Department of Civil Engineering

CURRICULUM AND SYLLABUS

(2023-2027)

B.Tech. Civil Engineering

Civil Engineering

B.Tech. (CE)

CURRICULUM AND SYLLABUS

Vision Statement of University

Be an internationally acclaimed University recognised for its excellent teaching, research, innovation, outreach and creating top class technocrats and professionals who can serve the mankind as multi skilled global citizen.

Mission Statement of University

- Establish state-of-the-art facilities for world class education and research.

- Conduct scholarly research and creative endeavours that impact quality of life.

- Attract quality staff and students to cater for diverse needs and preferences and widen participation.

- Build a foundation for students to be successful at all levels through high-quality, innovative programs.

- Collaborate with institute, industry, and society to address current issues through research and align curriculum.

- Involve in societal outreach programs to identify concerns and provide sustainable ethical solutions.

- Encourage life-long learning and team-based problem solving through an enabling environment.

Vision of the Department:

To emphasize deep understanding of fundamental principles, development of creative ability to handle the challenges of Civil Engineering, and the analytical ability to solve problems which are interdisciplinary in nature.

Mission of the Department:

1. To offer an exceptional curriculum including in-depth coverage in three technical sub-disciplines of civil engineering: structural engineering, Construction Management and Environmental engineering, as well as broad coverage in Computer Aided Design.

2. To engage students in creating innovative design solutions of civil engineering problems that include realistic constraints such as economic, environmental, sustainability, social, ethical, health and safety.

3. To provide research experiences, allowing students to work closely with members of the faculty.

4. To employ highly dedicated faculty members who are effective teacher scholars committed to maintaining a learner-centered environment with emphasis on student mentoring.

Department of Civil Engineering

Program Education Objectives (PEOs)

PEO 1   Graduates will use and apply necessary mathematical tools, scientific basics and fundamental concepts of Civil Engineering

    PEO 1.1: Sound in Mathematical tools and scientific basics
    PEO 1.2: Apply concepts of Civil Engineering

PEO 2   Graduates will demonstrate ability to analyze, design and develop civil engineering projects

    PEO 2.1: Abilities to design Civil Engineering projects
    PEO 2.2: Abilities to develop and execute Civil Engineering projects

PEO 3   Graduates are prepared to be employed, exhibit professionalism, engaged in lifelong learning and demonstrate entrepreneurship skills.

    PEO 3.1: Employable and entrepreneurial skills.
    PEO 3.2: Life Long Learning, Professionalism and ethics

Department of Civil Engineering

PO 01	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering, fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 02	**Problem analysis:** Identify, formulate, review, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
PO 03	**Design / development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 04	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 05	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO 06	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 07	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 08	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 09	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO 10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments
PO 12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME OUTCOMES (POs)

Department of Civil Engineering

PROGRAMME SPECIFIC OUTCOMES (PSOs)

PSO 1   Applying knowledge of applied sciences and engineering for analysing and solving civil Engineering Problems

PSO 2   Application of civil engineering concepts concerning, ecology, energy conservation and management.

PSO 3   Software based planning and execution of civil engineering projects applying relevant codes of practice for materials and techniques.

PSO 4   Applying knowledge of applied sciences and engineering for analysing and solving civil Engineering Problems

Scheme for Civil Engineering

SEMESTER I

Sr. No.	Course Code	Courses	L	T	P	Credit
1	EN3BS11	Engineering Mathematics-I	3	0	0	3
2	EN3BS16	Engineering Physics	3	0	2	4
3	EN3ES17	Basic Electrical Engineering	3	0	2	4
4	EN3ES26	Engineering Graphics	2	0	2	3
5	EN3ES27	Basic Programming with C	2	0	2	3
6	EN3ES30	Basic Civil Engineering & Mechanics	3	0	2	4
7	EN3NG01	Environmental Science	2	0	0	2
8	EN3NG02	Universal Human Values and Professional Ethics	2	0	0	2
		Total	**20**	**0**	**10**	**25**
		Total Contact Hours	**30**			

SEMESTER II

Sr. No.	Course Code	Courses	L	T	P	Credit
1	EN3BS12	Engineering Mathematics-II	3	0	0	3
2	EN3BS14	Engineering Chemistry	2	0	2	3
3	EN3ES16	Basic Electronics Engineering	3	0	2	4
4	EN3ES18	Basic Mechanical Engineering	3	0	2	4
5	EN3ES28	Advance Programming with C	2	0	2	3
6	EN3ES29	Engineering Workshop	0	0	2	1
7	EN3HS01	History of Science and Technology	2	0	0	2
8	EN3HS10	Communication Skill	2	0	2	3
		Total	**17**	**0**	**12**	**23**
		Total Contact Hours	**29**			

SEMESTER – III

Sr. No.	Course Code	Courses	L	T	P	Credit
1	EN3BS15	Engineering Mathematics-III	3	0	0	3
2	CE3CO01	Engineering Surveying	3	0	2	4
3	CE3CO05	Construction Material and Techniques	3	0	2	4
4	CE3CO19	Fluid Mechanics	3	0	2	4
5	CE3ES11	Strength of Material	3	0	2	4
6	CE3ES12	Python for Civil Engineering	0	0	2	1
7	EN3HS04	Fundamentals of Management,Economics and Accountancy	3	0	0	3
8	EN3NG03	Soft Skill-I	2	0	0	2
		Total	**20**	**0**	**10**	**25**
		Total Contact Hours	**30**			

SEMESTER – IV

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CE3CO20	Environmental Engineering -I	3	0	0	3
2	CE3CO21	Building Planning & Drawing	2	0	2	3
3	CE3CO22	Transportation Engineering -I	2	0	0	2
4	CE3CO23	Structural Analysis -I	3	0	2	4
5	CE3CO24	Hydraulic Engineering	3	0	0	3
6	CE3CO27	Geotechnical Engineering - I	3	0	2	4
7	CE3CO28	RCC Design	3	0	0	3
8	CE3CO32	Quantity Surveying & Estimation	2	0	0	2
9	EN3NG10	Soft Skills -II	2	0	0	2
		Total	**23**	**0**	**6**	**26**
		Total Contact Hours	**29**			

SEMESTER – V

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CE3CO25	Structural Analysis -II	3	0	0	3
2	CE3CO26	Environmental Engineering-II	3	0	2	4
3	CE3CO29	Water Resources Engineering	3	0	0	3
4	CE3CO31	Design of Steel Structures	3	0	0	3
5	CE3CO33	Geotechnical Engineering - II	3	0	0	3
6	CE3ELXX	Elective-I	3	0	0	3
7	CE3ELXX	Elective-II	3	0	0	3
8	OEXX	Open Elective-I	3	0	0	3
9	EN3NG06	Open Learning	1	0	0	1
10	EN3NG05	Soft Skill-III	2	0	0	2
		Total	**27**	**0**	**2**	**28**
		Total Contact Hours				**29**

SEMESTER – VI

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CE3CO30	Transportation Engineering - II	3	0	2	4
2	CE3CO34	Civil Engineering Software Lab	0	0	2	1
3	CE3CO35	Advance RCC Design	3	0	0	3
4	CE3PC08	Mini Project	0	0	4	2
5	CE3ELXX	Elective-III	3	0	0	3
6	CE3ELXX	Elective-IV	3	0	0	3
7	CE3ELXX	Elective-V	3	0	0	3
8	OEXX	Open Elective-II	3	0	0	3
9	EN3NG08	Soft Skills-IV	2	0	0	2
		Total	**20**	**0**	**8**	**24**
		Total Contact Hours				**28**

SEMESTER – VII

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CE3ELXX	Elective-VI	3	0	0	3
2	OEXX	Open Elective-III	3	0	0	3
3	CE3PC03	Industrial Training	0	2	0	2
4	CE3PC06	Project-I	0	0	8	4
		Total	**6**	**2**	**8**	**12**
		Total Contact Hours				**16**

SEMESTER VIII

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CE3PC07	Project-II	0	0	20	10
		Total	**0**	**0**	**20**	**10**
		Total Contact Hours				**20**

Choice Based Credit System Scheme- B. Tech CE

Batch 2023-2027

B.Tech. (I year)

Scheme (2023-27 Batch)

SNo.	Course Code	Courses	L	T	P	Credit
SEMESTER I						
1	EN3BS11	Engineering Mathematics-I	3	0	0	3
2	EN3BS16	Engineering Physics	3	0	2	4
3	EN3ES17	Basic Electrical Engineering	3	0	2	4
4	EN3ES26	Engineering Graphics	2	0	2	3
5	EN3ES27	Basic Programming with C	2	0	2	3
6	EN3ES30	Basic Civil Engineering & Mechanics	3	0	2	4
7	EN3NG01	Environmental Science	2	0	0	2
8	EN3NG02	Universal Human Values and Professional Ethics	2	0	0	2
		Total	**20**	**0**	**10**	**25**
		Total Contact Hours	**30**			

Course Code	Course Name	Hours per week			Total	
		L	T	P	Hours	Credit
EN3BS11	**Engineering Mathematics-I**	**3**	**0**	**0**	**3**	**3**

Course Learning Objectives (CLOs):

CLO$_{01}$ To impart analytical ability of using concepts of matrices in various fields of engineering.

CLO$_{02}$ To explain the concept of Differential Calculus.

