, Single sourcing, Localization.

UNIT III

Self Development and Assessment- Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, Self-esteem. Managing Time; Personal memory, Rapid reading, Taking notes; Complex problem solving; Creativity

UNIT IV

Communication and Technical Writing- Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report. Ethics- Business ethics, Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, Engineering ethics, Managing time, Role and

responsibility of engineer, Work culture in jobs, Personal memory, Rapid reading, Taking notes, Complex problem solving, Creativity.

REFERENCE BOOKS:

S. No	Name	Author(S)	Publisher
1	Guide to writing as an Engineer	David F. Beer and David McMurrey, John Willey	New York, 2004
2	You Can Win	Shiv Khera	Macmillan Books, New York, 2003
3	Technical Communications	Raman Sharma	Oxford Publication, London, 2004

Course Code	**CE215**
Course Title	**Introduction to Civil Engineering**
Type of course	**ESC**
L T P	**2 1 0**
Credits	**2**
Course Prerequisite	**Basics of Civil Engineering**
Course Outcomes	**The student will be able to recognize the significance of civil engineering in routine life, importance of surveying, importance and requirements of building planning and will learn about construction material, role of transportation as well as of water and its conservation.**
Course Objective (CO)	**1. Identifying the various areas available to pursue and specialize within the overall field of Civil Engineering.** **2. Highlighting the depth of engagement possible within each of these areas.** **3. Exploration of the various possibilities of a career in this field.** **4. Understanding the vast interfaces this field has with the society at large.** **5. Providing inspiration for doing creative and innovative work.**

SYLLABUS

UNIT-I

Basic Understanding: What is Civil Engineering/ Infrastructure? Basics of Engineering and Importance of Civil Engineering, Possible scopes for a career

History of Civil engineering: Early constructions and developments over time; Ancient monuments & Modern marvels; Ancient monuments & Modern marvels; Development of various materials of construction and methods of construction;

Fundamentals of Architecture & Town Planning: Aesthetics in Civil Engineering, Examples of great architecture, fundamentals of architectural design & town planning; Building Systems (HVAC, Acoustics, Lighting, etc.); LEED ratings; Development of Smart cities

UNIT-II

Fundamentals of Building Materials: Stones, bricks, mortars, Plain, Reinforced & Prestressed Concrete, Construction Chemicals; Structural Steel, High Tensile Steel, Carbon Composites; Plastics in Construction; 3D printing; Recycling of Construction & Demolition wastes

Basics of Construction Management & Contracts Management: Temporary Structures in Construction; Construction Methods for various types of Structures; Major Construction equipment; Automation & Robotics in Construction; Modern Project management Systems

Environmental Engineering & Sustainability: Water treatment systems; Effluent treatment systems; Solid waste management; Sustainability in Construction;

Geotechnical Engineering: Basics of soil mechanics, rock mechanics and geology; various types of foundations; basics of rock mechanics & tunneling

UNIT-III

Hydraulics, Hydrology &Water Resources Engineering: Fundamentals of fluid flow, basics of water supply systems; Underground Structures; Underground Structures Multi- purpose reservoir projects

Ocean Engineering: Basics of Wave and Current Systems; Sediment transport systems; Ports & Harbours and other marine structures
Power Plant Structures: Chimneys, Natural & Induced Draught Colling towers, coal handling systems, ash handling systems; nuclear containment structures; hydro power projects
Structural Engineering: Types of buildings; tall structures; various types of bridges; Water retaining structures; Other structural systems; Experimental Stress Analysis; Wind tunnel studies;
Surveying & Geomatics: Traditional surveying techniques, Total Stations, Development of Digital Terrain Models; GPS, LIDAR;
Traffic &Transportation Engineering: Investments in transport infrastructure development in India for different modes of transport;

UNIT-IV
Repairs & Rehabilitation of Structures: Basics of corrosion phenomena and other structural distress mechanisms; some simple systems of rehabilitation of structures; Non- Destructive testing systems; Use of carbon fibre wrapping and carbon composites in repairs.
Computational Methods, IT, IoT in Civil Engineering: Typical software used in Civil Engineering- Finite Element Method, Computational Fluid Dynamics; Computational Geotechnical Methods; highwaydesign (MX), Building Information Modelling; Highlighting typical available software systems (SAP,STAAD,ABAQUS,MATLAB, ETAB, NASTRAN, NISA, MIKE 21, MODFLOW, REVIT, TEKLA, AUTOCAD,…GEOSTUDIO, EDUSHAKE, MSP, PRIMAVERA, ArcGIS, VisSIM,…)
Industrial lectures: Case studies of large civil engineering projects by industry professionals, covering comprehensive planning to commissioning;
Basics of Professionalism: Professional Ethics, Entrepreneurial possibilities in Civil Engineering, Possibilities for creative & innovative working, Technical writing Skills enhancement; Facilities Management; Quality & HSE Systems in Construction

REFERENCE BOOKS:

S. No	Name	Author(S)	Publisher
1	Legal Aspects of Building and Engineering Contract	Patil, B.S.	(1974)
2	The National Building Code, BIS,2017	Meena Rao	
3	Fundamental concepts in Law of Contract	Rajput	3rd Edn. Professional Offset (2006)
4	The Law of Contract: An Outline	Chandiramani, Neelima	2nd Edn. Avinash Publications Mumbai (2000)
5	Law of Contract	Avtar Singh	Eastern Book Co. (2002)
6	Indian Contract Act	Dutt	Eastern Law House (1994)

Course Code	**EE002**
Course Title	**Basic Electronics Engineering**
Type of course	**ES**
L T P	**0 0 2**
Credits	**1**
Course Prerequisite	**Basics of Electrical Engineering**
Course Objective	**1. Know broadly the concepts and functionalities of the electronic**

(CO)	**devices, tools and instruments.** **2. Understand use, general specifications and deploy abilities of the electronic devices, and assemblies.** **3. Confidence in handling and usage of electronic devices, tools and instruments in engineering applications.**

SYLLABUS

1. Laboratory Sessions covering, Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Switches (SPDT, DPDT and DIP),Bread Boards and Printed Circuit Boards (PCBs); Identification, Specifications, Testing of Active Devices– Diodes, BJTs, JFETs, MOSFETs, Power Transistors, SCRs and LEDs;
2. Study and Operation of Digital Multi Meter, Function/Signal Generator, Regulated Power Supply(z of PN Junction Diode Characteristics in A) Forward Bias B) Reverse Bias, Zener Diode Characteristics and Zener Diode as Voltage Regulator, Input and Output Characteristics of BJT in Common Emitter (CE) Configuration, Drain and Transfer Characteristics of JFET in Common Source (CS)Configuration;
3. Study of Half Wave and Full Wave Rectification, Regulation with Filters, Gain and Bandwidth of BJT Common Emitter (CE) Amplifier, Gain and Bandwidth of JFET Common Source (CS) Amplifier, Gain and Bandwidth of BJT Current Series and Voltage Series Feedback Amplifiers, Oscillation Frequency of BJT based RC Phase Shift, Hartley and Colpitts Oscillators; Module 5: Op-Amp Applications – Adder, Subtractor, Voltage Follower and Comparator; Op-Amp Applications – Differentiator and Integrator, Square Wave andTriangularWaveGeneration,Applicationsof555Timer– stable and Monost able Multi vibrators;
4. Truth Tables and Functionality of Logic Gates – NOT, OR, AND, NOR, NAND,XOR and XNOR Integrated Circuits (ICs); Truth Tables and Functionality of Flip-Flops –SR, JK and D Flip-Flop ICs; Serial-In-Serial-Out and Serial-In-Parallel-Out Shift operations using 4-bit/8-bit Shift Register ICs; Functionality of Up-Down / Decade Counter ICs.

Course Code	**CE217**
Course Title	**Computer-aided Civil Engineering Drawing Laboratory**
Type of course	**ES**
L T P	**0 0 2**
Credits	**1**
Course Prerequisite	**Nil**
Course Objective (CO)	**Practical will provide better understanding of the various commands used in auto cadd and of structures to be made using commands.**
Course Outcomes (CO)	**1. Produce and interpret 2D & 3D drawings.** **2. Do a detailed study of an engineering artifact.** **3. Develop drawings for conventional structures using practical norms.**

SYLLABUS

List of Drawing Experiments:

1. Buildings with load bearing walls including details of doors and windows.
2. Taking standard drawings of a typical two storeyed building including, joinery, re-bars, finishing and other details and writing out a description of the Facility in about 500-700 words. RCC framed structures
3. Reinforcement drawings for typical slabs, beams, columns and spread footings.
4. Industrial buildings-North light roof structures-Trusses
5. Perspective view of one and two storey buildings

Course Code	**BOT235**
Course Title	**Life Science Laboratory**
Type of course	**ES**
L T P	**0 0 2**
Credits	**1**
Course Prerequisite	
Course Objective (CO)	

SYLLABUS

Laboratory & Fieldwork Sessions covering, Comparison of stomatal index in different plants; Study of mineral crystals in plants; Determination of diversity indices in plant communities; To construct ecological pyramids of population sizes in an eco system; Determination of Importance Value Index of a species in a plant community; Seminar (with PPTs) on EIA of a Mega-Project (e.g., Airport, Thermal/Nuclear Power Plant/ Oil spill scenario); Preparation and extraction of genomic DNA and determination of yield by UV absorbance; Isolation of Plasmid DNA and its separation by Gel Electro pores is; Data analysis using Bio-statistical tools

Semester IV

Course Code	**CE220**
Course Title	**Engineering Geology**
Type of Course	**PC**
LTP	**1 0 0**
Credits	**1**
Course Prerequisite	**Basics of Soil**
Course Objective (CO)	**The objective of the course for the students to develop an understanding of the engineering properties of rocks, geological and engineering rock classification, rock failure theories and principles of rock mechanics.**
Course Outcome(CO)	**4. Know broadly the concepts and functionalities of the electronic devices, tools and instruments.** **5. Understand use, general specifications and deploy abilities of the electronic devices, and assemblies.** **6. Confidence in handling and usage of electronic devices, tools and instruments in engineering applications.**

SYLLABUS

UNIT-I

Introduction-Branches of geology useful to civil engineering, scope of geological studies in various civil engineering projects. Department dealing with this subject in India and their scope of work- GSI. Origin and composition. Physical properties of minerals, susceptibility of minerals to alteration, basic of optical mineralogy, Rock forming minerals, megascopic identification of common primary & secondary minerals.

Petrology-Rock forming processes. Specific gravity of rocks. Igneous petrology- Volcanic Phenomenon and different materials ejected by volcanoes. Types of volcanic eruption. Characteristics of different types of magma. Division of rock on the basis of depth of formation, and their characteristics. Chemical and Mineralogical Composition. Texture and its types. Various forms of rocks. Basic Igneous rocks Like Gabbro, Dolerite, Basalt. Engineering aspect to Basalt. Sedimentary petrology- mode of formation, Mineralogical Composition. Texture and its types, Structures, Gradation of Clastic rocks. Classification of sedimentary rocks and their characteristics.

UNIT-II

Physical Geology- Weathering. Erosion and Denudation. Factors affecting weathering and product of weathering. Engineering consideration. Superficial deposits and its geotechnical importance: Water fall and Gorges, River meandering.

Strength Behavior of Rocks- Stress and Strain in rocks. Concept of Rock Deformation & Tectonics. Dip and Strike. Outcrop and width of outcrop. Inliers and Outliers. Main types of discontinuities according to size. Fold- Types and nomenclature, Criteria for their recognition in field. Faults: Classification, recognition in field, effects on outcrops. Joints & Unconformity; Types, Stresses responsible, geotechnical importance. Importance of structural elements in engineering operations. Consequences of failure as land sliding, Earthquake and Subsidence. Strength of Igneous rock structures.

UNIT-III

Geological Hazards- Rock Instability and Slope movement: Concept of sliding blocks. Different controlling factors. Instability in vertical rock structures and measures to prevent collapse. Earthquake: Magnitude and intensity of earthquake. Seismic sea waves. Revelation from Seismic Records of structure of earth. Case

Study on Elevation and Subsidence in Himalayan region in India. Seismic Zone in India.

UNIT-IV

Rock Mechanics- Sub surface investigations in rocks and engineering characteristics or rocks masses; Structural geology of rocks. Classification of rocks, Field & laboratory tests on rocks, Stress deformation of rocks, Failure theories and sheer strength of rocks, Bearing capacity of rocks.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Engineering and General Geology	Parbin Singh	S K Kataria &Sons
2	Text Book of Engineering Geology	N. Chenna Kesavulu	Macmillan Publishers India
3	Geology for Geotechnical Engineers	J.C.Harvey	Cambridge University Press
4	Introductory Electronic Devices & Circuits, Conventional Flow Version	R.T. Paynter(2009),	Pearson

Course Code	**CE222**
Course Title	**Introduction to Fluid Mechanics**
Type of Course	**PC**
LTP	**2 0 0**
Credits	**2**
Course Prerequisite	**Basics of Civil Engineering**
Course Objective (CO)	**This course aims at developing and understanding of the behavior of fluids in motion or at rest and the subsequent effects of the fluid on the boundaries. The study of this subject will develop analytical abilities related to fluid flow. This is a core subject, basic knowledge of which is required by all engineers.**
Course Outcome(CO)	**1. Understand the broad principles of fluid statics, kinematics and dynamics.** **2. Understand definitions of the basic terms used in fluid mechanics.** **3. Understand classifications of fluid flow.** **4. Be able to apply the continuity, momentum and energy principles.**

SYLLABUS

UNIT-I

Basic Concepts and Definitions–Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation ofviscositywithtemperature,Newtonlawofviscosity;vapourpressure,boilingpoint,cavitation;surface tension, capillarity, Bulk modulus of elasticity, compressibility.

UNIT II

Fluid Statics - Fluid Pressure: Pressure at a point, Pascals law, pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micro manometers. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

UNIT-III

Fluid Kinematics- Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-,two and three-dimensional continuity equations in Cartesian coordinates.

UNIT-IV

Fluid Dynamics- Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : venture meter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Vortex Flow – Free and Forced; Dimensional Analysis and Dynamic Similitude-Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's π-Theorem.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher

1	Fluid Mechanics and Machinery	C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli	Oxford University Press, 2010
2	Hydraulics and Fluid Mechanics	P M Modi and S M Seth	Standard Book House
3	Theory and Applications of Fluid Mechanics	K. Subramanya	Tata McGraw Hill
4	Fluid Mechanics with Engineering Applications	R.L. Daugherty, J.B. Franzini and E.J.Finnemore	International Student Edition, McGraw Hill

Course Code	**CE224**
Course Title	**Introduction to Solid Mechanics**
Type of Course	**PC**
LTP	**2 1 0**
Credits	**3**
Course Prerequisite	**Basics of Civil Engineering**
Course Objective (CO)	**Apprise the student about basic concepts of equilibrium, stress, deformation, bending stress and other structural members.**
Course Outcome(CO)	**On completion of the course, the student will be able to:** **1. Describe the concepts and principles, understand the theory of elasticity including strain/displacement and Hooke's law relationships; and perform calculations, relative to the strength and stability of structures and mechanical component.** **2. Define the characteristics and calculate the magnitude of combined stresses in individual members and complete structures; analyze solid mechanics problems using classical methods and energy methods.** **3. Analyse various situations involving structural members subjected to combined stresses by application of Mohr's circle of stress; locate the shear center of thin wall beams.** **4. Calculate the deflection at any point on a beam subjected to a combination of loads; solve for stresses and deflections of beams under unsymmetrical loading; apply various failure criteria for general stress states at points; solve torsion problems in bars and thin walled members.**

SYLLABUS

UNIT I

Simple Stresses and Strains- Concept of stress and strain, St. Venant's principle,stressandstraindiagram,Elasticityandplasticity–Typesofstressesandstrains,Hooke'slaw–stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them –Barsofvaryingsection– compositebars–Temperaturestresses.StrainEnergy–Resilience–Gradual,sudden,impact and shock loadings– simple applications.

Compound Stresses and Strains- Two dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two dimensional stress-strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain. Relationship between elastic constants.

UNIT II

Bending moment and Shear Force Diagrams- Bending moment (BM) and shear force (SF) diagrams.BM and SF diagrams for cantilevers simply supported and fixed beams with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments.

Flexural Stresses-Theory of simple bending–Assumptions–Derivation of bending equation: $M/I = f/y = E/R$ - Neutral axis – Determination of bending stresses –Section modulus of rectangular and circular sections (Solid and Hollow).

UNIT III

Shear Stresses- Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, Tangle sections.

UNIT IV

Torsion- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion. Analysis of close-coiled-helical springs.

Thin Cylinders and Spheres- Derivation of formulae and calculations of hoop stress, longitudinal stress in a cylinder, and sphere subjected to internal pressures.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Solid Mechanics	Kazmi,S. M.A	DVNC, New York, USA
2	R. C. Mechanics of Materials	Hibbeler	NJ: PearsonPrenticeHall,2004
3	An Introduction to the Mechanics of Solids.	Crandall, S. H., N. C. Dahl	William Kendrick Hall

Course Code	**CE226**
Course Title	**Surveying & Geomatics**
Type of Course	**PC**
LTP	**1 1 0**
Credits	**2**
Course Prerequisite	**Mathematics and Measurements**
Course Objective (CO)	**The objective of the subject is to study the maps and plans and also to learn the techniques for drawing maps in plane areas and in hilly areas using different instruments.**
Course Outcome(CO)	**The course will enable the students to:** **1. Apply the knowledge, techniques, skills, and applicable tools of the discipline to engineering and surveying activities.** **2. Translate the knowledge gained for the implementation of Civil infrastructure facilities.** **3. Relate the knowledge on Surveying to the new frontiers of science like Hydrographic surveying, Electronic Distance Measurement, Global Positioning System, Photogrammetry and Remote Sensing.**

SYLLABUS

UNIT I

Introduction to Surveying: Principles, Linear, angular and graphical methods, Survey stations, Survey lines-ranging, Bearing of survey lines, Levelling: Plane table surveying, Principles of levelling- booking and reducing levels; differential, reciprocal leveling, profile levelling and cross sectioning. Digital and Auto Level, Errors in levelling; contouring: Characteristics, methods, uses; areas and volumes.

Triangulation and Trilateration**:** Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Horizontal and vertical control -methods-triangulation-network- Signals. Baseline - choices - instruments and accessories - extension of base lines -corrections - Satellite station - reduction to centre - Intervisibility of height and distances –Trigonometric leveling-Axis single corrections.

UNIT II

Modern Field Survey Systems: Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station–Accessories–Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems-Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations.

Curves, Elements of simple and compound curves – Method of setting out– Elements of Reverse curve - Transition curve – length of curve – Elements of transition curve –Vertical curves

UNIT III

Photogrammetry Surveying: Introduction, Basic concepts, perspective geometry of aerialphotograph,reliefandtiltdisplacements,terrestrialphotogrammetry,flightplanning; Stereoscopy, ground control extension for photographic mapping-aerial triangulation, radial triangulation, methods; photographic mapping-mapping using paperprints, mapping using stereo plotting instruments, mosaics, map substitutes.

UNIT IV

Remote Sensing: Introduction –Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation; digital image processing.

REFERENCE BOOKS:

S. No	Name	Author(S)	Publisher
1	Advanced Surveying: Total Station, GIS and Remote Sensing,	Madhu N, Sathikumar R and Satheesh Gobi	Pearson India 2006
2	Geomatics Engineering	Manoj, K. Arora and Badjatia	NemChand&Bros,2011
3	Surveying and Levelling, Vol.I and II	Bhavikatti, S.S	I.K.International,2010

Course Code	**CE228**
Course Title	**Structural Engineering**
Type of Course	**PC**
LTP	**2 1 0**
Credits	**3**
Course Prerequisite	**Structural Analysis**
Course Objective (CO)	**Students will be exposed to the theories and concepts of both concrete and steel design and analysis both at the element and system levels.** **Hands-on design experience and skills will be gained and learned through problem sets and a comprehensive design project.** **An understanding of real-world open-ended design issues will be developed.**
Course Outcome(CO)	**Upon completion of this course, students will be able to** **CO1: Specify a strategy for site investigation to identify the soil deposits and determine the depth and spatial extent within the ground;** **CO2: Understand various site investigation techniques and their in-situ applications;** **CO3: Prepare a soil investigation report based on bore hole log data and various in-situ tests like SPT,CPT, etc.**

SYLLABUS

UNIT-I

Introduction- concepts of energy principles, safety, sustainable development in performance; what makes a structure; principles of stability, equilibrium; what is a structural engineer, role of engineer, architect, user, builder; what are the functions' what do the engineers design, first principles of process of design. Planning and Design Process; Materials, Loads and Design Safety; Behavior and Properties of Concrete and Steel; Wind and Earthquake Loads.

UNIT-II

Materials and Structural Design Criteria: Introduction to the analysis and design of structural systems. Analyses of determinate and indeterminate trusses, beams, and frames and design philosophies for structural engineering. Laboratory experiments dealing with the analysis of determinate and indeterminate structures.

UNIT-III

Design of Structural Elements; Concrete Elements, Steel Elements, Structural Joints; Theories and concepts of both concrete and steel design and analysis both at the element and system levels. Approximate Analysis Methods as a Basis for Design; Design of Reinforced Concrete Beams for Flexure; Design of Reinforced Concrete Beams for Shear; Bond, Anchorage, and Serviceability; Reinforced Concrete Columns; Reinforced Concrete Slabs; Introduction to Steel Design; Tension Members and Connections; Bending Members; Structural Systems.

UNIT-IV

System Design Concepts; Special Topics that may be Covered as Part of the Design Project Discussions; Cable Structures; Pre stressed Concrete Bridges; Construct ability and Structural Control; Fire Protection.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Design of Concrete Structures	Nilson, A.H.	13thedition. Mc Graw Hill, 2004
2	Design of Concrete Structures, Structural Steel Design	Mc Cormac, J.C., Nelson, J.K. Jr.	3rdedition. Prentice Hall, N.J., 2003
3	Reinforced Concrete: Mechanics and Design	Mac Gregor , J. G.	3rd Edition, Prentice Hall, New Jersey, 1997
4	Design of Concrete Structures	Nilson, A.H.	13thedition. Mc Graw Hill, 2004

Course Code	**CE230**
Course Title	**Construction Engineering & Management**
Type of Course	**PC**
L T P	**2 1 0**
Credits	**3**
Course Prerequisite	**Nil**
Course Objective(CO)	**To develop knowledge of conventional and new materials of construction.**
Course Outcome	**1. An idea of how structures are built and projects are developed on the field.** **2. An understanding of modern construction practices.** **3. A good idea of basic construction dynamics- various stakeholders, project objectives, processes, resources required and project economics.**

SYLLABUS

UNIT – I

Basics of Construction- Unique features of construction, construction projects-types and features, phase sofa project, agencies involved and the ir methods of execution;

Construction project planning- Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, concept of productivities, estimating durations, sequence of activities, activity utility data; Techniques of planning- Bar charts, Gantt Charts. Networks: basic terminology, types of precedence relationships, preparation of CPM networks: activity on link and activity on node representation, computation of float values, critical and semi critical paths, calendaring networks.

UNIT – II

PERT-Assumptions under lying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion.

Construction Equipment basics: Conventional construction methods Vs Mechanized methods and advantages of latter; Equipment for Earthmoving, Dewatering; Concrete mixing, transporting & placing; Cranes, Hoists and other equipment for lifting; Equipment for transportation of materials. Equipment Productivities

UNIT – III

Planning and organizing construction site and resources- Site: site layout including enabling structures, developing site organization, Documentation at site; Manpower: planning, organizing, staffing, motivation; Materials: concepts of planning, procurement and inventory control; Equipment: basic concepts of planning and organizing; Funds: cash flow, sources of funds; Histograms and S-Curves. Earned Value; Resource Scheduling-

UNIT – IV

Bar chart, line of balance technique, resource constraints and conflicts; resource aggregation, allocation, smoothening and leveling. Common Good Practices in Construction. Construction

Costs: Make-up of construction costs; Classification of costs, time-cost trade-off in construction projects, compression and decompression.

REFERENCE BOOKS

S. No	Name	Author(s)	Publisher
1	Construction Planning and Equipment	R.L. Peurifoy	McGraw Hill
2	Project Planning with PERT and CPM	Punmia, B.C., Khandelwal, K.K	Laxmi Publications
3	Construction Equipment & Planning and Application	Mahesh Verma	Pearson Education India

Course Code	**SSC007**
Course Title	**Universal Human Values: Understanding Harmony**
Type of Course	**HS**
LTP	**300**
Credits	**3**
Course Prerequisite	**Nil**
Course Objective (CO)	**1. Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.** **2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence** **3. Strengthening of self-reflection.** **4. Development of commitment and courage to act.**
Course Outcome(CO)	**By the end of the course, students are expected** **1. Tobecomemoreawareofthemselves,andtheirsurroundings(family,society,nature)** **2. More responsible in life, and in handling problems with sustainable solutions.** **3. Keeping human relationships and human nature in mind.**

SYLLABUS

UNIT-I

Course Introduction- Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I.
2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation-as the process for self-exploration.
3. Continuous Happiness and Prosperity- A look at basic Human Aspirations
4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority.
5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario.
6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

UNIT-II

Understanding Harmony in the Human Being –Harmony in Myself!

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'.

1. Understanding the needs of Self('I') and 'Body'- happiness and physical facility.
2. Understanding the Body as an instrument of 'I'(I being the doer, seer and enjoyer).
3. Understanding the characteristics and activities of 'I' and harmony in 'I'.
4. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.
5. Programs to ensure Sanyam and Health.

Include practice sessions to discuss the role other shave played in making material goods available to me. Identifying from one's own life.

Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

UNIT-III

Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship

1. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
2. Understanding the meaning of Trust; Difference between intention and competence
3. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
4. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
5. Visualizing a universal harmonious order in society-Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.

UNIT-IV

Understanding Harmony in the Nature and Existence-Whole existence as Co existence

1. Understanding the harmony in the Nature
2. Inter connectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature.
3. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space.
4. Holistic perception of harmony a tall level so of existence.
5. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.

ImplicationsoftheaboveHolisticUnderstandingofHarmonyonProfessionalEthics

1. Natural acceptance of human values
2. Definitiveness of Ethical Human Conduct
3. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
4. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
5. Case studies of typical holistic technologies, management models and production systems
6. Strategy for transition from the present state to Universal Human Order:

a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b) At the level of society: as mutually enriching institutions and organizations

7. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g. to discuss the conduct as an engineer or scientist etc.

REFERENCE BOOKS:

S. No	Name	Author(S)	Publisher
1	Human Values	A.N. Tripathi	New Age Intl. Publishers, New Delhi,2004

2	Amarkantak	Jeevan Vidya, Ek Parichaya, ANagaraj,	Jeevan Vidya Prakashan
3	Re discovering India	Dharampal	
4	The Story of My Experiments with Truth	Mohandas Karamch and Gandhi	

Course Code	**EVS002**
Course Title	**Environmental Sciences**
Type of course	**HS**
L T P	**3 0 0**
Credits	**NC**
Course Prerequisite	**To make students aware about environment and need of maintaining it with best possible knowledge.**
Course Objective (CO)	**1. Measure environmental variables and interpret results.** **2. Evaluate local, regional and global environmental topics related to resource use and management.** **3. Propose solutions to environmental problems related to resource use and management.**
Course Outcomes (CO)	

SYLLABUS

UNIT-I

Introduction to Environment and Ecosystem: Definition and scope and importance of multi disciplinary nature of environment. Need for public awareness, Concept of Ecosystem, Structure, inter relationship, producers, Consumers and decomposers, ecological pyramids-biodiversity and importance. Hotspots of biodiversity.

UNIT-II

Environmental Pollution & Natural Resources: Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards. Solid waste Management: Causes, effects, and control measure of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster Management: Floods, earthquake, cyclone and landslides, Natural Resources, and associated problems, use and over exploitation, case studies of for ester sources and water resources.

UNIT-III

Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Re settlement andreh abilitation of people; its problems and concerns. Case studies. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.Case studies. Waste land reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of pollution) Act. Wild life Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation.3

UNIT-III

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

Visit to a local area to document environmental assets river/forest/grassland/hill/mountain; Visit to a local polluted site-Urban/Rural/Industrial/Agricultural; Study of common plants, insects, birds; Study of simple ecosystems-pond, river, hill slopes, etc.

REFERENCE BOOKS:

S. No	Name	Author(S)	Publisher
1	A Textbook for Environmental Studies	Erach Bharucha	Orient Black Swan
2	Environmental Biology,	Agarwal, K.C.2001	Nidi Publ. Ltd. Bikaner.
3	Environmental Science,	Miller T. G. Jr.	Wadsworth

Course Code	**CE232**
Course Title	**Engineering Geology Laboratory**
Type of course	**PC**
L T P	**0 0 2**
Credits	**1**
Course Prerequisite	**Basics of Soil**
Course Objective (CO)	**The objective of the course for the students to develop an understanding of the engineering properties of rocks, geological and engineering rock classification, rock failure theories and principles of rock mechanics.**
Course Outcomes (CO)	**The students will be able:** **1. To categorize rocks and minerals by their origin and engineering properties.** **2. To apply geological principles of rock masses discontinuities for use in engineering design for examples foundation.**

SYLLABUS

List of experiments

1. **Study of physical properties of minerals.**
2. Study of different group of minerals.
3. Study of Crystal and Crystal system.
4. **Identification of minerals**: Silica group: Quartz, Amethyst, Opal; Felds pargroup: Orthoclase, Plagioclase; Crypto crystalline group : Jasper; Carbon ate group : Calcite; Element group: Graphite; Pyroxene group: Talc; Mica group: Muscovite; Amphibole group: Asbestos, Olivine, Hornblende, Magnetite, Hematite, Corundum, Kyanite, Garnet, Galena, Gypsum
5. **Identification of rocks (Igneous Petrology):** Acidic Igneous rock: Granite and its varieties,Syenite,Rhyolite,Pumice,Obsidian,Scoria,Pegmatite,VolcanicTuff.Basicrock:Gabbro, Dolerite,Basaltanditsvarieties,Trachyte.
6. **Identification of rocks (Sedimentary Petrology):** Conglomerate, Breccia, Sandstone and its varieties, Laterite, Limestone and its varieties, Shales and its varieties.
7. **Identification of rocks (Metamorphic Petrolody**): Marble, slate, Gneiss and its varieties, Schist and its varieties. Quartzite, Phyllite.