CLO$_{03}$ To discuss the concept of Integral Calculus and its applications.

CLO$_{04}$ To impart analytical ability in solving Ordinary Differential Equations of first and Higher order.

CLO$_{05}$ To impart basics of complex number and variables including concepts of analytical functions.

Unit I Matrices and Linear Systems
Rank and Nullity of a Matrix by reducing it into Echelon and Normal Forms, Solution of Simultaneous equations by elementary transformation methods, Consistency and Inconsistency of Equations, Eigen Values and Eigen Vectors.

Unit II Differential Calculus
Introduction to limit continuity, differentiability, Rolle's theorem, Mean value theorem, Taylors and Maclaurin's series expansions. Functions of Several variables, Partial differentiation, Euler's Theorem, Total Derivative, Maxima and Minima of function of two variables.

Unit III Integral Calculus
Definite Integral as a limit of sum and its application in summation of series, Beta and Gamma functions (Definitions, Relation between Beta and Gamma functions without proof, Duplication formula without proof). Multiple Integral (Double and Triple Integrals), Change the Order of Integration, Applications of Multiple Integral in Area, Volume.

Unit IV Ordinary Differential Equations
 First order differential equations (Separable, Exact, Homogeneous, Linear), Linear differential Equations of second and higher order with constant coefficients**,** Homogeneous linear differential equations, Simultaneous linear differential equations**.**

Unit V Complex Variable
 Basics of Complex number, Functions of complex variable: Analytic functions, Harmonic Conjugate functions, Cauchy-Riemann Equations, Complex Line Integral, Cauchy's Theorem, Cauchy's Integral Formula.

Text books:
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi.
2. H.K. Dass, *Higher Engineering Mathematics, S. Chand & Company Pvt LTD., New Delhi*

References:
1. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill Pub. Co. Ltd., New Delhi.
2. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
3. R.K. Jain and S.K. Iyengar, Advanced Engineering Mathematics, Narosa Pub. House, New- Delhi.

Web Source:
1. http://nptel.ac.in/courses/111108066/
2. http://nptel.ac.in/courses/111104085/
3. https://swayam.gov.in/courses/public
4. http://nptel.ac.in/course.ph

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO$_{01}$ To illustrate the tools of matrices in solving the system of simultaneous equations,

CO$_{02}$ To investigate the tools of differential calculus to relevant fields of engineering and can implement the concept of several variables.

CO$_{03}$ To relate the integral calculus to relevant fields of engineering and can translate the concept of multiple integrals in finding area of regions and volume of solids.

CO$_{04}$ To solve Ordinary Differential Equations using different methods.

CO$_{05}$ To relate the knowledge of complex number and categorize it in solving functions of several complex numbers.

Course Code	Course Name	Hours per Week			Credits
		L	T	P	
EN3BS16	Engineering Physics	3	0	2	4

Course Learning Objectives (CLOs):

CLO01 They will be able to understand the concept of Laser devices.

CLO02 An ability to understand the phenomena occurs in optical fibre.

CLO03 Students came to know about the optical phenomenon like Interference, diffraction, and polarization with their use in daily life.

CLO04 They will be able to learn about the quantum physics.

CLO05 They will be able to understand the concept of modern physics

CLO06 An ability to recognise the crystal structure and their basics.

CLO07 An ability to adapt the classical concept of oscillations.

CLO08 They will be able to use the acoustics nature in practical applications.

CLO09 Students learn the advanced concept of the superconductivity.

Unit-I Laser and Fibre Optics
Lasers: Properties of lasers, Spontaneous and Stimulated emission of radiation, Einstein's A & B co-efficient, Population inversion, Components of Laser, Ruby Laser, He-Ne Laser, Engineering applications of lasers. Fibre Optics: Fundamental idea about optical fibre, propagation of light through optical fibre acceptance angle, numerical aperture, fractional refractive index changes, V number, Classification of fibre, Engineering applications of fibre.

Unit-II Wave Optics
Interference: Fresnel's biprism experiment, Newton's ring experiment. Diffraction of light: Fraunhofer diffraction for single slit, N-slits diffraction (grating), Missing orders and Rayleigh criterion of Resolution. Polarization: General concept of Polarization, double refraction, Engineering Applications of Polarization.

Unit-III Quantum mechanics
Limitations of Classical Mechanics, De-Broglie hypothesis for matter waves, Phase and group velocity, wave packet, Heisenberg's uncertainty principle, Compton scattering, wave function, Schrodinger's Time dependent and time independent wave equation, Particle in a box problem.

Unit-IV Solid State Physics
Crystal Physics: Unit cell, Crystal System, Types of Unit cell: Simple cubic, Face centered cubic, Body centered cubic Crystal, Number of atoms per unit cell, Packing fraction in different cubical lattices, Miller indices. Band theory of solids: Free Electron model, Band Model, Fermi level for Intrinsic and Extrinsic Semiconductors, Hall effect. Superconductivity: Zero resistance, persistent currents, superconducting transition temperature (Tc), Meissner effect, Type-I and Type-II superconductors, Engineering applications of superconductivity.

Unit- V Oscillations and acoustics

Oscillations: Concept of Simple, Periodic & harmonic Oscillation with illustrations; Differential equation of harmonic oscillator; Kinetic and potential energy of Harmonic Oscillator, compound pendulum. Acoustics: Introduction, Reverberation, Sabine's Formula, Eyring's Formula, Absorption Coefficient, Conditions for good acoustical design, Production and detection of ultrasonic waves and their applications.

Textbooks:

1. A Text book of Optics, N. Subramanyam and Brij Lal, S. Chand , New Delhi, 2010 .
2. Engineering Physics, H. K. Malik and A. K. Singh, Tata McGraw Hill New Delhi, 2010
3. Concepts of Modern Physics A. Beiser, Tata McGraw Hill New Delhi.
4. Engineering Physics, Gaur and Gupta, Dhanpat Rai Publications.

References:

1. An Introduction to Lasers- Theory and Applications. Dr. M N. Avadhanulu, Dr. R. S. Hemne S. Chand Publications.
2. Optics, A. Ghatak: 4th Edition, Tata McGraw-Hill, New Delhi 2009.
3. An Introduction to Fiber Optics, Ghatak and Thiagarajan, Cambridge University Press.
4. Solid State Physics by Kittel, Wiley India
5. A Text book of Physics – N. Gupta & S.K. Tiwary, Dhanpat Rai & Co., Delhi
6. Quantum Mechanics by Ghatak & Loknathan, Macmillian India Ltd-new Delhi Revised Edition 2019.

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO_{01} Understand and analyse the different types of lasers and optical fibres, operation, and its characteristics.

CO_{02} Understand and apply various phenomenon of Interference, diffraction and polarization and their applications.

CO_{03} Understand and apply the concept of Quantum Mechanics.

CO_{04} Understand and examine the crystal structures and acquire the basic knowledge of various semiconductor devices.

CO_{05} Evaluate and apply the applications of superconductivity in technology and real world.

CO_{06} Apply basic concepts of oscillations in harmonic oscillator and compound pendulum.

CO_{07} To analyse and design acoustics applications.

List of Practical's

List of suggestive core experiments (Any 10 experiments from the list of 16)

Laser and Fiber Optics
1.   To measure the beam divergence and beam waist of laser beam.
2.   To measure the numerical aperture of an optical fiber by scanning method.
3.   To find the thickness of thin wire using laser.
4.   To study the working of laser using PhET simulation module.
5.   To establish a fiber optic analog link and study of bending loss in optical fiber.

Wave Optics
6.   To determine the radius of curvature of plano convex lens using Newton's ring experiment.
7.   To determine wavelength of spectral lines of mercury vapor lamp with the help of grating an spectrometer.
8.   To determine the specific optical rotation of sugar solution by biquartz polarimeter.
9.   To determine the wavelength of given sodium vapor lamp using Fresnel's Biprism.

Quantum Mechanics
10.   Determination of Planck's constant (h) using light emitting diode (LED) of various colors.
11.   To study black body Radiation by PhET Simulation.

Solid State Physics

12.   To study the Hall Effect experiment and calculate the charge carrier concentration (density) of given semiconductor diode.
13.   To determine the energy band gap of semiconductor diode.
14.   To study V-I characteristics of semiconductor diode and Zener diode.

Oscillations and Acoustics
15.   To find the frequency of AC Mains using Melde's method in longitudinal and transverse arrangement.
16.   To determine the value of acceleration due to gravity (g) using compound pendulum

Course Code	Course Name	Hours per week			Total	
		L	T	P	Hours	Credits
EN3ES17	**Basic Electrical Engineering**	3	0	2	5	4

Course Learning Objectives (CLOs):

CLO01   To introduce fundamental concepts and analysis techniques in electrical engineering to students across all disciplines.

CLO02   To introduce the students about domestic wiring, the functioning of various electrical apparatus and the safety measures. Emphasize the effects of electric shock and precautionary measures.

CLO03   To impart basic knowledge of electrical quantities such as current, voltage, power, energy, and frequency to understand the impact of technology in a global and societal context.

CLO04   To provide knowledge about the basic DC and AC electric circuits and magnetic circuits.

CLO05   To introduce the concepts of power supply, UPS, SMPS, motors, transformers, and their applications.