Course Code	**CE234**
Course Title	**Surveying & Geometics Laboratory**
Type of course	**PC**
L T P	**0 0 2**
Credits	**1**
Course Prerequisite	**Mathematics and Measurements**
Course Objective (CO)	**The objective of the subject is to study the maps and plans and also to learn the techniques for drawing maps in plane areas and in hilly areas using different instruments.**
Course Outcomes (CO)	**1. Able to apply principles of surveying in field.** **2. Able to handling basic survey instruments including leveling.** **3. Able to development of contour maps of given area and to possess knowledge about theodolite.**

SYLLABUS

List of experiments

1. Measurement of distance, ranging a line.
2. Measurement of bearing and angles with compass, adjustment of traverse by graphical Method.
3. Different methods of leveling, height of instrument, rise & fall methods.
4. Measurement of horizontal and vertical angle by theodolite.
5. Plane table survey, different methods of plotting, two point & three point problem.
6. Determination of height of an inaccessible object.

Course Code	**CE236**
Course Title	**Introduction to Fluid Mechanics Laboratory**
Type of course	**PC**
L T P	**0 0 2**
Credits	**1**
Course Prerequisite	**Basics of Civil Engineering**
Course Objective (CO)	**The study of this subject will develop analytical abilities related to fluid flow. This is a core subject, basic knowledge of which is required by all engineers.**
Course Outcomes (CO)	**1. To understand of basic physics of fluids.** **2. Gaining knowledge to calculate and design engineering applications involving fluid.** **3. Understanding of analyzing flow systems flow systems in terms of mass, momentum and energy balance.**

SYLLABUS

List of experiments

1. Measurement of viscosity
2. Study of Pressure Measuring Devices
3. Stability of Floating Body
4. Hydrostatics Force on Flat Surfaces/Curved Surfaces
5. Verification of Bernoulli's Theorem
6. Venturi meter
7. Orifice meter
8. Impacts of jets
9. Flow Visualisation -Ideal Flow
10. Length of establishment of flow
11. Velocity distribution in pipes
12. Laminar Flow

Semester V

Course Code	**CE313**
Course Title	**Mechanics of Materials**
Type of Course	**PC**
LTP	**3 0 0**
Credits	**3**
Course Prerequisite	**+2(non-medical)**
Course Objective (CO)	**To introduce to continuum mechanics and material modeling of engineering materials based on first energy principles: deformation and strain; momentum balance, stress and stress states; elasticity and elasticity bounds; plasticity and yield design.**
Course Outcome(CO)	**CO1: An ability to apply knowledge of mathematics, science, and engineering.** **CO2: An ability to design a system, component, or processes to meet desired needs.** **CO3: A n ability to use the techniques, skills and modern engineering tools necessary for engineering practice.** **CO4. An ability to apply principles of engineering, basic science and math to model, analyze, design and realize physical systems, components or processes.**

SYLLABUS

UNIT-I

Deformation and Strain covering description of finite deformation, Infinitesimal deformation; Analysis of statically determinate trusses; Stability of dams, retaining walls and chimneys; Stress analysis of thin, thick and compound cylinder; Generalized state of stress and strain: Stress and strain tensor, Yield criteria and theories of failure; Tresca, Von-Mises, Hillcriteria, Heigh-Westerguard'sstress space.

UNIT-II

Momentum Balance and Stresses covering Forces and Moments Transmitted by Slender Members, Shear Force and Bending Moment Diagrams, Momentum Balance, Stress States/Failure Criterion. Mechanics of Deformable Bodies covering Force-deformation Relationships and Static Indeterminacy, Uniaxial Loading and Material Properties, Trusses and Their Deformations, Statically Determinate and Indeterminate Trusses.

UNIT-III

Force-Stress-Equilibrium covering Multi axial Stress and Strain, Displacement – Strain covering Multi axial Strain and Multi axial Stress-strain Relationships, Elasticity and Elasticity Bounds covering Stress-strain-temperature Relationships and Thin-walled Pressure Vessels, Stress and strain Transformations and Principal Stress, Failure of Materials.

UNIT-IV

Bending: Stress and Strains; Deflections and Torsion covering Pure Bending, Moment-curvature Relationship, Beam Deflection, Symmetry, Superposition, and Statically Indeterminate Beams, Shear

and Torsion, Torsion and Twisting, Thermo elasticity, Energy methods, Variational Methods; Strain energy, elastic, complementary and total strain energy, Strain energy of axially loaded bar, Beam in bending, shear and torsion; General energy theorems, Castigliano's theorem, Maxwell Bettie's reciprocal theorem; Virtual work and unit load method for deflection, Application to problems of beams and frames. Structural stability; Stability of columns, Euler's formula, end conditions and effective length factor, Columns with eccentric and lateral load; Plasticity and Yield Design covering 1D-Plasticity – An Energy Approach, Plasticity Models, Limit Analysis and Yield Design.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Elementary Structural Analysis	Norris, C. H. and Wilber, J. B. and Utku, S.	Mc Graw Hill, Tokyo, Japan
2	Elements of Strength of Materials	Timoshenko, S. and Young, D. H.	DVNC , New York, USA
3	SolidMechanics	Kazmi, S. M. A.	TMH, Delhi, India
4	MechanicsofMaterials	Hibbeler, R.C.	6thed. East Rutherford, NJ

Course Code	**CE319**
Course Title	**Geotechnical Engineering**
Type of Course	**PC**
LTP	**3 0 0**
Credits	**3**
Course Prerequisite	**Engineering Geology**
Course Objective (CO)	**To impart knowledge on the various factors governing the Engineering behavior of soils and the suitability of soils for various Geotechnical Engineering applications.**
Course Outcome(CO)	**After completing this course, the students should be** **CO1: Specify a strategy for site investigation to identify the soil deposits and determine the depth and spatial extent within the ground;** **CO2: Understand various site investigation techniques and their in-situ applications;** **CO3: Prepare a soil investigation report based on bore hole log data and various in-situ tests like SPT,CPT, etc.**

SYLLABUS

UNIT-I

Introduction–Types of soils, their formation and deposition, Definitions: soil mechanics, soil engineering, rock mechanics, geotechnical engineering. Scope of soil engineering. Comparison and difference between soil and rock. Basic Definitions and Relationships-Soil as three-phase system in terms of weight, volume, voids ratio and porosity. Definitions: moisture content, unit weights, degree of saturation, voids ratio, porosity, specific gravity, mass specific gravity, etc. Relationship between volume weight, voids ratio- moisture content, unit weight- percent air voids, saturation- moisture content, moisture content- specific gravity etc. Determination of various parameters such as: Moisture content by oven dry method, pycno meter, sand bath method, torsional balance method, nuclear method, alcohol method and sensors. Specific gravity by density bottle method, pycno meter method, measuring flask method. Unit weight by water displacement method, submerged weight method, core-cutter method, sand - replacement method. Plasticity Characteristics of Soil - Introduction to definitions of: plasticity of soil, consistency limits-liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and consistency indices, flow & toughness indices, definitions of activity and sensitivity. Determination of: liquid limit, plastic limit and shrinkage limit. Use of consistency limits. Classification of Soils-Introduction of soil classification: particle size classification, textural classification, unified soil classification system, Indian standard soil classification system. Identification: field identification of soils, general characteristics of soil in different groups.

UNIT II

Permeability of Soil - Darcy's law, validity of Darcy's law. Determination of coefficient of permeability: Laboratory method: constant-head method, falling-head method. Field method: pumping-in test, pumping- out test. Permeability aspects: permeability of stratified soils, factors affecting permeability of soil.

UNIT-III

Stresses in soils – Introduction, stresses due to point load, line load, strip load, uniformly loaded circular area, rectangular loaded area. Influence factors, Isobars, Boussinesq's equation, Newmark's Influence Chart. Contact pressure under rigid and flexible area, computation of displacements from elastic theory. Consolidation of Soil-Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, Terzaghi's theory of consolidation, final settlement of soil deposits, computation of consolidation settlement and secondary consolidation.

UNIT-IV

Shear Strength - Mohr circle and its characteristics, principal planes, relation between major and minor principal stresses, Mohr-Coulomb theory, types of shear tests: direct shear test, merits of direct shear test, triaxial compression tests, test behaviour of UU, CU and CD tests, pore-pressure measurement, computation of effective shear strength parameters. Unconfined compression test, vane shear test, Stability of Slopes - Introduction, types of slopes and their failure mechanisms, factor of safety, analysis of finite and infinite slopes, wedge failure Swedish circle method, friction circle method, stability numbers and charts.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Soil Mechanics	Craig R.F.	Chapman & Hall
2	Fundamentals of Soil Engineering	Taylor	John Wiley & Sons
3	An Introduction to Geotechnical Engineering	Holtz R.D. and Kovacs, W.D.	Prentice Hall, NJ
4	Principles of Geotechnical Engineering	Braja M. Das	Cengage Learning
5	Principles of Foundation Engineering	Braja M. Das	Cengage Learning

Course Code	**CE323**
Course Title	**Environmental Engineering**
Type of Course	**PC**
LTP	**2 2 0**
Credits	**3**
Course Prerequisite	**None**
Course Objective (CO)	**1. Be successful in environmental engineering practice in areas such as solid waste, air pollution, water and wastewater treatment, water resources or related fields.** **2. Show a commitment to ethical practice and professional development by extending their knowledge through continuing education and self-directed life-long learning, professional licensure, service to the profession and society.**
Course Outcome(CO)	**Upon completion of this course, the students will be able to** **CO1: Understand the impact of humans on environment and environment on humans.** **CO2: Be able to identify and value the effect of the pollutants on the environment: atmosphere, water and soil.** **CO3: Be able to plan strategies to control, reduce and monitor pollution.**

SYLLABUS

UNIT I

Water:-Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices, water safety plans, Water Supply systems, Need for planned water supply schemes, Water demand industrial and agricultural water requirements, Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs and design. Water Treatment: aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes.

UNIT II

Sewage- Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage-Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems, Storm Water- Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, National River cleaning plans, Wastewater treatment, aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage–quality requirements for various purposes. Air-Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Air pollution-Occupational hazards, Urban air pollution auto mobile pollution, Chemistry of combustion, Automobile engines, quality of fuel, operating conditions and interrelationship. Air quality standards, Control measures for Air pollution, construction and limitations Noise- Basic concept, measurement and various control methods.

UNIT III

Solid waste management-Municipal solid waste, Composition and various chemical and physical

parameters of MSW, MSW management: Collection, transport, treatment and disposal of MSW. Special MSW: waste from commercial establishments and other urban areas, solid waste from construction activities, biomedical wastes, Effects of solid waste on environment: effects on air, soil, water surface and ground health hazards. Disposal of solid waste-segregation, reduction at source, recovery and recycle. Disposal methods-Integrated solid waste management. Hazardous waste: Types and nature of hazardous waste as per the HWS schedules of regulating authorities.

UNIT IV

Building Plumbing-Introduction to various types of home plumbing systems for water supply and waste water disposal, high rise building plumbing, Pressure reducing valves, Break pressure tanks, Storage tanks, Building drainage for high rise buildings, various kinds of fixtures and fittings used. Government authorities and their roles in water supply, sewerage disposal. Solid waste management and Factor; Bonded & Unbounded strain gauges; Temperature Compensation. monitoring/control of environmental pollution.

REFERENCE BOOKS:

S. No	Name	Author(S)	Publisher
1	Introduction to Environmental Engineering and Science	Gilbert Masters	Prentice Hall, New Jersey
2	Introduction to Environmental Engineering	P. Aarne Vesilind, Susan M. Morgan	Thompson /Brooks/Cole; Second Edition 2008
3	G. Environmental Engineering	Peavy, H.s, Rowe, D.R, Tchobanoglous	Mc-Graw - Hill International Editions, New York 1985
4	Wastewater Engineering, Treatment, Disposal and Reuse	MetCalf and Eddy	Tata McGraw-Hill, New Delhi
5	Plumbing Engineering. Theory, Design and Practice	S.M. Patil	1999
6	Integrated Solid Waste Management	Tchobanoglous, Theissen & Vigil	McGraw Hill Publication

Course Code	**CE325**
Course Title	**Transportation Engineering**
Type of Course	**PC**
LTP	**3 0 0**
Credits	**3**
Course Prerequisite	**None**
Course Objective (CO)	**1. Understand the principles and practices of transportation engineering and urban transportation planning.** **2. Understand the interactions between transportation planning and land use planning, economics, social planning and master plans.** **3. Have the capability to identify and solve transportation problems within the context of data availability and limitations of analysis tools.**
Course Outcome(CO)	**Upon completion of this course, the students will be able to** **CO1: Carry out surveys involved in planning and highway alignment.** **CO2: Design the geometric elements of highways and express ways.** **CO3: Carry out traffic studies and implement traffic regulation and control measures and intersection design.** **CO4: Characterize pavement materials.** **CO5: Design flexible and rigid pavements as per IRC.**

SYLLABUS

UNIT-I

Highway development and planning - Classification of roads, road development in India, Current road projects in India; highway alignment and project preparation. Geometric design of highways-: Introduction; highway cross section elements; sight distance, design of horizontal alignment; design of vertical alignment; design of intersections, problems.

UNIT-II

Traffic engineering & control- Traffic Characteristics, traffic engineering studies,traffic flow and capacity, traffic regulation and control; design of road intersections; design of parking facilities; highway lighting; problems.

UNIT-III

Pavement materials – Materials used in Highway Construction-Soils, Stone aggregates, bituminous binders, bituminous paving mixes; Portland cement and cement concrete: desirable properties, tests, requirements for different types of pavements. Problems.

UNIT-IV

Design of pavements- Introduction; flexible pavements, factors affecting design and performance; stresses in flexible pavements; design of flexible pavements as per IRC; rigid pavements- components and functions; factors affecting design and performance of CC pavements; stresses in rigid pavements; design of concrete pavements as per IRC; problems.

REFERENCE BOOKS:

S. No	Name	Author(S)	Publisher
1	Highway Engineering	Khanna, S.K., Justo, C.E.G and Veeraragavan, A.	Revised 10th Edition, Nem Chand & Bros, 2017
2	Traffic Engineering and Transport Planning	Kadiyalai, L.R.	Khanna Publishers
3	Principles Of Transportation Engineering	Partha Chakraborty	PHI Learning
4	Principles of Highway Engineering and Traffic Analysis	Fred L. Mannering, Scott S. Washburn, Walter P. Kilareski	4th Edition, John Wiley
5	Textbook of Highway Engineering	Srinivasa Kumar, R.	Universities Press, 2011
6	Highway Engineering	Paul H. Wright and Karen K. Dixon	7th Edition, Wiley Student Edition, 2009

Course Code	**SSC006**
Course Title	**Human values and Professional Ethics**
Type of Course	**HS**
LTP	**3:0:0**
Credits	**3**
Course Prerequisite	**None**
Course Objective (CO)	**To help the students to discriminate between valuable and superficial in the life. To help students develop sensitivity and awareness; leading to commitment and courage to act on their own belief. This Course will encourage the students to discover what they consider valuable. Accordingly, they should be able to discriminate between valuable and the superficial in real situations in their life. This course is an effort to fulfill our responsibility to provide our students significant input about understanding**
Course Outcome(CO)	**The students will able to:** **CO1: Learn the moral issues and problems in engineering; find the solution to those problems.** **CO2: Learn the need for professional ethics, codes of ethics and roles, concept of safety, risk assessment.** **CO3: Gain exposure to Environment Ethics & computer ethics; know their responsibilities and rights**

SYLLABUS

UNIT-I:

Course Introduction-Need, Basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education, Understanding Happiness and Prosperity correctly.

Understanding Harmony in the Human Being: Understanding the harmony with self and the Body: Sanyam and Swasthya.

UNIT-II

Harmony in Human Relationship: Understanding harmony in the Family - the basic unit of human interaction, visualizing a universal harmonious order in society.

Understanding Harmony in the Nature and Existence: Understanding the harmony in the Nature, Holistic perception of harmony at all levels of existence.

UNIT-III

Understanding of Harmony on Professional Ethics: Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems.

UNIT-IV

Understanding of Harmony on Professional Ethics: Ability to utilize the professional competence for augmenting universal human order, Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems.

REFERENCE BOOKS:

S. No	Name	Author(S)	Publisher
1	A Foundation Course in Value Education	R RGaur, R Sangal	Excel Books Publishers
2	Energy & Equity	IvanIllich	The Trinity Press, Worcester, and Harper Collins, USA
3	Human Values and Professional Ethics	RishabhAnand	Satya Prakashan, New Delhi
4	A Foundation Course in Value Education	RRGaur, R Sangal	Excel Books Publishers

Course Code	**LAW005**
Course Title	**Constitution of India**
Type of course	**NC**
L T P	**3 0 0**
Credits	**NC**
Course Prerequisite	**None**
Course Objective (CO)	**To provide the students knowledge about basic features of Indian Constitution and various rights provided under the Constitution**
Course Outcome(CO)	**At the end of the completion of course students are expected to learn:** **CO1. To understand and explain concepts in constitutional law.** **CO2. Identify and discuss in depth the sources of constitution.** **CO3. To understand how the governance system is working in the country.** **CO4. To understand the relations between Centre and State including legislative, executive and financial.** **CO5. Understand the distinction between various constitutional organs and their relations with each other and concept of separation of power**

SYLLABUS

UNIT-I

Constitution of India: - Basic features of the Indian Constitution: Sovereign, Socialist, Secular and Democratic Republic, Preamble of the Constitution of India: Text and features of Indian Federation and its importance, Nature of Indian Federalism and Centre-State Relations

UNIT-II

Fundamental Duties: Fundamental Duties included in the Constitution, Importance of Fundamental Duties, Directive Principles of the State Policy: Nature and Classification of Directive Principles, Criticism & Importance of Directive Principles, Parliament: Characteristics, Powers & Actual role of Parliament, Decline in the position of Parliament.

UNIT-III

President: Method & Stages of President Election, Powers and Position of the President, Prime Minister: Appointment of the Prime Minister, Powers, Changing role of Prime Minister, Supreme Court: Its Composition, Powers and Functions of Supreme Court, Position and Independence of judiciary.

UNIT-IV

Governor: Appointment, Powers and position of the Governor, Chief Minister: Powers and Position of the State Council Minister & Chief Minister, High Court: Its Composition, Powers and Functions of Supreme Court

REFERENCE BOOKS:

S. No	Name	Author(S)	Publisher
1	Indian Constitutional Law	M.P. Jain	Lexis Nexis, 2014
2	Introduction to Constitution	D.D. Basu	Lexis Nexis, 2014
3	Constitutional Law of India	H.M Seervai	Universal Law Publishing, 2015

Course Code	**CE327**
Course Title	**Geotechnical Engineering Laboratory**
Type of course	**PC**
L T P	**0 0 2**
Credits	**1**
Course Prerequisite	**None**
Course Objective (CO)	**This course is aimed to develop analytical skills in dealing with soil as a medium of water flow, a medium for structural supports and a primary building material.**
Course Outcome(CO)	**1. To determine index properties of soils.** **2. To determine engineering properties of soil.** **3. To evaluate compressive behaviour of soils.** **4. To evaluate strength behaviour of soils.**

SYLLABUS

List of experiments

1. Field Density using Core Cutter method.
2. Field Density using Sand replacement method.
3. Natural moisture content using Oven Drying method.
4. Field identification of Fine Grained soils.
5. Specific gravity of Soils.
6. Grain size distribution by Sieve Analysis.
7. Grain size distribution by Hydrometer Analysis.
8. Consistency limits by Liquid limit
9. Consistency limits by Plastic limit
10. Consistency limits by Shrinkage limit.
11. Permeability test using Constant-head test method.
12. Permeability test using Falling-head method.
13. Compaction test: Standard Proctor test.
14. Compaction test: Modified Proctor test.
15. Relative density.
16. Consolidation Test.
17. Tri axial Test(UU)
18. Vane shear test
19. Direct Shear Test
20. Unconfined Compression Strength Test

Course Code	**CE329**
Course Title	**Transportation Engineering Laboratory**
Type of course	**PC**
L T P	**0 0 2**
Credits	**1**
Course Prerequisite	**Nil**
Course Objective (CO)	**The objective of the subject is to study highway project planning and to design various elements of roads.**
Course Outcomes	**The experiments will provide better understanding of the materials and their behavior under various loading conditions.**

SYLLABUS

List of experiments

Tests on Sub-grade Soil

1. California Bearing Ratio Test

Tests on Road Aggregates

2. Crushing Value Test
3. Los Angles Abrasion Value Test
4. Impact Value Test
5. Shape Test (Flakiness and Elongation Index)

Tests on Bituminous Materials and Mixes

6. Penetration Test
7. Ductility Test
8. Softening Point Test
9. Flash & Fire Point Test
10. Bitumen Extraction Test

Professional Elective I

Course Code	**CE331**
Course Title	**Geotechnical Design**
Type of Course	**PE**
L T P	**3 0 0**
Credits	**3**
Course Prerequisite	**Nil**
Course Objective(CO)	**The student would be well acquainted with the various investigation specifications as per the infrastructure to be built on the proposed site.**
Course Outcome	**1. Knowing about the properties of materials required for the constructing a desired infrastructure.** **2. Familiar with design concepts of various foundation systems.** **3. Familiar with design of transportation facilities.**

SYLLABUS

UNIT – I

Sub surface site evaluation; integrated design of retaining walls,

UNIT – II

Subsurface site evaluation; integrated design of foundations, pavements

UNIT – III

Subsurface site evaluation; integrated design of materials for airports, highways

UNIT – IV

Subsurface site evaluation; integrated design of dams, or other facilities

REFERENCE BOOKS

S. No	Name	Author(s)	Publisher
1	Analysis and Design of Substructures	Swami Saran	Oxford and IBH Publishing Company Pvt. Ltd.
2	Modern Geotechnical Engineering	A. Singh	CBS Publishers, New Delhi
3	Principles of Geotechnical Engineering	Braja M. Das	Cengage Learning

Course Code	**CE333**
Course Title	**Foundation Engineering**
Type of Course	**PE**
L T P	**3 0 0**
Credits	**3**
Course Prerequisite	**Soil Mechanics and Structures**
Course Objective(CO)	**Learn about types and purposes of different foundation systems and structures.**
Course Outcome	**1. Have an exposure to the systematic methods for designing foundations.** **2. Be able evaluate the feasibility of foundation solutions to different types of soil conditions considering the time effect on soil behaviour.** **3. Have necessary theoretical background for design and construction of foundation systems.**

SYLLABUS

UNIT – I

Analysis and design of foundations, types of foundations.

UNIT – II

Bearing capacity and settlement of foundations; ground movements due to construction.

UNIT – III

Analysis and design of excavations, retaining walls.

UNIT – IV

Cuts & excavations and sheet piles, slopes and underground structures.

REFERENCE BOOKS

S. No	Name	Author(s)	Publisher
1	Modern Geotechnical Engineering	A. Singh	CBS Publishers, New Delhi
2	Principles of Foundation Engineering	B.M. Das	Thomson Asia, Singapore
3	Theory and Practice of Foundation Design	N. Som	Prentice Hall

Course Code	**CE335**
Course Title	**Offshore Engineering**
Type of Course	**PE**
L T P	**3 0 0**
Credits	**3**
Course Prerequisite	**Dynamics and Fluid mechanics**
Course Objective(CO)	**Students will be introduced to modeling and different stages of the design process of offshore engineering**
Course Outcome	**The students will be able to** **1. Floatation and stability of floating offshore platform.** **2. Deep and shallow water wave kinematics.** **3. Wave, wind, current and motion induced loading on offshore energy structures.**

SYLLABUS

UNIT – I

Introduction to offshore structures, codes of practice, offshore project management, deep water.

UNIT – II

Off shore site investigations, geophysical methods.

UNIT – III

Off shore sediment sampling, in-situ testing, geological aspects;

UNIT – IV

Development of design stratigraphies.

REFERENCE BOOKS

S. No	Name	Author(s)	Publisher
1	Offshore operations and engineering	Singh SSP, Jatin R Aggarwal	Taylor & Francis
2	Offshore mecatronics systems engineering	Karimi. HR	CRC Press
3	Offshore mechanics	Karimirad, Michailids	Wiley

Course Code	**CE337**
Course Title	**Railway Engineering**
Type of Course	**PE**
L T P	**3 0 0**
Credits	**3**
Course Prerequisite	**Transportation Engineering I**
Course Objective(CO)	**To provide knowledge about basics and design aspects of railway tracks and airports.**
Course Outcome	**1. Impart basic knowledge of railway track components and their functions.** **2. Introduce geometric design, signaling and control system.** **3. Acquaint with bridge technology.**

SYLLABUS

UNIT – I

Railway track gauge, alignment of railway lines, engineering surveys and construction of new lines, tracks and track stresses; rails, sleepers; ballast; sub grade and formation.

UNIT – II

Track fittings and fastenings, creep of rails, geometric design of track, curves and super-elevation, points and crossings, track junctions and simple track layouts; rail joints and welding of rails.

UNIT – III

Track maintenance, track drainage; modern methods of track maintenance, rehabilitation and renewal of track.

UNIT – IV

Tractive resistance and power, railway stations and yards; railway tunneling; signaling and interlocking; maintenance of railways and high speed trains

REFERENCE BOOKS

S. No	Name	Author(s)	Publisher
1	Railway Engineering	CS Saxena; SP Arora	Dhanapt Rai Publications
2	Railway Engineering	Chandra S., and Aggarwal	M.M. Oxford University Press, New Delhi,
3	Railway Track Engineering	J. S. Mundrey	McGraw Hill Publishing Co., 2009

Semester VI

Course Code	**CE318**
Course Title	**Hydraulic Engineering**
Type of Course	**PC**
LTP	**2 1 0**
Credits	**3**
Course Prerequisite	**None**
Course Objective (CO)	**To introduce the students to various hydraulic engineering problems like open channel flows and hydraulic machines.**
Course Outcome(CO)	**CO1: The students will be able to apply their knowledge of fluid mechanics in addressing problems in open channels.** **CO2: They will possess the skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions.** **CO3: They will have knowledge in hydraulic machineries (pumps and turbines).**

SYLLABUS

UNIT-I

Laminar Flow- Laminar flow through: circular pipes, annulus and parallel plates. Stoke's law, Measurement of viscosity. Turbulent Flow- Reynolds experiment, Transition from laminar to turbulent flow. Definition of turbulence, scale and intensity, Causes of turbulence, instability, mechanism of turbulence and effect of turbulent flow in pipes. Reynolds stresses, semi-empirical theories of turbulence, Prandtl's mixing length theory, universal velocity distribution equation. Resistance to flow of fluid in smooth and rough pipes. Boundary Layer Analysis-Assumptionand concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.

UNIT-II

Dimensional Analysis and Hydraulic Similitude: Dimensional homogeneity, Rayleigh method, Buckingham's Pi method and other methods. Introduction to Open Channel Flow-Comparison between open channel flow and pipe flow, geometrical parameters of a channel, classification of open channels, classification of open channel flow, Velocity Distribution of channel section. Uniform Flow-Continuity Equation, Energy Equation and Momentum Equation, Characteristics of uniform flow, Chezy's formula, Manning's formula. Factors affecting Manning's Roughness Coefficient " n. Most economical section of channel. Computation of Uniform flow, Norma ldepth.

UNIT-III

Non-Uniform Flow-Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth and Critical depth. Channel Transitions. Measurement of Velocity-Current meter, Floats, Hot-wire anemometer. Gradually Varied Flow-Dynamic Equation of Gradually Varied Flow,Classification of channel bottom slopes, Classification of surface profile, Characteristics of surface profile. Computation of water surface profile by graphical, numerical and analytical approaches. Hydraulic Jump-Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses, surge as a moving hydraulic jump. Positive and negative surges.