Unit-I: DC circuit analysis
Elements and characteristics of electric circuits, ideal and practical sources, independent and dependent electrical sources, Ohm's law, source transformation, Kirchhoff's laws. Mesh analysis, nodal analysis, voltage and current division rules, star-delta conversions, Thevenin's and Norton's theorems.

Unit-II: AC Circuit Analysis
Generation of sinusoidal AC voltage, average and RMS values, concept of phasor, analysis of series RL, RC and RLC circuits, power triangle, power factor, series resonance and Q factor.
Generation of three phase voltages, advantages of three phase systems, star and delta connections (balanced only), relation between line and phase quantities.

Unit-III: Electrical Machines
Definition, working principle and construction of transformer, construction & working principle of DC motor and three phase induction motor, single phase induction motor, application of rotating machines.

Unit-IV: Industrial Electrical Engineering
Power supply: linear power supply, switch mode power supply (SMPS), block diagram of UPS.
Safety and protection: electric hazards and precautions, earthing, fuses, MCB, types of wires and cables,

components of domestic wiring, electricity metering and billing.

Unit-V: Electrical Energy Systems and Utilization

Power generation to distribution through overhead lines and underground cables with single line diagram, block schematic representation of hydroelectric and thermal power plants.

Advantages of electrical heating, induction heating and its applications, dielectric heating and its applications, welding transformer.

Textbooks:
1. V.N. Mittal & Mittle, Basic Electrical Engineering, Tata McGraw - Hill
2. D.P. Kothari and I. J, Nagrath, Basic Electrical Engineering, Tata McGraw - Hill.
3. C. L. Wadhwa, Generation, Distribution and Utilization of Electrical Power, Wiley Eastern Ltd., New Delhi.

References:
1. Ashfaq Hussain, Electrical power systems, CBS, Publication
2. D. C. kulshreshtha, Basic Electrical Engineering, McGraw Hill Education.
3. Hemant Joshi, Residential, commercial and industrial electrical systems, Volume-1 (equipment and selection), Tata McGraw – Hill.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO01   Demonstrate an understanding of the basic knowledge of electrical quantities such as current, voltage, power, energy, and frequency to understand the impact of technology in a global and societal context.

CO02   Demonstrate an understanding of basic concepts of analysis of simple DC and AC circuits used in electrical engineering.

CO03   Demonstrate an understanding of power supply, UPS, type of motors and their applications.

CO04   Demonstrate an understanding of basic concepts of transformers, power system components and their application in transmission and distribution of electric power system.

CO05   Demonstrate an understanding of the effects of electric shock and precautionary measures.

List of Experiments

1. To study various electric hazards and corresponding precautions.
2. To verify KCL and KVL.
3. To verify Thevenin's and Norton's theorem.
4. Determination of resistance, inductance, capacitance and power factor of R-L, R-C & R-L-C series circuits.
5. To measure active power, reactive power & apparent power of a single-phase AC circuit.
6. To verify relation between line and phase quantities in a three-phase system.
7. To determine ratio and polarity of single-phase transformer.
8. To study construction of DC machine and three-phase induction motor.
9. To find out fusing factor and plot characteristic of fuse.
10. Study of different components of domestic wiring.
11. Preparation of energy bill based on energy consumption of residence/ Institute.
12. To study welding transformer and its accessories.

Course Code	Course Name	Total Hours per week			Total	
		L	T	P	Hours	Credits
EN3ES 26	**Engineering Graphics**	**2**	**0**	**2**	**4**	**3**

Course Learning Objectives (CLOs):

CLO01 To familiarize with the construction of geometrical figures.
CLO02 To familiarize with the projection of 1D, 2D and 3D elements
CLO03 To familiarize with the projection and sectioning of solids.
CLO04 To familiarize with the Preparation and interpretation of building drawing.
CLO05 To familiarize with the Upgraded Drawing Software and their use.

Unit -I
Drawing scales: Engineering scale, graphical scale, plain scale, diagonal scale, scale of chord.
Orthographic Projections: Reference planes, types of orthographic projections–First angle projections, Third angle projections.

Unit-II
Projections of points: Including points in all four quadrants
Projections of lines: Line parallel to reference plane, perpendicular to reference plane, inclined to one reference plane, inclined to both reference planes, traces of line.

Unit-III
Projections of Planes: Projections of Planes in different Positions, Auxiliary planes, Auxiliary Vertical Plane (AVP), Auxiliary Inclined Plane (AIP)
Projection of Solids: Classification of solid. Projections in simple and complex positions of the axis of the solid.

Unit-IV
Sections of Solids: Sectional views and true shape of the section.
Isometric Projections: Isometric view, Isometric scale to draw Isometric projection, non-Isometric lines, construction of isometric view from given orthographic views and to construct Isometric view of a Pyramid, Cone, Sphere.

Unit V
Computer Aided Drawing (CAD): Introduction to AutoCAD **,**2D & 3D Basics, Modify & Draw Commands Using AutoCAD, Points, Lines planes and Solids and their projections.

Textbooks:
1. N.D. Bhatt, Elementary Engineering Drawing, Chartor Publishing House.
2. D. N. Johle, Engineering Drawing, Tata McGraw-Hill Publishing Co.Ltd.
3. P.S. Gill, Engineering Graphics, S.K. Kataria andSons.
4. Warren J. Luzzader, Fundamentals of Engineering Drawing, Prentice Hall of India, New Delhi.
5. F. E. Giesecke, A. Mitchell & others, Principles of Engineering Graphics, Maxwell McMillan Publishing.
6. K.C. John, Engineering Graphics for Degree, PHI Learning Pvt. Ltd.

References:
1. Engineering Drawing- Basant Agarwal, TMH
2. D. M. Kulkarni, A. P. Rastogi, and A. K. Sarkar (2009), Engineering Graphics with AutoCAD, PHI Learning Private Limited, New Delhi
3. Venugopal (2010), Engineering Drawing and Graphics, 2nd edition, New Age Publications, New Delhi.
4. Trymbaka Murthy (2007), Computer Aided Engineering Drawing, I.K. International Publishers, New Delhi.
5. R.B. Choudary (2005), Engineering graphics with Auto CAD, Anuradha Publishers, New Delhi

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO_{01} Familiarize with different drawing equipment's and technical standards and Know purpose, procedures, materials and conventional symbols used. Create and read an engineering drawing using standard views and have ability to Convert pictorial (3D) drawings to orthographic (2-D) drawings and vice versa

CO_{02} Understand the projection of points, straight lines and have the ability to convert the practical problems in to projections

CO_{03} To understand and apply concepts of the projection of simple planes & solids.

CO_{04} Understand and apply the concepts of Projection & Sections of solids & development of surfaces

CO_{05} Convert simple 2D orthographic projections into 3D isometric projections with the help of auto cad commands

List of Experiments

Preparation of drawing sheets containing the drawings for topics covered in theory.

List of Drawing Sheets (Manual)
1. Orthographic Projections
2. Projections of points & Projections of straight lines
3. Projections of planes & Projections of solids

4. Projections of sections of solids & isometric projections
5. Drawing scales

List of CAD Sheets
1. To study about special features, advantages and applications of CAD in detail.
2. To study and practice basic draw commands, modifying commands exist in the CAD.
3. To construct a diagonal scale.
4. To draw orthographic projection of given pictorial views.
5. To construct the isometric views of given geometries.

| Course Code | Course Name | Hours per Week | | | Total |
		L	T	P	Credits
EN3ES27	Basic Programming with C	2	0	2	3

Course Learning Objectives (CLOs):

CLO01   Analyse Basics of Computers, programming environment and about different types of Programming languages.

CLO02   Application of various basic concepts required to create programs, use good problem-solving approach.

CLO03   Use different control structures for conditional programming.

CLO04   Use of Arrays and string in different problems and also to apply different operations on arrays and strings.

CLO05   Use the functions and procedures to solve different problems.

Unit-I Introduction to Computer and Problem-Solving Methodology

Computer System, Computing Environments, Software, Types of Software and Features of Software.
Design Tools (Algorithm, Flow-Chart, Pseudo-Code). Types and Generations of Programming Languages. Compiler, Interpreter, Linker, Loader, Execution of Program. Develop an Algorithm for Simple Problems.

Unit-II Basics of Language

Character set, Identifier, Keywords, Constants, Data Types, Preprocessor Directives, Variables and Declaration, White Space and Escape Sequence, Operators and Expressions, Type Conversions, Operator Precedence and Associativity, Expression Evaluation, Input and Output Functions. Computational Problems Solving Based on above Constructs.

Unit-III Control Statements

Selection (If, Else), Conditional Operator, Iteration (For, While, Do-While), Branching (Switch, Break, Continue, Goto), Nesting of Control Statements. Problem Solving Based on Control Statements.

Unit-IV Arrays and Strings

Defining an Array, One Dimensional Array, Two-Dimensional Array, Multi-Dimensional Array. Basic Array Operations and Matrix Manipulation Operations (Addition, Subtraction, and Multiplication). Problem Solving Based on Array.
Strings Definition, String Operations and String Functions. Problem Solving Based on Strings.

Unit-V Functions

Introduction, Functions Declaration, Definition, Calling, Return Statement, Parameter Passing (By Value), Recursion, Library Functions. Problem Solving Based on Functions.