UNIT-IV

Flow through Pipes: Loss of head through pipes, Darcy-Wies batch equation, minor losses, total energy equation,

hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel, flow through laterals, flows in dead end pipes, siphon, power transmission through pipes, nozzles. Analysis of pipe networks: Hardy Cross method, water hammer in pipes and control measures, branching of pipes, three reservoir problem

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Hydraulics and Fluid Mechanics	P.M. Modi and S.M. Seth	Standard Book House
2	Theory and Applications of Fluid Mechanics	K. Subramanya	Tata McGraw Hill
3	OpenChannelHydraulics	Ven Te Chow	Tata McGraw Hill
4	ElectromagneticDistanceMeasurement	Burnside, C.D.	BeekmanPublishers,1971

Course Code	**CE312**
Course Title	**Engineering Economics, Estimation & Costing**
Type of Course	**PC**
L T P	**2 1 0**
Credits	**3**
Course Prerequisite	**Nil**
Course Objective(CO)	**To estimate the quantity of materials in a building and its probable cost.**
Course Outcome	**1. Have an idea of Economics in general, Economics of India particularly for public sector agencies and private sector businesses.** **2. Be able to perform and evaluate present worth, future worth and annual worth analyses on one of more economic alternatives.** **3. Be able to carry out and evaluate benefit/cost, life cycle and break even analyses on one or more economic alternatives.**

SYLLABUS

UNIT – I

Basic Principles and Methodology of Economics. Demand/Supply – elasticity –Government Policies and Application. Theory of the Firm and Market Structure. Basic Macro-economic Concepts (including GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies. Aggregate demand and Supply (IS/LM). Price Indices(WPI/CPI), Interest rates, Direct and Indirect Taxes

Public Sector Economics –Welfare, Externalities, Labour Market. Components of Monetary and Financial System, Central Bank –Monetary Aggregates; Commercial Banks &their functions; Capital and Debt Markets. Monetary and Fiscal Policy Tools & their impact on the economy–Inflation and Phillips Curve.

UNIT – II

Elements of Business/Managerial Economics and forms of organizations. Cost &Cost Control – Techniques, Types of Costs, Lifecycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI,IRR, Payback Period, Depreciation, Time value of money (present and future worth of cash flows). Business Forecasting – Elementary techniques. Statements – Cash flow, Financial. Case Study Method.

Indianeconomy-Briefoverviewofpost-independenceperiod–plans.PostreformGrowth,StructureofproductiveactivityIssuesofInclusion–Sectors,States/Regions, Groups of people (M/F), Urbanization. Employment–Informal, Organized, Unorganized, Public, Private. Challenges and Policy Debates in Monetary, Fiscal, Social, External sectors.

UNIT – III

*Estimation/*Measurementsforvariousitems-IntroductiontotheprocessofEstimation; Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Estimating Earthwork and Foundations, Estimating Concrete and Masonry, Finishes, Interiors, MEP works;

BIM and quantity take-offs; adding equipment costs; labour costs; rate analysis; Material survey- Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost, cost sensitive index, market survey of basic materials. Use of Computers in quantity surveying

Specifications- Types requirements and importance, detailed specifications for buildings, roads, minor bridges and industrial structures.

Rate analysis-Purpose, importance and necessity of the same, factors affecting, task work, daily output from different equipment/productivity.

UNIT – IV

Tender- Preparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification. General and special conditions, termination of contracts, extra work and Changes, penalty and liquidated charges, Settlement of disputes,

R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc. Preparing Bids- Bid Price build up: Material, Labour, Equipment costs, Risks, Direct & Indirect Overheads, Profits; Bid conditions, alternative specifications; Alternative Bids. Bid process management

Introduction to Acts pertaining to-Minimum wages, Workman's compensation, Contracts, Arbitration, Easement rights.

REFERENCE BOOKS

S. No	Name	Author(s)	Publisher
1	Estimating and Costing	B.N. Datta,	UBSPD, New Delhi
2	Estimating and Costing	G.S. Birdie	Dhanpat Rai Publication
3	Estimating and Costing	V.N. Chakravorty	Calcutta

Professional Elective II

Course Code	**CE324**
Course Title	**Structural Analysis**
Type of Course	**PE**
L T P	**3 0 0**
Credits	**3**
Course Prerequisite	**Knowledge of Solid Mechanics**
Course Objective(CO)	**The objective of this course is to introduce the students with various types of structures and the concept of stability, determinacy and analysis of their structures.**
Course Outcome	**1. Ability to distinguish between stable and unstable structures.** **2. Apply different methods to calculate slopes and deflections.** **3. Ability to model and analyze structural system.**

SYLLABUS

UNIT – I

Direct stiffness method of structural analysis; fundamentals and algorithms. Virtual work and energy principles. Numerical analysis of plane trusses, grids and frames.

UNIT – II

Introduction to the finite element method for plane stress and plane strain, Analysis of building frames; Kani's, moment distribution and other methods and Approximate methods. Slope and deflection- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.

UNIT – III

Stiffness matrix method. Application to simple problems of beams and frames; Flexibility matrix method. Application to simple problems of beams and frames; Moving loads for determinate beams

UNIT – IV

Different load cases, Influence lines for forces for determinate beams; Influence lines for pin-jointed trusses; Influence lines for indeterminate beams using Muller Breslau principle. Influence lines for Arches and stiffening girders.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Basic Structural Analysis	C.S. Reddy	Tata McGraw Hill, New Delhi
2	Analysis of Structures Vol- I and Vol- II	Vazirani VN; Ratwani MM; Duggal SK	Khanna publications
3	Intermediate Structural Analysis	C.K. Wang	McGraw Hill Education, Europe
4	Theory of Structures	S. Ramamurthum: R Narayan	Dhanpat Rai Publishing Company

Course Code	**CE326**
Course Title	**Concrete Technology**
Type of Course	**PE**
L T P	**3 0 0**
Credits	**3**
Course Prerequisite	**Knowledge of Solid Mechanics and Building Technology**
Course Objective(CO)	**To make the students well acquainted with the basics of RCC & RCC structures and design of various RCC structural components using appropriate codes.**
Course Outcome	**1. To understand concepts related to properties of concrete and its constituents.** **2. To present foundation to basic engineering tools and concepts related to concrete technology.** **3. To give an experience in implementation of engineering concepts in the field of civil engineering.**

SYLLABUS

UNIT – I

Concrete; Properties of ingredients, tests, Production of concrete, mixing, compaction curing, Properties of fresh concrete; Defects in Concrete, Concrete additives; Behavior of concrete in tension and compression, shear and bond, Influence of various factors on test results,

UNIT – II

Time dependent behavior of concrete -creep, shrinkage and fatigue; Concrete mix design; Proportioning of concrete mixes, basic considerations, cost specifications, factors in the choice of mix proportion, different method of mix design.

UNIT – III

Quality control, Behavior of concrete in extreme environment; temperature problem in concreting, hot weather, cold weather and under water conditions, Resistance to freezing, sulphate and acid attack, efflorescence, fire resistance.

UNIT – IV

Inspection and testing of concrete-Concrete cracking, types of cracks, causes and remedies Non-destructive tests on concrete; Chemical tests on cement and aggregates; Special concrete; types and specifications, Fibre reinforced and steel Fibre reinforced concrete, Polymer concrete, Use of admixtures; Deterioration of concrete and its prevention Repair and rehabilitation.

REFERENCE BOOKS

S. No	Name	Author(s)	Publisher
1	Concrete Technology	MS Shetty	S Chand
2	Concrete Technology, 5th Edition	ML Ghambhir	McGraw Hill, New Delhi

3	Limit State Design of Reinforced Concrete	Varghese	Prentice Hall of India, New Delhi

Course Code	**CE328**
Course Title	**Bridge Engineering**
Type of Course	**PE**
L T P	**3 0 0**
Credits	**3**
Course Prerequisite	**Concrete Structures**
Course Objective(CO)	**The objective of the course is to teach students about bridge engineering design.**
Course Outcome	**1. Able to learn about components, classifications and choice of bridge type.** **2. To apply various standard specifications for road bridges.** **3. Able to gain knowledge about different type of bridges.**

SYLLABUS

UNIT – I

General; classification of bridges, sites election, geometric and hydraulic design consideration, loading standards for highway and railway bridges

UNIT – II

General design consideration; optimum spans; Concrete bridges: culverts; Slab, T-beam, box girder bridges, balanced cantilever bridge, cable stayed bridge, extra dos bridges; arch bridge; Special requirements for Pre-stressed Concrete bridges.

UNIT – III

Steel bridges: plate girder bridge, truss bridge, suspension cable bridge, cable stayed bridge

UNIT – IV

Substructures: design of piers and abutments, pile and well foundations, bearings and expansion joints, special wearing coats; seismic design considerations; Aero dynamic stability considerations; special durability measures; provisions for inspection and maintenance.

REFERENCE BOOKS

S. No	Name	Author(s)	Publisher
1	Essentials of Bridge Engineering	Johnson, Victor	Oxford University Press
2	A Text book of Bridge Construction	Khadilkar, C. H.	Allied Publishers.
3	Bridge Engineering	Rangwala, S. C.	Charotar Publishing House Pvt. Ltd.
4	Concrete Bridges Handbook	Raina, V. K.	Shroff Publishers and Distributors
5	Bridge Engineering	Ponnuswamy, S.	McGraw Hill Education

Course Code	**CE336**
Course Title	**Design of Structural Systems**
Type of Course	**PE**
L T P	**3 0 0**
Credits	**3**
Course Prerequisite	**Knowledge of Structural Analysis I**
Course Objective(CO)	**To learn advanced methods like matrix methods of structural analysis plastic theory.**
Course Outcome	**1. Evaluate structural design analysis.** **2. Analyze structure cost and value.** **3. Analyze loading system of structures.**

SYLLABUS

UNIT – I

The whole structural design process including definition of functional requirements.

UNIT – II

Selection of structural scheme, formulation of design criteria

UNIT – III

Preliminary and computer-aided proportioning

UNIT – IV

Analysis of response, cost, and value

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Theory of structures	B.C. Punmia, Ashok Jain, Arun Jain	Laxami Publications
2	Basic structural analysis	C.S Reddy	Tata McGraw Hill
3	Indeterminate structure analysis	C.K Wang	McGraw Hill
4	Structural analysis-A matrix approach	G.S Pandit& Gupta	McGraw Hill

Professional Elective III

Course Code	**CE330**
Course Title	**Reinforced Concrete**
Type of Course	**PE**
L T P	**3 0 0**
Credits	**3**
Course Prerequisite	**Structural Analysis**
Course Objective (CO)	**To enhance competence in design of reinforced concrete structures and to familiarize the students with the concepts of design concrete mixes using different methods of proportioning and to understand the effects of various parameters.**
Course Outcome	**The students will be able to** **1. Explain the basic concepts of structural design methods of RCC to the practical problem.** **2. Use the knowledge in structural planning and design of various components of buildings.** **3. Explain the composite action of reinforced steel and concrete in reinforced concrete structural members.**

SYLLABUS

UNIT – I

Study of the strength, behavior, and design of reinforced concrete members subjected to moments.

UNIT – II

Study of the strength, behavior, and design of reinforced concrete members subjected to shear.

UNIT – III

Study of the strength, behavior, and design of reinforced concrete members subjected to axial forces.

UNIT – IV

Extensive discussion of the influence of the material properties on behavior.

REFERENCE BOOKS

S. No	Name	Author(s)	Publisher
1	Reinforced Concrete: Mechanics and Design	MacGregor, J. G	Prentice Hall, New Jersey
2	Reinforced Concrete: A Fundamental Approach	Nawy, E. G.	Prentice Hall, New Jersey
3	Reinforced Concrete Design	Wang C-K. and Salmon	Addison Wesley, New York

Course Code	**CE332**
Course Title	**Structural Dynamics**
Type of Course	**PE**
L T P	**3 0 0**
Credits	**3**
Course Prerequisite	**Structural Analysis**
Course Objective (CO)	**The objective is to provide the fundamental understanding of dynamic structure and introduce students to analytical and numerical methods in structural dynamics with emphasis on vibration and to optimize system for desired dynamic response.**
Course Outcome	**1. Apply knowledge of mathematics, science and engineering by developing the equation of motion for vibratory systems and solving for the free and forced response.** **2. Intercept dynamics analysis results for design analysis and research purposes.** **3. Analyze different systems with distributed load.**

SYLLABUS

UNIT – I

Analysis of the dynamic response of structures and structural components to transient loads and foundation excitation.

UNIT – II

Single-degree-of-freedom and multi-degree-of-freedom systems;

UNIT – III

Response spectrum concepts; simple inelastic structural systems.

UNIT – IV

Introduction to systems with distributed mass and flexibility.

REFERENCE BOOKS

S. No	Name	Author(s)	Publisher
1	Dynamic of Structures	Anil K Chopra	Prentice Hall of India Ltd, New Delhi
2	Structural Dynamics	Marion Paz and Leigh	CBS Publishers
3	Structural Dynamics for Structural Engineers	G C Hard and K Wang	John Wiley and Sons

Course Code	**CE334**
Course Title	**Design of Concrete Structures**
Type of Course	**PE**
L T P	**3 0 0**
Credits	**3**
Course Prerequisite	**Knowledge of Solid Mechanics and Building Technology**
Course Objective(CO)	**To make the students well acquainted with the basics of RCC & RCC structures and design of various RCC structural components using appropriate codes.**
Course Outcome	**1. Able to describe about characteristics of cement, sand and aggregates.** **2. Able to illustrate design philosophies.** **3. Able to solve problems in context to beams and slabs.**

SYLLABUS

UNIT – I

Study of the strength, behavior and design of indeterminate reinforced concrete structures, Load and stresses, load combinations, Working stresss and limit state approach. Analysis and design of sections in bending–working stress and limit state method, Rectangular and T-sections, Beams with reinforcement in compression, One-way slab.

UNIT – II

Design for shear and bond, Mechanism of shear and bond failure, Design of shear using limit state concept, Development length of bars; Design of sections in torsion. Design of two-way slabs; Design of flat slab–direct method; Circular slab; Slab type stair case, Placement of reinforcement in slabs; Voided slab

UNIT – III

Design of compression members, Short column, Columns with uni-axial and bi-axial bending; Long columns, use of design charts. Design of foundation; Wall footing, Isolated and combined footing for columns.

UNIT – IV

Introduction, pre-stressing system, losses in pre-stress, Design of simple span girders, Design of end block; Design of staircases; Design of cantilever and counter-forte type retaining wall; All design steps/process to as per the most recent BIS code of practices

All designs to be as per the most recent BIS standards as applicable.

REFERENCE BOOKS

S. No	Name	Author(s)	Publisher
1	Reinforced Concrete Design	Pillai U. and Menon D	Tata McGraw Hill, New Delhi (2003).
2	Limit State Design of R.C.C. Structures	Jain A.K	Nem Chand & Sons, Roorkee(2002).
3	Limit State Design of	Varghese	Prentice Hall of India, New

	Reinforced Concrete		Delhi
4	Advanced Design of Structures	N. Krishna Raju	CBS Publishers and Distributors

Course Code	**CE338**
Course Title	**Industrial Structures**
Type of Course	**PE**
L T P	**3 0 0**
Credits	**3**
Course Prerequisite	**Steel and Concrete Structures**
Course Objective(CO)	**It provides the ability in analysis and design of basic reinforced concrete and Steel components. To study of advanced topics including theory and design of reinforced concrete structures**
Course Outcome	**1. Acquired adequate knowledge of statistics and probability related to reliability analysis.** **2. Acquired adequate knowledge of statistics and probability related to reliability systems.** **3. Ability to carry out reliability based design procedure for structural problems.**

SYLLABUS

UNIT – I

Industrial steel building frames: Types of frames, bracing, crane girders and columns, workshop sheds, trussed bents, Pressed steel tank, circular tank

Transmission and Communication towers: Types and configuration, Analysis and design; Chimneys; Loads and stresses in chimney shaft, Earthquake and wind effect, Stresses due to temperature difference, combined effect of loads and temperature, temperature.