Text Books:

1. Herbert Schildt, C: The complete Reference, Fourth Edition, Mc-GrawHill.
2. R. Sethi, Programming Language Concepts and Constructs, Pearson Education.
3. V. Rajaraman, Computer Programming in 'C',PHI.
4. M. Sprankle, Programming and Problem Solving, Pearson Education.
5. R.G. Dromey, How to solve it by Computer, Pearson Education.
6. E. Balguruswamy, Programming in ANSI C by, Tata Mc-GrawHill.
7. Yashavant Kanetkar, Let Us C, BPB.
8. E.Balagurusamy, Fundamentals of Computers, TMH.

References:
1. Kernighan and Ritchie , The 'C' programming language, PHI
2. Programming With C, Schaum Series.
3. A. N. Kamthane, Programming with ANSI and Turbo C, Pearson Education.

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO$_{01}$ Understand Basics of Computers and Programming languages.
CO$_{02}$ Understand basic concepts of C programming language required to create programs.
CO$_{03}$ Apply different types of control structures in problem solving.
CO$_{04}$ Use of Arrays and string in different problems and also to apply different operations on arrays and strings.
CO$_{05}$ Apply and use the functions and procedures to solve different problems.

List of Practical

1.   Write a program to print hello user on output screen.

2.   Write a program to perform arithmetic operation on two numbers.

3.   Write a program to find sum of individual digits of any three digits number.

4.   Write a program to print any three-digit number in reverse order.

5.   Write a program to swap any two numbers using third variable and without using third variable.

6.   Write a program to check given number is even or odd.

7.   Write a program to check given char is vowel or consonant.

8.   Write a program to check given number is positive or negative.

9.   Write a program to check given year is leap year or not.

10.   Write a program to check given number in range of 100-200 or not.

11.   Write a program to check given number is palindrome or not.

12.   Write a program to print grade of student on the basis of percentage:
a.   If per greater than or equal to 75 ☐ A grade
b.   If per between 60-75   ☐ B grade
c.   If per between 50-60   ☐ C grade
d.   If per between 40-50   ☐ D grade
e.   If per less than 40   ☐ Fail

13.   Write a program for addition subtraction multiplication division using switch case.

14.   Write a program to print table of any number.

15.   Write a program to calculate factorial of any number.

16.   Write a program to print series of alphabet.

17.   Write a program to print Fibonacci series.

18.   Write a program to check given number is perfect or not

19.   Write a program to check given number is prime or not.

20.   Write a program to check given number is Armstrong or not

21.   Write a program to print number in word in between 1-5. Like (1 =one)

22.   Write a program to check given char is vowel or consonant.

23.   Write a program to print name of month according to number.

24.   Write a program for convertor.
        • For currency convertor
        • For temperature convertor
        • For weight convertor
        • For length convertor
        • For time convertor
        • For energy convertor

25.   Write a program to print series of number from 1-100 without using loop.

26.   Write a program to find maximum & minimum number from array.

27.   Write a program to check how many numbers is prime & not prime in a list

28. Write a program to check how many digits at each index of array.

29. Write a program to check (search) given number is present or not present in list.

30. Write a program to arrange (sort) array elements in ascending or descending order.

31. Write a program to print a 2*2 matrix.

32. Write a program to find sum of two matrix.

33. Write a program to find multiplication of two matrix.

34. Write a program of string functions.

35. Write a function to find sum of two numbers.

36. Write a function to calculate factorial of any number.

37. Write a function for call by value to find sum of two numbers.

38. Write a function to pass an integer array as an argument and find sum of array elements

39. Write a function to pass a char array as an argument and find length of string.

40. Write a recursive function to calculate factorial of any number.

41. Write a program to find the no of char no of word and no of lines from given text input.

Course Code	Course Name	Hours per Week			Total	Total
EN3ES30	Basic Civil Engineering & Mechanics	**L**	**T**	**P**	**Hrs.**	**Credits**
		3	0	2	5	4

Course Learning Objectives (CLOs):

CLO01 To understand the utility of various types of building materials.

CLO02 To determine the location of object on ground surface.

CLO03 To understand the location, construction detail and suitability of various building elements.

CLO04 To understand the effects of system of forces on rigid body in static conditions.

CLO05 Analysis of determinate structure (beam & truss).

Unit- I Building Materials & Construction

Stones, bricks, cement, lime, timber-types, properties, test & uses, laboratory tests concrete and mortar Materials: Workability, Strength properties of Concrete, Nominal proportion of Concrete preparation of concrete, compaction, curing.

Elements of Building Construction, Foundations conventional spread footings, RCC footings, floors, staircases – types and their suitability

Unit II Surveying & Levelling

Surveying-classification, general principles of surveying–Basic terms and definitions of chain, Chain survey, Compass survey and levelling.

Unit III Mapping & Sensing

Mapping details and contouring, Profile Cross sectioning and measurement of areas, volumes, application of measurements in quantity computations, Survey stations.

Unit IV Forces & its applications

Graphical and Analytical Treatment of Concurrent and nonconcurrent Co- planner forces, Free Body Diagram, Force Diagram and Bow's notations.
Application of Equilibrium Concepts: Analysis of plane Trusses: Method of joints, Method of Sections. Frictional force in equilibrium problems.

Unit-V Shear force and Bending moment

Introduction of shear force and bending moment and their sign conventions, Types of loads, Types of beams, Types of supports; Shear force and bending moment diagrams for simply supported, overhang and cantilever beams subjected to any combination of point loads, uniformly distributed load, and point moment; Relationship between load, shear force and bending moment.

Textbooks

1.S.C. Rangwala, Building materials, Charotar Publishing House, Pvt. Limited.
2. S. Ramamrutham , BasicCivil Engineering and Engineering Mechanics, Dhanpat Rai.
3. K. K. Dwivedi & K.K. Shukla, Basic Civil Engineering & Engineering Mechanics, Dhanpat Rai & Co.2017 (Revised).

References:

I. K. V. B. Raju and P. T. Ravichandran, Basics of Civil Engineering, Ayyappa
Publications, Chennai, 2012.
2. S. Gopi, Basic Civil Engineering, Pearson Publishers, 2009.
3. M. S. Palanichamy, Basic Civil Engineering, Tata McGraw Hill.

Course Outcomes (COs)

After completion of this course the students shall be able to:

CO1: Understand concepts and terminologies of building, Construction materials, surveying and mechanics.

CO2: Apply various methods for surveying and mechanics.

CO3: Determine the location, area and volume of ground.

CO4: Solve the problems of surveying and mechanics by using various methods.

 CO5: Analyse the effects of system of forces on rigid bodies in static conditions.

List of Practicals:

1. To determine particle size distribution & fineness modulus of coarse and fine aggregates.
2. To determine standard consistency, Initial & Final Setting time of cement paste using Vicat's Apparatus.
3. To determine the workability of fresh concrete of given proportion by slump cone test.
4. To determine the Crushing Strength of Brick by using CTM.
5. To determine the Compressive Strength of Concrete Sample by CTM.
6. To determine the area of land by chain surveying.
7. To perform traverse surveying with prismatic compass check for local attractionand determine corrected bearing and to balance the traversing by Included Angle Method.
8. To perform levelling by height of Instrument & Rise and Fall method.
9. To find the support reactions of a given truss and verify analytically.
10. To perform Plane Table Surveying work by radiation method.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EN3NG01	**Environmental Science**	2	0	0	2

Course Learning Objectives (CLOs):

CLO01 To impart knowledge of Environment and its basic components.

CLO02 To build basic understanding of various effects of human activities to the environment.

CLO03 To understand concepts of water pollution

CLO04 To understand function of solid waste management

CLO05 To learn concepts of disaster management

Unit-I Ecosystem and Biodiversity
Concept of Ecosystem, Food Chains, Food Webs, Energy flow in an ecosystem.
Biodiversity**:** Introduction, Types, Significance and Conservation.

Unit-II Air Pollution
Causes, Effects and Control of Air Pollution, Greenhouse Effect - Climate changes and Global warming, Ozone layer depletion, Acid Rain.
Case studies on recent cases of air pollution and management.

Unit-III Water Pollution
Causes, Effects and Control of Water Pollution, DO, BOD and COD, Water sampling, Municipal water treatment.

Unit-IV Solid Waste Management
Introduction, Types of solid waste, Harmful effects of solid waste, Methods to manage and modern techniques for solid waste management.

Unit-V Disaster Management
Concept of Disaster, Types of Disaster, Pre-disaster risk and vulnerability reduction, Post disaster recovery and rehabilitation.
Case studies on recent disasters and management.

Textbooks:
1. Preeti Jain, S.L.Garg, K.G.Garg, Energy, Environment, Ecology and Society, Variety Publication.
2. Surinder Deswal, Environmental Science, Dhanpat Rai & Co. publication.
3. R. Rajgopalan , Environmental Studies, Oxford IBH Publication.

References:

1. G. M. Masters, Introduction to Environmental Science and Engineering, Pearson Education Pvt. Ltd.
2. K. De, Environmental Chemistry, New Age International.
3. Daniel D. Chiras, Environmental Science, Jones & Bartlett Ltd.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO01 Gain knowledge of Ecosystem & Biodiversity.

CO02 Develop basic understanding of air pollution and its control method

CO03 Develop basic understanding of water pollution and its control method

CO04 Gain knowledge of Solid waste management and its importance.

CO05 Gain knowledge of Disaster Management.

Course Code	Course Name	Hours per Week			
		L	**T**	**P**	**Credits**
EN3NG02	Universal Human Values and Professional Ethics	2	0	0	0

Course Learning Objectives (CLOs):

CLO1: Understand the need for and importance of value education in society and its role in promoting harmony and holistic development.

CLO2: Explore the content and process of value education, including self-exploration, experiential validation, and the mechanism of self-exploration.

CLO3: Recognize the basic human aspirations of continuous happiness and prosperity and the requirements for their fulfilment, such as right understanding, relationships, and physical facilities.

CLO4: Develop an understanding of harmony in oneself, including the coexistence of the sentient "I" and the material body, and the importance of balance and well-being.

CLO5: Gain insights into harmony in human-human relationships, including the values of trust, respect, and justice, and understand the importance of harmony in the family and society.

UNIT-I
Introduction-Need, Basic Guidelines, Content and Process for Value Education
Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration – what is it ?-its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self - exploration, Continuous Happiness and Prosperity-A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities-the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfil 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', Understanding the needs of Self ('I') and 'Body'- Sukhand Suvidha, Understanding the Body as an instrument of 'I'(I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony of I with the Body: Sanyamand Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail, Programs to ensure Sanyam and Swasthya.

UNIT-III
Understanding Harmony in the Family and Society-Harmony in Human- Human Relationship
Understanding harmony in the Family- the basic unit of human interaction, Understanding values in human - human relationship ;meaning of Nyayaand program for its fulfilment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship, Understanding them eaning of Vishwas; Difference between intention and competence, Understanding the meaning of Samman ,Difference between respect and differentiation ;the other salient value in relationship, Understanding the harmony in the society(society being an extension of family):Samadhan, Samridhi, Abhay, Sah-astitvaas comprehensive Human Goals, Visualizing a universal harmonious order in society-Undivided Society (AkhandSamaj), Universal Order (SarvabhaumVyawastha)-from family to world family!.

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

Understanding the harmony in the Nature, Inter connectedness and mutual fulfilment among the four orders of nature –recyclability and self-regulation in nature, Understanding Existence as Co-existence(Sah-astitva) of mutually interacting units in all-pervasive space, Holistic perception of harmony at all levels of existence.

UNIT-V
Implications of the above Holistic Understanding of Harmony on Professional Ethics

Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order, 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, technologies and management models, Case studies of typical holistictechnologies,managementmodelsandproductionsystems,Strategyfor 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.

TextBooks:
1. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.

References:
1. IvanIllich,1974,Energy & Equity, The Trinity Press, Worcester, and Harper Collins, USA
2. E.F.Schumacher,1973, Smallis Beautiful: a sudy of economics as if people mattered, Blond & Briggs, Britain.
3. SussanGeorge,1976,HowtheOtherHalfDies,PenguinPress.Reprinted 1986, 1991
4. Donella H .Meadows, DennisL. Meadows,JorgenRanders, WilliamW. BehrensIII, 1972, Limits to Growth–Club of Rome's report, UniverseBooks.
5. ANagraj, 1998, JeevanVidyaEkParichay, DivyaPathSansthan, Amarkantak.
6. PLDhar, RRGaur,1990,Science and Humanism,Commonwealth Publishers.
7. A NTripathy, 2003, Human Values, New Age International Publishers. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) KrishiTantraShodh, Amravati.
8. EGSeebauer&RobertL.Berry,2000,FundamentalsofEthicsforScientists&Engineers , Oxford University Press
9. MGovindrajran,SNatrajan&V.S.SenthilKumar,EngineeringEthics(includingHumanValues),EasternEconomyEdition,PrenticeHallofIndia Ltd.
10. BP Banerjee,2005, Foundations of Ethics andManagement, Excel Books. BLBajpai,2004,IndianEthosandModernManagement,NewRoyal Book Co., Lucknow. Reprinted 2008.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO1: Ability to apply self-exploration techniques and experiential validation for personal growth and self-awareness.

CO2: Proficiency in recognizing and addressing the needs of the self and the body to achieve harmony and well-being.

CO3: Competence in fostering harmonious relationships based on trust, respect, and justice within the family and society.

CO4: Understanding the interconnection and mutual fulfillment among different orders of nature and the significance of coexistence in the larger existence.

CO5: Awareness of the implications of holistic understanding of harmony on professional ethics and the ability to apply ethical principles in professional settings to contribute to the development of a universal human order and sustainable practices.

SEMESTER II

Sr. No.	Course Code	Courses	L	T	P	Credit
1	EN3BS12	Engineering Mathematics-II	3	0	0	3
2	EN3BS14	Engineering Chemistry	2	0	2	3
3	EN3ES16	Basic Electronics Engineering	3	0	2	4
4	EN3ES18	Basic Mechanical Engineering	3	0	2	4
5	EN3ES28	Advance Programming with C	2	0	2	3
6	EN3ES29	Engineering Workshop	0	0	2	1
7	EN3HS01	History of Science and Technology	2	0	0	2
8	EN3HS10	Communication Skills	2	0	2	3
		Total	**17**	**0**	**12**	**23**
		Total Contact Hours		**29**		

Course Code	Course Name	Hours per week			Total	
		L	T	P	Hours	Credit
EN3BS12	**Engineering Mathematics-II**	**3**	**0**	**0**	**3**	**3**

Course Learning Objectives (CLOs):

CLO01 To illustrate knowledge of Laplace Transform and investigate its application.

CLO02 To explain the concept of Fourier Series and Fourier Transform.

CLO03 To illustrate the concept of Partial Differential Equations.

CLO04 To impart the knowledge of Vector Calculus.

CLO05 To discuss numerical methods and to outline its application in solving algebraic, transcendental equations and system of linear equations.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO1 To impact mathematical models involving ordinary and partial differential equations with given boundary condition which is helpful in all engineering and research work.

CO2 To examine the general mathematical concepts required for the field regarding Laplace and Fourier Transform.

CO3 To compare and contrast importance of partial differential equations in physical problems.

CO4 To prioritize derivatives of vector- point functions, gradient functions, evaluate integral of functions over curves, surfaces and domains in two and three dimensional.

CO5 To examine numerical techniques and investigate its application in solving algebraic and transcendental equations.

Unit I Laplace Transform
Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, Inverse Laplace transform and its properties, Convolution theorem, Applications of Laplace Transform to solve the Ordinary Differential Equation, Laplace transform of Unit step function and Impulse function.

Unit II Fourier Series and Fourier Transform
Introduction of Fourier series, Fourier series for Discontinuous functions, Fourier series for Even and Odd function, Half range series, Fourier Transform, Sine and Cosine Transform.

Unit III Partial Differential Equations
Definition, Formulation, Solution of Partial Differential Equations (By Direct Integration Method and Lagrange's Method), Non-Linear Partial Differential Equations of First order {Standard form

I, II, III & IV), Charpit's method. Partial Differential Equations with Constant Coefficients (Higher Orders Homogeneous), Method of Separation of Variables.

Unit IV Vector Calculus
Scalar and Vector fields, Vector Differentiation, Laplacian operator, Gradient, Divergence and Curl, Line and surface integrals, Green's theorem, Gauss Divergence theorem, Stoke's theorem.

Unit V Numerical Analysis
Errors and Approximations, Solution of Algebraic and Transcendental Equations (Regula Falsi, Newton-Raphson and Iterative methods), Solution of Simultaneous linear equations by Gauss Elimination, Gauss Jordan, Jacobi's and Gauss-Siedel Iterative methods.

Textbooks:
1. B.S. Grewal, *Higher Engineering Mathematics*, Edition-43, Khanna Publishers, New Delhi.
2. *H. K. Dass, Higher Engineering Mathematics,S. Chand & Company Pvt LTD., New Delhi*

References:
1. B.V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill Publishing Company Ltd., New Delhi.
2. Shanti Narayan, A textbook of Vector Calculus, S. Chand & Co., New Delhi.
3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons 1999.

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3. https://swayam.gov.in/courses/public
4. http://nptel.ac.in/course.php

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EN3BS14	Engineering Chemistry	2	0	2	4

Course Learning Objectives (CLOs):

CLO$_{01}$ To gain fundamental knowledge of the principles related to, so as to meet the challenging requirements of students in chemistry studies.

CLO$_{02}$ To attain awareness in students about current & new issues in the fields of chemistry.

CLO$_{03}$ To make students understand about the present needs without compromising on theability of future generations to meet their own needs for proper engineering, relevanteducation efficient management of resources.

CLO$_{04}$ To increase curiosity and give them awareness about practical knowledge of variouslaboratory methods among the students regarding the course.

Unit-I Lubricants

Introduction, Classification of lubricants, Mechanism of lubrication, Properties and Testing of lubricating oils (Flash and Fire point, Cloud and Pour point, Viscosity and Viscosity Index, Neutralization number, Saponification Number, Steam Emulsification Number, Aniline Point, Iodine Value), Numerical problems based on testing methods.

Unit -II Polymer

Introduction and Classification of polymer, Preparation, Properties andUses of the following- Polythene, PVC, Teflon, Nylon 66, Bakelite, Silicone resin, Natural and Synthetic Rubber, Vulcanization of Rubber, Biopolymers, Biodegradable polymers.