UNIT – II

Design ofchimney;SilosandBunkers;Jassen'stheory,Airy'stheory,Shallowanddeepbins,Rectangular bunkers with slopping bottom, Rectangular bunkers with high side walls; Steel stacks; introduction, force acting on a steel stack, design consideration, design example of stacks

UNIT – III

Concrete Shell Structures: Folded plate and cylindrical shell structures; Introduction, structural behaviour of long and short shells, beam and arch action, analysis and design of cylindrical shell structures, Analysis and design of folded plates

UNIT – IV

Machine foundations; introduction, machine vibration, structural design of foundation to rotary machines, impact machines, vibration characteristics, design consideration of foundation to impact machine, grillage, pile and raft foundation.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Advanced Reinforced Concrete Design	N. Krishna Raju.	New Delhi: CBS Publishers Distributors
2	Design of Steel Structures	Duggal	New Delhi: McGraw-Hill Education

Course Code	**MGT007**
Course Title	**Organizational Behaviour**
Type of Course	**MC**
L T P	**3 0 0**
Credits	**3**
Course Prerequisite	**Nil**
Course Objective(CO)	**The aim is to enable the student to know about the behavior of Individual in the organization.**
Course Outcome	

SYLLABUS

UNIT – I

Organization Behavior: its Concepts, Features and Importance, Challenges and Opportunities for OB. Foundations of Individual Behavior. Learning, Concept, Theories and Principles of learning, Reinforcement. Perception**,** Concept, Perceptual Process, Factors in Interpersonal perception. Attitude**,** Concept, Components, Attitude formation, Values & Beliefs.

UNIT – II

Leadership, Concept, Theories and Leadership Styles in Management.
Transactional Analysis: Life positions, Levels of Self Awareness-Johari window Model, Ego States. Motivation: Nature, importance, process, Theories of Motivation, Application of Motivation Perception: Concept, Theories of Personality, Determinants of Personality

UNIT – III

Group Dynamics: Concept and nature of group formation, Models of Group formation, Theories of group formation. Group decision making techniques. Difference between group and team, Types of Teams, Power and Politics: Concept, Bases of power, Tactics to gain Power, Techniques of politics. Stress Management: Meaning, Concept, Causes of Organization Stress, Stress Management.

UNIT – IV

Organization Change: Concept, Change Agents, Resistance to change, Overcoming resistance to change, Organization Culture: Concept, functions of Organization Culture, Development and implications of Organization Culture, Creating and sustaining Organization Culture.

REFERENCE BOOKS

S. No	Name	Author(s)	Publisher
1	Organizational Behavior	Luthans,F	McGraw –Hill Inc.
2	Understanding Organizational Behaviour	Pareek, U	Oxford University Press, Delhi.

Course Code	**SSC008**
Course Title	**Gender, Culture and Development**
Type of Course	**OE**
L T P	**3 0 0**
Credits	**3**
Course Prerequisite	**None**
Course Objective(CO)	**The objective of this course is to build an understanding and initiate and strengthen programmes combating gender-based violence and discrimination**
Course Outcome	**Upon completion of this course, students will be able to** **1. Understand basic gender concepts.** **2. Explain gender roles and relationships matrix.** **3. Identify Gender-based violence from a human rights perspective** **4. Develop relationship between gender, development and violence**

SYLLABUS

UNIT – I

Introduction to Gender

1. Definition of Gender
2. Basic Gender Concepts and Terminology
3. Exploring Attitudes towards Gender
4. Social Construction of Gender

UNIT – II

Gender Roles and Relations

1. Types of Gender Roles
2. Gender Roles and Relationships Matrix
3. Gender-based Division and Valuation of Labour

UNIT – III

Gender Development Issues

1. Identifying Gender Issues
2. Gender Sensitive Language
3. Gender, Governance and Sustainable Development
4. Gender and Human Rights

Gender-based Violence

1. The concept of violence
2. Types of Gender-based violence
3. The relationship between gender, development and violence
4. Gender-based violence from a human rights perspective

UNIT – IV

Gender and Culture

1. Gender and Film
2. Gender and Electronic Media
3. Gender and Advertisement
4. Gender and Popular Literature

Semester VII

Course Code	**CE409**
Course Title	**Hydrology & Water Resources Engineering**
Type of Course	**PC**
LTP	**3 1 0**
Credits	**4**
Course Prerequisite	**NA**
Course Objective (CO)	**To know diverse methods of collecting the hydrological information, which is essential, to understand surface and ground water hydrology.** **To know the basic principles and movements of ground water and properties of ground water flow.**
Course Outcome(CO)	**Student will be able to** **CO1: Understand the interaction among various processes in the hydrologic cycle.** **CO2: Understand the basic aquifer parameters and estimate groundwater resources for different hydro-geological boundary conditions.** **CO3: Apply the application of fluid mechanics and use of computers in solving a host of problems in hydraulic engineering.**

SYLLABUS

UNIT I

Introduction - hydrologic cycle, Precipitation - forms of precipitation, characteristics of precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, depth-area-duration relationships, maximum intensity/depth – duration – frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India.

UNIT II

Abstractions from precipitation - evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapo transpiration, measurement of evapo transpiration, evapo transpiration equations, potential evapo transpiration over India, actual evapo transpiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration in dices. Runoff- runoff volume, SCS-CN method of estimating runoff volume, flow-duration curve, flow-mass curve, hydrograph, factors affecting runoff hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph surface water resources of India, environmental flows.

UNIT III

Groundwater and well hydrology-forms of subsurface water, saturated formation, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests. Water with drawals and uses – water for energy production, water for agriculture, water for hydroelectric generation; flood control. Analysis of surface water supply, Water requirement of crops-Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, infiltration, consumptive use, irrigation

requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle /drip irrigation.

UNIT IV

Distribution systems - canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels-rigid boundary channels, all uvial channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals, types of lining. Drainage of irrigated lands: necessity, methods.

Dams and spillways - embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Engineering Hydrology	K Subramanya	Mc-Graw Hill
2	Applied Hydrology	K N Muthreja	Tata Mc-Graw Hill
3	Water Resources Engineering through Objective Questions	K Subramanya	Tata Mc- Graw Hill
4	Irrigation Engineering	G L Asawa	Wiley Eastern
5	Water Resources Engineering	L W Mays	Wiley
6	Irrigation	J D Zimmerman	John Wiley & Sons
7	Engineering Hydrology	C S P Ojha, R Berndts son and P Bhunya	Oxford

Course Code	**CE405**
Course Title	**Civil Engineering - Societal & Global Impact**
Type of Course	**HS**
L T P	**2 0 0**
Credits	**2**
Course Prerequisite	**Nil**
Course Objective(CO)	**To aware the importance of Civil Engineering and the impact it has on the Society and at global levels, the impact of Civil Engineering for the various specific fields of human endeavor and need to think innovatively to ensure sustainability**
Course Outcome	**1. The impact which Civil Engineering projects have on the Society at large and on the global arena and using resources efficiently and effectively.** **2. The extent of Infrastructure, its requirements for energy and how they are met: past, present and future.** **3. The Sustainability of the Environment, including its Aesthetics, The potentials of Civil Engineering for Employment creation and its Contribution to the GDP.**

SYLLABUS

UNIT – I

Introduction to Course and Overview; Understanding the past to look into the future: Pre-industrial revolution days, Agricultural revolution, first and second industrial revolutions, IT revolution; Recent major Civil Engineering breakthroughs and innovations; Present day world and future projections, Ecosystems in Society and in Nature; the steady erosion in Sustainability; Global warming, its impact and possible causes; Evaluating future requirements for various resources; GIS and applications for monitoring systems; Human Development Index and Ecological Footprint of India Vs other countries and analysis;

Understanding the importance of Civil Engineering in shaping and impacting the world; The ancient and modern Marvels and Wonders in the field of Civil Engineering; Future Vision for Civil Engineering

UNIT – II

Infrastructure-Habitats, Megacities, Smart Cities, futuristic visions; Transportation (Roads, Railways & Metros, Airports, Seaports, River ways, Sea canals, Tunnels (below ground, underwater); Futuristic systems (ex, Hyper Loop); Energy generation (Hydro, Solar (Photovoltaic, Solar Chimney), Wind, Wave, Tidal, Geothermal, Thermal energy); Water provisioning; Telecommunication needs (towers, above-ground and underground cabling); Awareness of various Codes & Standards governing Infrastructure development; Innovations and methodologies for ensuring Sustainability

UNIT – III

Environment- Traditional & futuristic methods; Solid waste management, Water purification, Wastewater treatment & Recycling, Hazardous waste treatment; Flood control(Dams, Canals, River interlinking), Multi-purpose water projects, Atmospheric pollution; Global warming phenomena and Pollution Mitigation measures, Stationarity and non-stationarity; Environmental Metrics & Monitoring; Other Sustainability measures; Innovations and methodologies for ensuring Sustainability.

Built environment – Facilities management, Climate control; Energy efficient built environments and LEED ratings, Recycling, Temperature/Sound control in built environment, Security systems; Intelligent/ Smart Buildings; Aesthetics of built environment, Role of Urban Arts Commissions; Conservation, Repairs & Rehabilitation of Structures & Heritage structures; Innovations and methodologies for ensuring Sustainability

UNIT – IV

Civil Engineering Projects – Environmental Impact Analysis procedures; Waste(materials, manpower, equipment) avoidance/ Efficiency increase; Advanced construction techniques for better sustainability; Techniques for reduction of Green House Gas emissions in various aspects of Civil Engineering Projects; New Project Management paradigms & Systems (Ex. Lean Construction), contribution of Civil Engineering to GDP, Contribution to employment(projects, facilities management), Quality of products, Health & Safety aspects for stakeholders; Innovations and methodologies for ensuring Sustainability during Project development

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Global Challenges and the Role of Civil Engineering	*Žiga*Turk	Geological and Earthquake Engineering, Vol.32. Springer, Dordrecht
2	Engineering impacting Social, Economical and Working Environment,	Brito, Ciampi, Vasconcelos, Amarol, Barros	Engineering for the Developing World, The Bridge
3	Grand Challenges for Engineering	NAE	Ohio University Press

Course Code	**CE419**
Course Title	**Disaster Preparedness & Planning Management**
Type of Course	**PC**
L T P	**1 1 0**
Credits	**2**
Course Prerequisite	**Environmental Impact assessment**
Course Objective(CO)	**The objective of this course is to make students aware of the various elements of rural technology and community development.**
Course Outcome	**The course is intended to provide a** **1. General concept in the dimensions of disasters caused by nature beyond the human control.** **2. The disasters and environmental hazards induced by human activities with emphasis on disaster preparedness, response and recovery.**

SYLLABUS

UNIT I

Introduction – Concepts and definitions: disaster, hazard, vulnerability, risks-severity, frequency and details, capacity, impact, prevention, mitigation).

UNIT II

Disasters - Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); man-made disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemicals pills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

UNIT III

Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

UNIT IV

Disaster Risk Reduction (DRR)- Disaster management cycle–its phases; prevention, mitigation, preparedness, relief and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority. Disasters, Environment and Development - Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.),sustainable and environmental friendly recovery; reconstruction and development methods.

REFERENCE BOOKS

S. No	Name	Author(s)	Publisher
1	Disaster Risk Reduction in South Asia	Pradeep Sahni	Prentice Hall, 2004
2	Handbook of Disaster Management: Techniques & Guidelines	Singh B.K.	Rajat Publication, 2008
3	Disaster Management	Ghosh G.K.	APH Publishing Corporation, 2006

Professional Elective IV

Course Code	**CE411**
Course Title	**Design of Steel Structures**
Type of Course	**PE**
L T P	**3 0 0**
Credits	**3**
Course Prerequisite	**Nil**
Course Objective(CO)	**To make the students acquainted with the basics and design of various components used in fabrication of steel.**
Course Outcome	**1. Ability to design steel structures.** **2. Gain technical expertise to analyze different steel structures.** **3. Ability to insight relevant codes of practice.**

SYLLABUS

UNIT – I

Properties of materials; loads and stresses, Design of semi-rigid, rigid and moment resistant connections; Built-up sections

UNIT – II

Design of tension members subjected to axial tension and bending, splicing of tension member, Design of compression members, Beam-column connections, Design of columns and their bases

UNIT – III

Design of flexural members and Plate girder; loads, specification and design Industrial buildings; loads, design of purlins, trusses, bracings; gantry girders

UNIT – IV

Introduction to Plastic analysis; Simple cases of beams and frames; All design steps/process to as per the most recent BIS code of practices

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Design of steel structures:	L S Negi	Macmillan Education
2	Design of steel structures:	Arya AS and Ajmani	Nem chand& bros Roorkee
3	Design of steel structures: Vol-I and Vol II	Chandra R	Standard book house
4	Limit state design of steel structures	S.K Duggal	Tata Mc Graw Hills

Course Code	**CE413**
Course Title	**Pre-stressed Concrete**
Type of Course	**PE**
L T P	**3 0 0**
Credits	**3**
Course Prerequisite	**Design of Concrete Structures**
Course Objective(CO)	**To provide an exposure to design of pre stressed concrete structures and structural elements.**
Course Outcome	**1. Ability to carry out pre-stressed concrete systems.** **2. Able to fundamental principles as well as design aids.** **3. Develop competence in load conditions.**

SYLLABUS

UNIT – I

Study of strength, behavior, and design of prestressed reinforced concrete members.

UNIT – II

Design of prestressed reinforced concrete structures.

UNIT – III

Primary emphasis on pretensioned, precast construction

UNIT – IV

Emphasis on the necessary coordination between design and construction techniques inprestressing.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Pre-stressed concrete,	R. Krishna Raju,	Tata McGraw Hill
2	Pre-stressed Concrete	R. Rajagopalan,	Alpha science international
3	Pre-stressed Concrete	PanditG.S.Gupta S.P	CBS Publishers
4	IS Code of practice for Pre-stressed Concrete	IS 1343-1980	BIS New Delhi 1980

Course Code	**CE415**
Course Title	**Airport Planning and Design**
Type of course	**PE**
L T P	**3 0 0**
Credits	**3**
Course Prerequisite	**Nil**
Course Objective(CO)	**To provide knowledge about basics and design aspects of airports**
Course Outcome	**1. Investments in transport infrastructure; Developments and challenges in Intelligent Transport Systems.** **2. Urban Transport; Plan a sustainable transport system for a city.** **3. Identify key features/components in the planning and design of a green field airport and the cost–economics.**

SYLLABUS

UNIT – I

Aircraft characteristics; Aircraft performance characteristics: Airport planning and air travel demand forecasting: Airport Site Selection;

UNIT – II

Geometric Designof the Airfield: Determination of Runway Capacity and Delay - Taxiway and Gate Capacity -Holding Aprons - Terminal Aprons

UNIT – III

Airport drainage - Function of Airport Passenger and Cargo Terminal -Design of Air Freight Terminals –Airport access –Airport Landside planning - Capacity

UNIT – IV

Air Traffic Management: Navigational aids: ground based systems, satellite based systems – Air traffic control and surveillance facilities – Airfield lighting – air traffic management.

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Airport Planning and Design	Khanna, S.K., Arora, M.G., and Jain, S.S	Nem Chand & Bros. Roorkee, 1999.
2	Airport Engineering Planning and Design	Subhash C. Sexena	ICAO Agency
3	Planning and Design of Airports	Horenjeff, R. and McKelvey, F	McGraw Hill Company, New York, 1994.

Course Code	**CE417**
Course Title	**Pavement Design**
Type of Course	**PE**
L T P	**3 0 0**
Credits	**3**
Course Prerequisite	**Transportation Engineering**
Course Objective(CO)	**The objective in the design of the road pavement is to select appropriate pavement and surfacing materials, types, layer thickness and configuration to ensure that the pavement performs adequately and requires minimal maintenance.**
Course Outcome	**1. Characterize pavement materials.** **2. Design flexible and rigid pavements as per IRC.** **3. Carry out surveys involved in planning and highway alignment.**

SYLLABUS

UNIT – I

Introduction: Types and component parts of pavements, Factors affecting design and performance of pavements. Highway and airport pavements.

UNIT – II

Stresses and Deflections in Flexible Pavements: Stresses and deflections in homogeneous masses. Burmister's two-layer theory, three layer and multi-layer theories; wheel load stresses, various factors in traffic wheel loads; ESWL of multiple wheels. Repeated loads and EWL factors; sustained loads. Pavement behaviour under transient traffic loads.

UNIT – III

Flexible Pavement Design Methods for Highways and Airports: Empirical, semi-empirical and theoretical approaches, development, principle, design steps, advantages; design of flexible pavements as per IRC; Stresses in Rigid Pavements: Types of stresses and causes, factors influencing the stresses; general considerations in rigid pavement analysis, EWL; wheel load stresses, warping stresses, frictional stresses, combined stresses.

UNIT – IV

Rigid Pavement Design: Types of joints in cement concrete pavements and their functions, joint spacings; design of CC pavement for roads and runways as per IRC, design of joint details for longitudinal joints, contraction joints and expansion joints. IRC method of design by stress ratio method. Design of continuously reinforced concrete pavements; Maintenance, repair and rehabilitation of pavements including design of bituminous and concrete overlays as per IRC

REFERENCE BOOKS:

S. No	Name	Author(s)	Publisher
1	Principals of Pavement Design	Yoder, E. J., and M. W. Witczak	Wiley Publication.
2	Highway engineering	Khanna, S. K., and C. E. G. Justo,	Nem Chand & Bros., Roorkee
3	Principles of Transportation Engineering	Chakraborty,P. and A.Das,	Prentice Hall India.
4	Pavement Analysis and Design	Yang H. Huang	Prentice Hall.

OPEN ELECTIVE

Course Code	**CE340**
Course Title	**Construction Practice**
Type of Course	**Open Elective**
LTP	**3 0 0**
Credits	**3**
Course Prerequisite	**Nil**
Course Objective (CO)	**Upon the completion of the course students will demonstrate the ability to:** **1. Common terminology and units of measurements** **2. Composition and properties of common building materials** **3. Standard sizes and shapes**
Course Outcome(CO)	**1. Predict the properties of building stones and its classifications.** **2. Understand the concept of various methods of manufacture of bricks.** **3. Identify rock using basic geological classification systems.** **4. Obtain differentiate the fine aggregates and coarse aggregates under various views.** **5. Explain various types of cements and their applications in construction. Various field and laboratory tests on cement.**

Syllabus

Unit-I

INTRODUCTION: Introduction, Principles of building planning, classification building and planning and building by laws.

STONES, BRICKS AND AGGREGATES:

Properties of building stones, relation to their structural requirements. Classification of stones, stone quarrying, precautions in blasting, dressing of stone, composition of good brick earth, various methods of manufacture of bricks, Comparison between clamp burning and kiln burning; Fine aggregate: Natural and manufactured: Sieve analysis, zoning, specify gravity, bulking, moisture content, deleterious materials; Coarse aggregate: Natural and manufactured: Importance of size, shape and texture.

Unit-II

CEMENT AND ADMIXTURES

Various types of cement and their properties; Various field and laboratory tests for cement; Various ingredients of cement concrete and their importance, various tests for concrete; Field and tests admixtures, mineral and chemical admixture.

Unit-III

BUILDING COMPONENTS AND FOUNDATIONS

Lintels, arches, different types of floors-concrete, mosaic, terrazzo floors, pitched, flat and curved roofs, lean-to roof, coupled roofs, trussed roofs, king and queen post trusses; RCC roofs, madras terrace/shell roofs. Stairs: Definitions, technical terms and types of stairs, requirements of good stairs; Geometrical design of RCC doglegged and open-well stairs Foundations: Shallow foundations, spread, combined, strap and mat footings

Unit-IV WOOD, ALUMINUM AND GLASS

Structure, properties, seasoning of timber; Classification of various types of woods used in buildings, defects in timber; Alternative materials for wood, galvanized iron, fibre-reinforced plastics, steel, aluminium; Types of masonry, English and Flemish bonds, rubble and ashlars masonry, cavity and partition walls

Text Books:

1. S. K. Duggal, “Building Materials”, New Age International Publishers.
2. Sushil Kumar “Building Materials and construction”, Standard Publishers, 20th edition, reprint, 2015.
3. Dr.B. C. Punmia, Ashok kumar Jain, Arun Kumar Jain, “Building Construction”, Laxmi Publications (P) ltd., New Delhi. 4. Rangawala S. C. “Engineering Materials‖”, Charter

Publishing House, Anand, India

Reference Books:

1. PC Verghese, “Building Construction”, PHI.
2. R. Chuddy, “Construction Technology”,Vol 1&2, Longman UK.
3. Subhash Chander, “Basic Civil Engineering”, Jain Brothers.

Course Code	**CE421**
Course Title	**METRO SYSTEMS AND ENGINEERING**
Type of Course	**Open Elective**
LTP	**3 0 0**
Credits	**3**
Course Prerequisite	**Nil**
Course Objective (CO)	**At the end of the course the student will be able to:** **CO1: Explain the different metro systems** **CO2: Discuss construction methods for elevated and underground section** **CO3: .Explain the construction quality and safety**
Course Outcome(CO)	**1. Explain the construction methods of Metro Systems** **2. Explain the requirements of commercial and service buildings for Metros** **3. Describe various initial surveys and investigations for Metro construction**

SYLLABUS

UNIT-I OVERVIEW:

General: Overview of Metro Systems; Need for Metros; Routing studies; Basic Planning and Financials.

UNIT-II CONSTRUCTION METHODS:

Civil Engineering- Overview and construction methods for elevated and underground stations; Viaduct spans and bridges; Underground tunnels; Depots; Commercial and Service buildings. Initial Surveys & Investigations;

UNIT-III

QUALITY & SAFETY SYSTEMS:

Basics of Construction Planning & Management, Construction Quality & Safety Systems. Traffic integration, multimodal transfers and pedestrian facilities; Environmental and social safeguards; Track systems-permanent way. Facilities Management

Learning outcomes:

UNIT-IV

OPERATION CONTROL CENTER:

Electronics and Communication Engineering- Signaling systems; Automatic fare collection; Operation Control Centre (OCC and BCC); SCADA and other control systems; Platform Screen Doors.

MECHANICAL & ROLLING STOCK:

Mechanical & TVS, AC: Rolling stock, vehicle dynamics and structure; Tunnel Ventilation systems; Air conditioning for stations and buildings; Fire control systems; Lifts and Escalators. ELECTRICAL: OHE, Traction Power; Substations- TSS and ASS; Power SCADA; Standby and Back-up systems; Green buildings, Carbon credits and clear air mechanics.

TEXT BOOKS:

1. Paul Garbutt, World Metro Systems, Capital Transport Pub; 2nd Edition, 1997.

REFERENCES:

1. General & Technical information of Hyderabad Metro
2. General & Technical information of Delhi Metro

Course Code	**CE423**
Course Title	**Environmental Systems**
Type of Course	**Open Elective**
LTP	**3 0 0**
Credits	**3**
Course Prerequisite	**Nil**
Course Objective (CO)	**1. conduct hands-on laboratory and field investigations using safe, environmentally appropriate, and ethical practices;** **2. use scientific methods during laboratory and field investigations;** **3. use critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom;** **4. understand the relationships of biotic and abiotic factors within habitats, ecosystems, and biomes;** **5. recognize the interrelationships among the resources within the local environmental system;**
Course Outcome(CO)	**CO1 Gain knowledge about environment and ecosystem.** **CO2 Students will learn about natural resource, its importance and environmental impacts of human activities on natural resource.** **CO3 Gain knowledge about the conservation of biodiversity and its importance.** **CO4 Aware students about problems of environmental pollution, its impact on human and ecosystem and control measures.** **CO5 Students will learn about increase in population growth and its impact on environment**

Syllabus

Unit _I

Introduction; Environment, Systems and its Types, Science and Environment, Environmental science Tools, Dynamic Earth.

UNIT-II

Organisation of life, how ecosystem works, Aquatic Ecosystem, biomes

UNIT-III

Understanding the Population, Effects of Population on Environments and remedial Measures.

UINT-IV

Biodiversity; definition, types of Bio Diversity, Importance of Biodiversity in India.

Reference Books:

1. Environmental Assessment in Practice (Routledge Environmental Management) by Owen Harrop and Ashley Nixon.
2. Environmental Management: Text and Cases by Krishnamoorthy Bala.

3. Environmental Management by Ajith Sankar.
4. Corporate Environmental Management: A Study With Reference to India by Banerjee and Bhabatosh.

Course Code	**CE420**
Course Title	**Environmental Law and Policy**
Type of Course	**Open Elective**
LTP	**3 0 0**
Credits	**3**
Course Prerequisite	**Nil**
Course Objective (CO)	**1. To explain the role of law, policy and institutions in the conservation and management of natural resources as well as pollution control** **2. To introduce the laws and policies both at the national and international level relating to environment** **3. To equip the students with the skills needed for interpreting laws, policies and judicial decisions.**
Course Outcome(CO)	**1. Be familiar with the laws, policies and institutions in the field of environment.** **2. Acquire the skills needed for interpreting laws, policies and judicial decisions in a holistic perspective.** **3. Acquire the ability to evaluate the role of law and policy in conservation and management of natural resources and prevention of pollution**

Syllabus

UNIT I:

An introduction to the legal system; Constitution, Acts, Rules, Regulations; Indian Judiciary, Doctrine of precedents, judicial review, Writ petitions, PIL–liberalization of the rule of locus standi, Judicial activism. Introduction to environmental laws in India; Constitutional provisions, Stockholm conference; Bhopal gas tragedy; Rio conference. General principles in Environmental law: Precautionary principle; Polluter pays principle; Sustainable development; Public trust doctrine. Overview of legislations and basic concepts.

UNIT II: -

Forest, Wildlife and Biodiversity related laws Evolution and Jurisprudence of Forest and Wildlife laws; Colonial forest policies; Forest policies after independence. Statutory framework on Forests, Wildlife and Biodiversity: IFA, 1927; WLPA, 1972; FCA, 1980; Biological Diversity Act, 2002; Forest Rights Act, 2006. Strategies for conservation–Project Tiger, Elephant, Rhino, Modulew leopard.

UNIT III: -

Air, Water and Marine Laws National Water Policy and some state policies Laws relating to prevention of pollution, access and management of water and institutional mechanism: Water Act, 1974; Water Cess Act, 1977, EPA, 1986. Pollution Control Boards Ground water and law Judicial remedies and procedures Marine laws of India; Coastal zone regulations. Legal framework on Air pollution: Air Act,1981; EPA, 1986.

UNIT IV

Environment protection laws and large Projects Legal framework on environment protection-Environment Protection Act as the framework legislation–strength and weaknesses; EIA; National Green tribunal The courts infrastructure projects.

International Environmental law An introduction to International law; sources of international law; law of treaties; signature, ratification Evolution of international environmental law: Customary principles; Common but differentiated responsibility, Polluter pays.

TEXT BOOKS:

Materials Required text

1. Divan S. and Rosencranz A. (2005) Environmental Law and Policy in India, 2 nd ed., Oxford, New Delhi
2. Leelakrishnan P. (2008) Environmental Law in India, 3rd ed., Lexis Nexis, India.

Course Code	**CE422**
Course Title	**Ecological Engineering**
Type of Course	**Open Elective**
LTP	**3 0 0**
Credits	**3**
Course Prerequisite	**Nil**
Course Objective (CO)	**Upon completion of the course students will be able to:** **1) Understand and describe important physical, chemical, and biological processes that affect ecosystem integrity;** **2) Explain, use, and illustrate mass balances, water balances, energy balances, and chemical balances as tools to help understand and describe ecosystem functions;** **3) Familiarity with approaches to ecological restoration of streams and rivers, wetlands and riparian areas, lakes and reservoirs, and coastal ecosystems;**
Course Outcome(CO)	**CO1: Able to Identify, formulate and solve complex problems in field of civil engineering.** **CO2: Able to recognize ethical and professional responsibilities** **CO3: Apply engineering design while considering public, safety and welfare.**

Syllabus

UNIT I

Graphics or GIS Course

Introduction to Engineering Graphics, Introduction to Geographic Information Systems in Forest Resources, Principles of Cartography, Geographic Information System Applications to Forest Resources.

UNIT II

Measurements Thread

Plane Surveying, Surveying Engineering, Natural Resource Measurements, Photogrammetry, Fisheries Techniques

UNIT III

Mechanics Thread

Engineering Statics, Introduction to Mechanics of Materials, Fluid Mechanics, Basic Soil Mechanics

UNIT IV

General Engineering

Computer Programming for Engineers and Scientists I, Kinematics and Dynamics, Thermodynamics.

General Forest Engineering

Timber Harvesting, Wildland Hydrology, Properties of Biological Materials, Silvicultural Engineering Systems, Ecological Basis of Forest Engineering, **Design** Introduction to Forest Engineering Design, Advanced Forest Engineering Design.