Unit -III New Engineering Materials

Introduction, PropertiesandApplications of - Superconductors, Optical Fiber, Fullerenes, Graphene, Carbon nanotubes, Nanowires.

Unit -IV Instrumental Techniques in Chemical Analysis

Spectroscopy, Electromagnetic spectrum, Beer &Lambert's Law and its limitations,Principle, Instrumentation and Applications of-UV-VisibleSpectroscopy, IR Spectroscopy, Gas Chromatography.

Unit- V Electrochemistry

Concept of Enthalpy, Entropy and Free energy, EMF, Applications of EMF measurements, Corrosion- Definition, Types, Causes and Protection from corrosion.

Text Books:
1. Preeti Jain, Anjali Soni, Jeetendra Bhawsar, A text book of Engineering Chemistry, 1st edition, Manthan Publication, 2016.
2. Preeti Jain, S L Garg, Engineering Chemisty, 4th edition, Variety Publication.
3. Shashi Chawla, Engineering Chemistry, 11th edition, Dhanpat RaiPublications.

References:
1. P C Jain, Monika Jain, Engineering Chemistry, Dhanpat RaiPublications.
2. S. S.Dara, A Text Book of Engineering Chemistry, S. Chand & Company.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO$_{01}$ To Understand the lubricants, their mechanism and practically analyze the properties of lubricants.
CO$_{02}$ Will acquire betterment in lifestyle by understanding the need of bio polymers in the current scenario and replacing synthetic polymers with its bio-polymer substitute.
CO$_{03}$ Will get familiarised with new engineering materials and their commercial applications.
CO$_{04}$ Will get knowledge of using instrumental techniques and their applications for determination of chemical structure of any compound.
CO$_{05}$ Identify various types of corrosion and methods to protect the metallic structures from corrosive environment.

List of Practicals:
Volumetric Analysis:

1. To determine Hardness of given water sample by Complexometrictitration.
2. To determine total and mixed Alkalinity of given water sample using   phenolphthalein and methyl orange asindicator.
3. To determine strength of unknown FAS solution by Redox titration using N-   Phenyl anthranilic acid as internalindicator.
4. To determine strength of unknown $CuSO_4$ solution by Iodometric titration using Starch as internalindicator.
5. To determine Chloride content of water sample by Mohr's method (Argentometrictitration).

Fuel Testing:

1. Todeterminemoisturecontentingivensampleofcoalbyproximateanalysis.
2. Todeterminevolatilecontentingivensampleofcoalbyproximateanalysis.
3. Todetermineashcontentingivensampleofcoalbyproximateanalysis.
4. To determine percentage carbon content of coal by proximate analysis.

Lubricant Testing:

1. To determine penetration number of grease by Cone Penetrometerapparatus.
2. To determine flash and fire point of given oil sample by Cleveland's open cup apparatus.
3. To determine flash point of given oil sample by Penskey Marten's close cup apparatus.
4. To determine flash point of given oil sample by Abel's Closecup apparatus.
5. To determine Steam emulsification number of givenlubricant.
6. To determine Aniline point of given oilsample.
7. To determine Cloud and Pour point of given lubricatingsample.
8. To study rate of change of viscosity with temperature of the given lubricating oil by   meansof Redwood Viscometerno.1
9. To study rate of change of viscosity with temperature of the given lubricating oil by means of Redwood Viscometer no.2.

Electrochemistry:

Variation of cell potential in $Zn/Zn^{2+}//Cu^{2+}/Cu$ with change in concentration of electrolytes ($CuSO_4$ or $ZnSO_4$) at room temperature.

Kinetics:

Effect of concentration and temperature on the rate of reaction between sodium thiosulphate and hydrochloric acid.

Course Code	Course Name	Hours per Week			
		L	**T**	**P**	**Credits**
EN3ES16	Basic Electronics Engineering	3	0	2	4

Course Learning Objectives (CLOs):

CLO01 To learn the basics of semiconductor materials and their usage in variety of PN junction diodes and applications of diodes

CLO02 To study transistor in different modes of configuration and basic biasing techniques, FET.

CLO03 To study of the fundamental concepts and various types of analog communication systems

CLO04 To study of the concept of number systems and Boolean Algebra, minimization, Logic gates and other Combinational circuits and their designing.

CLO05 To learn about basic Measurement & Instrument components.

Unit-I SEMICONDUCTOR DIODE
Semiconductor basics, PN Junction diode construction & working, Volt-amp characteristics, Diode current equation, Half wave rectifier, Full wave rectifier: Bridge and center tapped rectifier,Clipper and Clamper. Zener diode and zener diode-based voltage regulator, LED

Unit-II BIPOLAR JUNCTION TRANSISTOR
Construction and working of transistor, characteristics of transistor, transistor as an amplifier and switch, transistor configurations, transistor biasing and biasing methods, basic amplifier configurations, Basic principle and working of FET and MOSFET

Unit-III BASICS OF COMMUNICATION SYSTEMS
Block schematic of communication system, Simplex and duplex systems, Modes of communication: Broadcast and point to point communication, Necessity of modulation, Classification of modulation: Amplitude, phase, frequency modulation, sampling theorem and pulse amplitude modulation.

Unit-IV DIGITAL SYSTEM
Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, Excess 3, Gray, Boolean theorems, Minterms and Maxterms, Sum of products and products of sums, Karnaugh map Minimization, Logic gates: NOT, AND, OR, NAND, NOR, EX- OR and EX-NOR, half adder and full adder. Function and Structure of a Computer System, Von Neumann Architecture, and modern computers.

Unit-V ELECTRONICS MEASUREMENT
Introduction, Basics of Measurements, Ammeter, Voltmeter, multimeter, Signal Generators, Cathode Ray Oscilloscope: Block diagram of CRO, Construction of CRT, Deflection sensitivity and various controls, Measurement of voltage, current frequency and phase angle using CRO

Textbooks:
1. Millman and Halkias: Integrated electronics, TMH.
2. D Roy Choudhury, Digital Electronics, Vol-I & II, TMH Publication.
3. A.K.Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai.
4. Simon Haykins, Communication System, John Willy.
5. Andrew S. Tanenbaum, Structured Computer Organization, Upper Saddle River.

References:
1. Sedra and Smith: Microelectronics, Oxford Press.
2. Millman and Taub, Pulse, Digital and Switching Waveforms, MGM.
3. A.Anand Kumar: Digital Circuits, PHI.
4. Salivahanan: Electronic Circuits Analysis and Design, TMH
5. Boylestad and Nashelsky: Electronic Devices and Circuit Theory, Pearson Education.
6. B.P.Lathi, Modern Digital & Analog Communication System, TMH

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO01 Should have the knowledge of basic semiconductor materials and their usage in variety of PN junction diodes and applications of diodes

CO02 Should be able to understand the concept operation of transistors and its configuration.

CO03 Understand and identify the fundamental concepts and various components of analog communication systems

CO04 Should have the knowledge of number systems and Boolean Algebra, minimization, Logic gates and other Combinational circuits and their designing.

CO05 Should have understood the basics of Measurement & Instrument components.

List of Experiments:
1. To verify V-I characteristic of semiconductor & Zener diode.
2. To verify input and output waveform of half wave rectifier.
3. To verify input and output waveform of full wave rectifier.
4. To verify Input and output characteristic of BJT in CB and CE configurations.
5. Implementation of basic logic gates using Universal gates (NAND, NOR).
6. To verify half adder & full adder.
7. Study of computer system structure and main peripheral devices.
8. Study of Frequency Division Multiplexing with sinusoidal inputs / audio inputs.
9. Study of CRO and its demonstration kit.
10. Study of voltmeter and multimeter.

Course Code	Course Name	Hours per Week			Total	
		L	T	P	Hours	**Credits**
EN3ES18	**Basic Mechanical Engineering**	**3**	**0**	**2**	**5**	**4**

Course Learning Objectives (CLOs):

CLO01 To understand the properties of materials and their behavior with variation in temperature and Load. To understand different measuring instruments used in engineering applications.

CLO02 To understand the basic laws of thermodynamics and their applications in engineering, refrigeration cycles and properties of refrigerants.

CLO03 To understand Construction and Working of I. C. Engines.

CLO04 To understand Construction and Working of Steam Generators

CLO05 To understand the concepts of Centroid & Moment of Inertia and of plane areas and different theorems of moment of Inertia

Unit-I Materials & their mechanical properties
Classification of Engineering material and their mechanical properties, Composition of cast iron and carbon steels and their application. Stress-strain diagram, Hooks law and modulus of elasticity.Tensile, shear, hardness, and fatigue testing of materials.

Unit-II Thermodynamics
Thermodynamic properties and systems, First of thermodynamics, thermal processes at constant pressure, volume. Second law of thermodynamic, enthalpy, entropy, heat engine, heat pump, refrigerator and their numerical.

Unit-III I.C. Engines
Description and working of four stroke petrol engines, two stroke petrol engines, four stroke diesel engines and two stroke diesel engines, and its efficiency relative merits and demerits.

Unit-IV Steam generators
Definition, Classification, general study of Cochran, Lancashire and Locomotive boilers, boilers mountings and accessories. Steam properties and boiler performance. Draught Classification, Calculation of Chimney height, boiler efficiency and numerical. Unit V: Centroid & Moment of Inertia Location of centroid and Moment of Inertia of plane areas, Perpendicular Axis and Parallel Axis theorems.