Course Code	**CE424**
Course Title	**Air and Noise Pollution Control**
Type of Course	**Open Elective**
LTP	**3 0 0**
Credits	**3**
Course Prerequisite	**Nil**
Course Objective (CO)	**To understand and evaluate the behaviour of air and noise pollutants and the strategies to control their presence in the ambient atmosphere.**
Course Outcome(CO)	**The students should be able to:** **1. Brief on the behaviour of air pollutants in atmosphere** **2. Design different types of control equipment's for the abatement of air and noise.** **3. Evaluate the engineering solutions for industrial and vehicular air pollution problems**

Syllabus

Unit I

General properties of particle and flue gas and particle dynamics.

Design of control device for gaseous pollutant-absorption-adsorption incineration-condensation

Design of control device for particulate pollutant-Gravity settler Cyclone separators- fabric filters Electrostatic Precipitator -wet scrubber.

Unit II

Industrial Air Pollution Control: Dust control and abatement measures in mines; role of green belts. Thermal power plants: Control principle to improve overall thermal efficiency, Fuel and flue gas desulphurization, FBC, control of NOx, control of mercury, concept of Integrated Gasification Combined Cycle (IGCC) and Carbon Capture and Storage (CCS). Control of motor vehicle emissions.

Unit III

Indoor air pollution control, auxiliary equipments design for air pollution control such as hoods, fans and ducts, calculation to estimate pressure drop due to air pollution control device and total cost estimation procedure including operating cost.

Unit IV

Noise Control Measures - Sound Absorption, Acoustic Barrier, Vibration Isolation, Vibration Damping, Muffling, Personal Protector Green Belt Development--Principles and design considerations, Industrial Noise Pollution Control methods.

Text Books:

1. Theodore, L. Air pollution control equipment calculations, John Wiley & Sons, Inc 2008
2. De Nevers, N., Air Pollution Control Engineering, 3rd edition Waveland Press Inc 2016.
3. Noise Pollution and Control Strategy- by Sagar Pal Singal, Alpha Science International Ltd; 2005 2nd Edition.
4. Noise Control: Principles and Practice – Bruel & Kjaer, 2nd ed. B & K Pub., Denmark 1982.

Reference Books:

1. W. T. Davis, Air Pollution Engineering Manual, 2nd edition., Wiley-Inter-Science Publication, John Wiley and Sons Inc 2000.
2. Industrial Noise Control and Acoustics – Randall F Barron, Marcel Dekker, Inc., New York 2002.
3. Engineering Noise Control: Theory and Practice – David Bies et. al., Routledge Publishers 1988.

Course Code	**CE426**
Course Title	**Engineering Materials for Sustainibility**
Type of Course	**Open Elective**
LTP	**3 0 0**
Credits	**3**
Course Prerequisite	**Nil**
Course Objective (CO)	**This course offers students the ability to understand the economic, environmental and social aspects of sustainability as they pertain to engineering design, as well as the ability to speak professionally about environmental and sustainability issues.**
Course Outcome(CO)	**CO 1 Understand the relevance and the concept of sustainability and the global initiatives in this direction** **CO 2 Explain the different types of environmental pollution problems and their sustainable solutions** **CO 3 Discuss the environmental regulations and standards**

SYLLABUS

UNIT- I

Sustainability: Introduction, concept, evolution of the concept; Social, environmental and economic sustainability concepts; Sustainable development, Nexus between Technology and Sustainable development; Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs), Clean Development Mechanism (CDM).

UNIT-II

Sustainability- need and concept, technology and sustainable development-Natural resources and their pollution, Carbon credits, Zero waste concept. Life Cycle Analysis, Environmental Impact Assessment studies, Sustainable habitat, Green buildings, green materials, Energy, Conventional and renewable sources, Sustainable urbanization, Industrial Ecology.

UNIT-III

Environmental Pollution: Air Pollution and its effects, Water pollution and its sources, Zero waste concept and 3 R concepts in solid waste management; Greenhouse effect, Global warming, Climate change, Ozone layer depletion, Carbon credits, carbon trading and carbon foot print, legal provisions for environmental protection.

UNIT-IV

Resources and its utilisation: Basic concepts of Conventional and non-conventional energy, General idea about solar energy, Fuel cells, Wind energy, Small hydro plants, bio-fuels, Energy derived from oceans and Geothermal energy.

Reference Books:

- Environmental studies by Rajagopalan- Oxford University Press.
- Waste Water Treatment & Disposal Metcalf & Eddy – TMH publication.
- Environmental Engg. – Peavy, Rowe – McGraw Hill Publication.
- Waste Water Treatment Rao & Dutta.

Course Code	**CE428**
Course Title	**Solid and Hazardous Waste Management**
Type of Course	**Open Elective**
LTP	**3 0 0**
Credits	**3**
Course Prerequisite	**Nil**
Course Objective (CO)	**1. Understanding of problems of municipal waste, biomedical waste, hazardous waste, e-waste, industrial waste etc.** **2. Knowledge of legal, institutional and financial aspects of management of solid wastes.** **3. Become aware of Environment and health impacts solid waste mismanagement**
Course Outcome(CO)	**After completion of the course students should be able to-do sampling and characterization of solid waste; analysis of hazardous waste constituents including QA/QC issues; understand health and environmental issues related to solid waste management; apply steps in solid waste management-waste reduction at source, collection techniques, materials and resource recovery/recycling, transport, optimization of solid waste transport, treatment.**

Syllabus

UNIT I SOURCES, CLASSIFICATION AND REGULATORY FRAMEWORK

Types and Sources of solid and hazardous wastes - Need for solid and hazardous waste management – Elements of integrated waste management and roles of stakeholders - Salient features of Indian legislations on management and handling of municipal solid wastes, hazardous wastes, biomedical wastes, lead acid batteries, electronic wastes , plastics and fly ash – Financing waste management.

UNIT II WASTE CHARACTERIZATION AND SOURCE REDUCTION

Waste generation rates and variation - Composition, physical, chemical and biological properties of solid wastes – Hazardous Characteristics – TCLP tests – waste sampling and characterization plan - Source reduction of wastes –Waste exchange - Extended producer responsibility - Recycling and reuse Practical: Composition of MSW, Determination of Physical and Chemical Properties of MSW.

UNIT III STORAGE, COLLECTION AND TRANSPORT OF WASTES

Handling and segregation of wastes at source – storage and collection of municipal solid wastes – Analysis of Collection systems - Need for transfer and transport – Transfer stations Optimizing waste allocation– compatibility, storage, labeling and handling of hazardous wastes – hazardous waste manifests and transport.

UNIT IV WASTE PROCESSING TECHNOLOGIES AND DISPOSAL

Objectives of waste processing – material separation and processing technologies – biological &chemical conversion technologies – methods and controls of Composting - thermal conversion technologies, energy recovery – incineration – solidification & stabilization of hazardous wastes- treatment of biomedical wastes.

Waste disposal options – Disposal in landfills - Landfill Classification, types and methods – site selection - design and operation of sanitary landfills, secure landfills and landfill bioreactors – leachate and landfill gas

management – landfill closure and environmental monitoring – Rehabilitation of open dumps – landfill remediation

Text books: -

1. George Techobanoglous et al, ‖Integrated Solid Waste Management‖, McGraw - Hill, 2014.
2. Manual on Municipal Solid waste Management, CPHEEO, Ministry of Urban Development, Govt. Of. India, New Delhi, 2000.
3. Techobanoglous Thiesen Ellasen; Solid Waste Engineering Principles and Management, McGraw - Hill 1997.

References

1. R.E.Landrefh and P.A.Rebers,‖ Municipal Solid Wastes-Problems & Solutions‖ ,Lewis, 1997.
2. Blide A.D.& Sundaresan, B.B,‖Solid Waste Management in Developing Countries‖, INSDOC, 1993.
3. Georges E. Ekosse, Rogers W'O Okut-Uma, Pollution control & Waste management in Developing Countries, Commonwealth Publishers, New Delhi, 2000.
4. B. B. Sundaresan, A. D. Bhide – Solid Waste Management, Collection, Processing and Disposal, Mudrashilpa Offset Printers, 2001.

Course Code	**CE430**
Course Title	**Rural water Supply and onsite Sanitation Systems**
Type of Course	**Open Elective**
LTP	**3 0 0**
Credits	**3**
Course Prerequisite	**Nil**
Course Objective (CO)	**Student should be able to make technology choice to deal with water quality issues, operate and maintain working treatment systems and do troubleshooting of the problems in these systems. The student will be able to apply the knowledge gained from the subject in EIA studies for water component and water pollution control strategies.**
Course Outcome(CO)	**1. Understand water quality concepts and their effect on treatment process selection.** **2. Appreciate the importance and methods of operation and maintenance of water supply systems.** **3. Communicate effectively in oral and written presentations to technical and non-technical audiences.**

Syllabus

Unit 1

Rural Water Supply: Issues of rural water supply -Various techniques for rural water supply- merits-National rural drinking water program- rural water quality monitoring and surveillance -operation and maintenance of rural water supplies

Unit 2

Low Cost Water Treatment: Introduction - Epidemiological aspects of water quality- methods for low cost water treatment- Specific contaminant removal systems.

Unit 3

Rural Sanitation: Introduction to rural sanitation-Community and sanitary latrines-planning of wastewater collection system in rural areas- Ecological sanitation approach - Grey water and storm water management - catch basins-constructed wetlands- roughing filters- stabilization ponds - septic tanks-anaerobic baffled reactors-soak pits- low cost excreta disposal systems Village ponds as sustainable wastewater treatment system-Wastewater disposal

Unit 4

Solid Waste Management: Disposal of Solid Wastes- Composting land filling- incineration- Biogas plants- Other specific issues and problems encountered in rural sanitation.

Reference Books:

1. Eulers, V.M.andSteel,EW MunicipalandRuralSanitation, 6thEd McGraw HillBook Company.
2. Wright, F.B. Rural water Supply and Sanitation, E.Robert Krieger Publishing Company Huntington, New York
3. Juuti, P. Tapio S. Kand Vuorinen H.Environmental History of Water: Global Viewson Community Water Supply and Sanitation, IWA Publishing
(IndWater Assoc).
4. Winbald, U and Simpson-Hebert M. Ecological Sanitation SEI Stockholm Sweden.
5. Kadlec R.HandWallace S.D.TreatmentWetlands, CRCPress, Boca Raton

Course Code	**CE432**
Course Title	**TRANSPORT OF WATER AND WASTEWATER**
Type of Course	**Open Elective**
LTP	**3 0 0**
Credits	**3**
Course Prerequisite	**Nil**
Course Objective (CO)	**1. To educate the students in detailed design concepts related to water transmission mains,** **2. To educate the students in detailed design concepts related water distribution system, sewer networks and storm water drain** **3. To educate the students in detailed design concepts related computer application on design.**
Course Outcome(CO)	**On Completion of the Course the student will** **1. Be able to select various pipe materials for water supply main, distribution network and sewer** **2. Be able to design water supply main, distribution network and sewer for various field conditions** **3. Troubleshooting in water and sewage transmission be able to use various computer software for the design of water and sewage network**

Syllabus

UNIT I GENERAL HYDRAULICS AND FLOW MEASUREMENT

Fluid properties; fluid flow – continuity principle, energy principle and momentum principle; frictional head loss in free and pressure flow, minor heads losses, Carrying Capacity–Flow measurement.

UNIT II WATER TRANSMISSION AND DISTRIBUTION

Need for Transport of water and wastewater-Planning of Water System –Selection of pipe materials, Water transmission main design- gravity and pumping main; Selection of Pumps- characteristics- economics; Specials, Jointing, laying and maintenance, water hammer analysis; water distribution pipe networks Design, analysis and optimization – appurtenances – corrosion prevention – minimization of water losses – leak detection Storage reservoirs.

UNIT III WASTEWATER COLLECTION AND CONVEYANCE

Planning factors – Design of sanitary sewer; partial flow in sewers, economics of sewer design; Wastewater pumps and pumping stations- sewer appurtenances; material, construction, inspection and maintenance of sewers; Design of sewer outfalls-mixing conditions; conveyance of corrosive wastewaters.

UNIT IV STORM WATER DRAINAGE

Necessity- - combined and separate system; Estimation of storm water run-off Formulation of rainfall intensity duration and frequency relationships- Rational methods

REFERENCE AND TEXT BOOKS:

1. Bajwa, G.S. "Practical Handbook on Public Health Engineering", Deep Publishers, Shimla, 2003.
2. “Manual on water supply and Treatment”, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1999.
3. “Manual on Sewerage and Sewage Treatment”, CPHEEO, Ministry of Urban Development, Government of India, New Delhi, 1993.

Course Code	**CE434**
Course Title	**GROUNDWATER ENGINEERING**
Type of Course	**Open Elective**
LTP	**3 0 0**
Credits	**3**
Course Prerequisite	**Nil**
Course Objective (CO)	• **To introduce the student to the principles of Groundwater governing Equations and Characteristics of different aquifers.** • **To understand the techniques of development and management of groundwater.**
Course Outcome(CO)	**The students will be able to:** • **Understand aquifer properties and its dynamics.** • **Get an exposure towards well design and practical problems** • **Develop a model for groundwater management.** • **Students will be able to understand the importance of artificial recharge and groundwater quality concepts.** • **Gain knowledge on conservation of groundwater.**

SYLLABUS

UNIT I HYDROGEOLOGICAL PARAMETERS Introduction – Water bearing Properties of Rock – Type of aquifers - Aquifer properties – permeability, specific yield, transmissivity and storage coefficient – Methods of Estimation – GECnorms - Steady state flow - Darcy's Law - Groundwater Velocity –- Dupuit Forchheimer assumption – Steady Radial Flow into a Well

UNIT II WELL HYDRAULICS

Unsteady state flow - Theis method - Jacob method – Chow's method – Law of Times – Theis Recovery – Bailer method – Slug method - tests - Image well theory – Partial penetrations of wells – Well losses – Specific Capacity and Safe yield - Collector well and Infiltration gallery

UNIT III GROUNDWATER MANAGEMENT

Need for Management Model – Database for Groundwater Management – Groundwater balance study – Introduction to Mathematical model – Model Conceptualization – Initial and Boundary Condition – Calibration – Validation – Future Prediction – Sensitivity Analysis – Uncertainty – Development of a model

UNIT IV GROUNDWATER QUALITY

Ground water chemistry - Origin, movement and quality - Water quality standards – Drinking water – Industrial water – Irrigation water - Ground water Pollution and legislation - Environmental Regulatory requirements
Artificial recharge techniques – Reclaimed wastewater recharge – Soil aquifer treatment (SAT) – Aquifer Storage and Recovery (ASR) Seawater Intrusion and Remediation – Ground water Basin management and Conjunctive use – Protection zone delineation, Contamination source inventory and remediation schemes

TEXT BOOKS:

1. Raghunath H.M., "Ground Water Hydrology", New Age International (P) Limited, New Delhi, 2010.
2. Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2000.

REFERENCES

1. Fitts R Charles, "Groundwater Science". Elsevier, Academic Press, 2002.
2. Ramakrishnan, S, Ground Water, K.J. Graph arts, Chennai, 1998.