Unit V Centroid & Moment of Inertia
Location of centroid and Moment of Inertia of plane areas, Perpendicular Axis and Parallel Axis theorems.

Textbooks:
1. R.K. Rajput, Basic Mechanical Engineering, Laxmi Publication.
2. P.K. Nag, Engineering Thermodynamics, McGraw Hill.
3. R.K. Bansal, Engineering Mechanics, Laxmi publications.

References:

1. Anand K Bewoor, Vinay A Kulkarni, Ist edition, Metrology & Measurement, McGraw Hill.
2. Cengel and Boles, Thermodynamic, An Engineering Approach in S.I Unit, McGraw Hill.
   S.S. Bhavikatti and K.G.Rajashekarappa, Engineering Mechanics, New age international limited.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO01   Students will be able to understand the engineering materials, their properties, Iron-Carbon Diagram and Stress-Strain Curve, Measuring Equipment's and Testing Machines.

CO02   Student will be thorough with the basic laws of thermodynamics and their applications in engineering also know about Refrigeration cycles and properties of refrigerants.

CO03   Students will be able to understand the construction and working of I.C. Engines .

CO04   Students will be able to understand the construction and working of Steam Generators

CO05   Students will be able to determine the Centroid & Moment of Inertia of areas/composite sections.

List of Experiments

1. Measurements using Vernier calliper & micrometer.
2. Measurements using dial gauges and combination set.
3. Measurements using slip gauges & sine-bar.
4. Tensile Testing of standard mild steel specimen on UTM.
5. To determine the hardness number by using Brinell Hardness Testing Machine.
6. Study of 2-stroke petrol and diesel engine.
7. Study of 4-stroke petrol and diesel engine.
8. Study of different type of boilers.
9. Study of different type of boilers mounting & accessories.
10. To find the centroid of different plane laminas.

| Course Code | Course Name | Hours per Week | | | Total |
		L	T	P	Credits
EN3ES28	Advanced Programming with C	2	0	2	2

Course Learning Objectives (CLOs):

CLO01 Understand Pointer variables. Declaring and dereferencing pointer variables. Pointer Arithmetic. Accessing arrays, strings through pointers.

CLO02   Declaration and use structures, perform operations on structures, passing structures as function arguments. type defining structures.

CLO03 Use Function declaration, function definition, function call, Passing arguments to a function, by value, by reference. Scope of variable names, creation of header files

CLO04 Use calloc, malloc, realloc dynamic memory.

CLO05 Apply Input-output using files in C, Opening, closing and reading from files. Programming for command line arguments.

CLO06 Apply graphics functions to create pictorial representation and animations

Unit-I Pointers

Introduction to Pointers (Declaration and Initialization), Double Pointer, Pointers and Array, Pointers and Functions, Operations on Pointers.

Unit-II User Defined Data Types

Defining a Structure, Declaration of Structure Variables, Initialization of Structure Variables, Accessing Structure Members, Storage of Structures in Memory Array within a Structure, Array of Structure, Pointer Structure, Passing Structure to a Function, Structure within a Structure. Define Union, Structure versus Union, Working with Union, Initializing Union, Enumerated Data Type.

Unit-III Pre-processor and Memory Allocation

Pre-processor Directives, Macro and Macro Expansions, File Inclusions, Conditional Compilation, Stringification (#) and Token Passing Operator (##), Type Def, Command Line Argument, Dynamic Memory Allocation. malloc(), calloc(), realloc(), free(), Core Dump, Memory Leak, Dynamic 1D and 2D Arrays. Header Files and Their Creations.

Unit-IV File Handling

File Concept, File Pointer and File Handling Operations Using files in C, Buffer and Streams, Working with Text Files and Binary Files, File Operations using std. Library and System Calls, File Management I/O Functions, Random Access Files.

Unit-V Graphics Programming

C Header Files for handling graphics and initializing graphics mode, Understand Coordinate system, Function to Draw Lines,Circle, Arc, Ellipse, pieslice, sector, Rectangle, Bar, 3-D Bars & Polygon, Color Spraying: filling Ellipse, polygons and flooding the fills, Filling Styles and Patterns, Understand Animation, Function to create Animation, Traffic Light and Moving Car Simulation.

Text Books:

1. Herbert Schildt, C: The complete Reference, Fourth Edition, Mc-Graw Hill.
2. R. Sethi, Programming Language Concepts and Constructs, Pearson Education.
3. V. Rajaraman, Computer Programming in 'C', PHI.
4. M. Sprankle, Programming and Problem Solving, Pearson Education.
5. R.G. Dromey, How to solve it by Computer, Pearson Education.
6. E. Balguruswamy, Programming in ANSI C by, Tata Mc-Graw Hill.
7. Yashavant Kanetkar, Let Us C, BPB.
8. E. Balagurusamy, Fundamentals of Computers, TMH.
9. AL Stevens, C Database Development, MIS Press.

References:

1. Kernighan and Ritchie, The 'C' programming language, PHI.
2. Programming With C, Schaum Series.
3. A. N. Kamthane, Programming with ANSI and Turbo C, Pearson Education.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO01 Apply Pointers, Pointer Arithmetic and Accessing arrays, strings through pointers.
CO02 Use different user defined data types like structures, union and enum.
CO03 Understand and Use of dynamic memory allocation and preprocessor directives.
CO04 Use the concepts of file handing.

CO05 Use Graphics programming to draw and use different shapes.

List of Practical

1. Program to create, initialize, assign and access a pointer variable.
2. Program to swap two numbers using pointers.
3. Program to change the value of constant integer using pointers.
4. Program to print a string using pointer.
5. Program to count vowels and consonants in a string using pointer.

6.   Program to find sum of elements of array using pointer.

7.   Program to swap two numbers using pointers.

8.   Compare strings using pointer

9.   Find smallest number in array using pointer.

10.   Find largest element in array using pointer.

11.   Find sum of all matrix elements using pointer.

12.   Program to create a pointer array store elements in it and display.

13.   Program to demonstrate function pointers.

14.   Program to perform Addition Subtraction Multiplication Division using array of function pointers.

15.   Program to display details of student two (Name, roll no, marks) using structure.

16.   Program to display details of employee using array of structure.

17.   Program to access member of structures using pointers.

18.   Program for passing structure to a function.

19.   Program for returning a structure from a function.

20.   Program to display details of student two (Name, roll no, marks) with the help of union.

21.   Program to demonstrate the memory allocation in structure and union.

22.   Program to demonstrate malloc and calloc.

23.   Program to allocate memory of array at run time.

24.   Program to print the day of week.

25.   Program to print month of a year.

26.   Program to calculate area of circle using macro.

27.   Program to calculate area of circle using macro function.

28.   Program to create a header file and use it in a program.

29.   Program to demonstrate file operation.

a.   Creating a new file

b.   Opening an existing file

c.   Closing a file

d.   Reading from and writing information to a file

30.   Program to count number of words, number of character and number of lines from a given text file.

31.   Program in C to delete a specific line from a file.

32.   Write a program in C to append multiple lines at the end of a text file.

33.   Write a program in C to copy a file in another name.

34.   Write a program in C to merge two files and write it in a new file.

35.   Write a program in C to encrypt a text file.

36.   Write a program in C to decrypt a previously encrypted file.

37.   Write a program in C to remove a file from the disk.

38.   Write a program to draw a circle and fill blue color in it.

39.   Write a program to draw a rectangle with diagonal and fill different colors in both halves.

40. Write a program to move a circle using suitable annimations.
41. Write a program to implement traffic signal.
42. Write a pogram to simulate a moving car. Draw car using simple shapes like line, circle and   polygon.

Course Code	Course Name	Total Hours per week			Total	
		L	T	P	Hours	Credits
EN3ES29	**Engineering Workshop**	**0**	**0**	**2**	**2**	**1**

Course Learning Objectives (CLOs):

CLO01 To familiar with Lathe, Drilling, Milling and shaping machines.

CLO02 The basic law of physics and their utilization in engineering.

CLO03 To understand different primary manufacturing process.

CLO04 To understand different metal joining process.

CLO05 To identify different tools used in basic manufacturing process.

Unit-I Introduction and Demonstration: - Introduction to various shops / sections and workshop layouts. Safety norms to be followed in a workshop.
Carpentry Shop: Introduction of Tools & operations, Types of woods & their applications, Types of Carpentry tools and their uses, Carpentry Joints, carpentry operations such as marking, sawing, planning, chiseling, grooving, boring, joining, types of woods and carpentry hardware.

Unit-II Fitting Shop: Introduction of Tools & operations, Types of Marking tools & their uses, Types of fitting cutting tool & their uses, fitting operations such as chipping, filing, scraping, grinding, sawing, marking, drilling, tapping

Unit-III Foundry Shop: Pattern Making: Study of Pattern materials, pattern allowances and types of patterns. Core box and core print. Use and care of tools used for making wooden patterns.
Molding: Properties of good mould & Core sand, Composition of Green, Dry and Loam sand. Methods used to prepare simple green sand mould using single piece and split patterns.
Black Smithy Shop: Use of various smithy tools. Forging operations: Upsetting, drawing down, Fullering Swaging and Cutting down.

Unit-IV: Welding Shop: Study and use of tools used for Brazing, Soldering, Gas & Arc welding. Preparing Lap & Butt joints using gas and arc welding methods, Study of TIG & MIG welding processes. Safety precautions.

Unit V: Machine Shop: Study of machine tools in particular Lathe machine (different parts, different operations, study of cutting tools). Demonstration of different operations on Lathe machine, Practice of Facing, Plane Turning, step turning, taper turning, knurling, and parting. Demonstration and applications of drilling machine, Demonstration of CNC Machines

 Textbooks:
1. B.S. Raghuwanshi, Workshop Technology Vol. I & II, Dhanpath Rai & Sons.
2. R.S. Khurmi, Workshop Technology, S. Chand and Co.

3. S.K. Hajra Choudhary, A.K. Hajra Choudhary and Nirjhar Roy, Elements of Workshop Technology, vol. I Media promoters and Publishers Pvt. Ltd
4. R.K. Bansal, Engineering Mechanics, Laxmi publications.

References:

1. W. A.J. Chapman, Workshop Technology, 1998, Part -1, 1st South Asian Edition, Viva Book Pvt. Ltd.
2. P.N. Rao, 2009, Manufacturing Technology, Vol.1, 3rd Ed., Tata McGraw Hill Publishing Company.
3. Dr. S.K. Sinha , CNC programming — Golgotia publication.

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO01 Understand the engineering materials, their properties, and their utilization in manufacturing tool and other equipment's.

CO02 Understand the primary manufacturing process.

CO03 Understand the basic operation involve in casting.

CO04 Understand the basic process of forging.

CO05 Basic knowledge of simple cutting, holding. Marking and striking tool.

Course Code	Course Name	Hours per Week			
		L	T	P	Credits
EN3HS01	History of Science and Technology	3	0	0	2

Course Learning Objectives (CLOs):

CLO$_{01}$ To know the historical perspective of science and technology in India, its roots and its role.

CLO$_{02}$ To know how research and development field is progressing in India.

CLO$_{03}$ To know what were the policies and plans are proposed after independence to be technologically sound.

CLO$_{04}$ To Know what were the developments done in major areas of science & technology.

CLO$_{05}$ To know the relationship between the technologies.

Unit-I Historical Perspective

Nature of science and technology, Roots of science and technology in India, Role of Science and Scientists in society, Science and Faith.

Unit-II Research and Development (R&D) in India

Science and Technology Education, Research activities and promotion of technology development, Technology mission, Programs aimed at technological self-reliance, activities of council of scientific and industrial research (CSIR).

Unit-III Policies and Plans after Independence

Nehru's vision of science for independent India, Science and technology developments in the new era, science and technology developments during the Five-Year Plan Periods and science and technology policy resolutions.

Unit-IV Science and Technological Developments in Major Areas

Space – Objectives of space programs, Geostationary Satellite Services – INSAT system and INSAT services remote sensing applications, Launch Vehicle Technology. Ocean Development. Objectives of ocean development, marine research. Biotechnology - Applications of biotechnology in medicine, agriculture, food, and fuel. Energy – Research and development in the field of nonconventional energy resources, India's nuclear energy program.

Unit-V Nexus between Technologies

Transfer of Technology – Types, Methods, Mechanisms, Process, Channels and Techniques, Appropriate technology, Technology assessment, Technological forecasting, Technological innovations and barriers of technological change.

Textbooks:

1. K. Rajaram, Science and Technology in India, Published and Distributed by Spectrum Books (P) Ltd., New Delhi.
2. M. Srinivasan, Management of Science and Technology (Problems & Prospects), East- West Press (P) Ltd., New Delhi.
3. G.R. Kohili, The Role and Impact of Science and Technology in the Development of India, Surjeet Publications.
4. Government of India, Five Year Plans, Planning Commission, New Delhi.
5. K.D. Sharma, and M.A. Qureshi, Science, Technology and Development, Sterling Publications (P) Ltd., New Delhi.

References:
1. Suvobrata Sarkar , History of Science, Technology, Environment, and Medicine in India, Published by Routledge India.
2. Sabareesh P.A. , A Brief History Of Science In India. Published by Garuda rakashan.
3. G. Kuppuram, K. Kumudamani, History of Science and Technology in India, Published by Sundeep Prakashan.

Course Outcomes (COs):
After completion of this course the students shall be able to:

CO01	Student will be aware about the ancient India & the existence of science & technology in that era & how it is reciprocated.
CO02	Student will be aware about the upliftment done in the field of R & D after independence.
CO03	Student will come to know about the plans and policies that brought about radical changes for the growth of science in India.
CO04	Student will come to know about the major areas of the applied science and their existence. And can set the relationship between the technologies.
CO05	Students will understand the need of technology transfer, its types and processes.

Course Code	Course Name	Hours per Week			
		L	**T**	**P**	**Credits**
EN3HS10	COMMUNICATION SKILLS	2	0	2	3

Unit-I

Grammar and Vocabulary Development : Applied Grammar and usage: Parts of Speech, Tenses, Subject-Verb Agreement, Active and Passive Voice, Clauses, Modals, Reported Speech, common errors. Vocabulary: Synonyms, Antonyms, Homophones, One Word Substitution, Affixation: Prefixes & Suffixes, Correctly Spelt Words, Idioms, Proverbs, and Derivation from root words.

Unit-II

Developing Effective Communication Skills: Corporate Communication, Process, Characteristics and principles, Verbal and non-verbal communication, Barriers to effective communication, Importance of effective communication, Importance of Feedback in communication. Seven Cs of Communication.

Unit-III

Speaking Skills and Oral Presentation: Preparing for and conducting presentations, Introducing yourself, Use of formal expressions, Delivery using Audio – Visual Aids with stress on body language and voice modulations, audience research, objective of presentation, Assimilation of data and post presentation strategy.

Unit-IV

Developing Reading and Listening Skills: Reading Comprehension, Process, note-making, note - taking, SQ3R reading technique. Listening Skills: Meaning, process hearing and listening, types, barriers.

Unit-V

Developing Writing Skills: Précis, Paragraph writing, digital communication etiquettes. Business Letters: Parts & Layouts of Business Letters, writing job application and Resume, Calling/ Sending Quotations/ Orders/ Complaints and E-mails.

Text Books:
1. P.C. Wren and Martin, High School English Grammar & Composition, , S Chand and Co Pvt Ltd.
2. S. Kumar and P. Lata , English for Effective Communication, Oxford UP, New Delhi.
3. J.S. Korlahalli and R. Pal, Essentials of Business Communication All Courses, Sultan Chand & Sons.

References Books
1. A.C. Gimson, An introduction to the Pronunciation of English, ELBS.

2. S. Greenbaum, The Oxford English Grammar, Oxford University Press.
3. K.Mohan and M. Raman, Effective English Communication, Tata Mc-Graw Hill.
4. A.J. Thompson and A. V. Martinet, A Practical English Grammar, Oxford UP, New Delhi.
5. U. S. Rai and S.M, Rai, Effective Communication, Himalaya Publishing House.

List of Practicals (Wherever Applicable)

1. Exercises on Grammar and vocabulary
2. Exercises based on reading and comprehension which also include taking notes during presentation.
3. Exercises based on listening which also include taking notes.
4. Writing technical description precis, business letters.
5. Presentations on various issues.
6. Presentations with Non verbal communication.
7. Delivering speeches and exercising voice modulation transcription.
8. Performing extempore.
9. Role plays.
10. Group discussions.

SEMESTER – III

Sr. No.	Course Code	Courses	L	T	P	Credit
1	EN3BS15	Engineering Mathematics-III	3	0	0	**3**
2	CE3CO01	Engineering Surveying	3	0	2	**4**
3	CE3CO05	Construction Material and Techniques	3	0	2	**4**
4	CE3CO19	Fluid Mechanics	3	0	2	**4**
5	CE3ES11	Strength of Material	3	0	2	**4**
6	CE3ES12	Python for Civil Engineering	0	0	2	**1**
7	EN3HS04	Fundamentals of Management,Economics and Accountancy	3	0	0	**3**
8	EN3NG03	Soft Skill-I	2	0	0	2
		Total	20	**0**	**10**	**25**
		Total Contact Hours	**30**			

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
EN3BS15	Engineering Mathematics-III	3	**0**	0	**3**	3

Course Learning Objectives (CLOs):

CLO01 To equip the students with knowledge of difference operators and interpolation.

CLO02 To impart the concepts of appropriate techniques for Numerical differentiation and integration.

CLO03 To equip the students with the knowledge of probability distribution.

CLO04 To describe the concepts of correlation, regression and curve fitting.

CLO05 To provide the knowledge of concept of Correlation and Regression the concept of tests of hypothesis, need of testing, applications of Chi-Square, t-test and F-test

Unit I Functions of Complex Variables
Functions of complex variables: Analytic functions, Harmonic Conjugate funtions, Cauchy-Riemann Equations, Complex Line Integral, Cauchy's Theorem, Cauchy's Integral Formula,Singular Points, Poles and Residues, Residue Theorem, Application of Residue theorem forevaluation of real integrals.

Unit II Numerical Analysis -I
Errors and Approximations, Solution of Algebraic &Trancendental Equations (RegulaFalsimethod , Newton-Raphson formula and Iterative method), Solution of Simultaneous linearequations by Gauss Elimination, Gauss Jordan, Jacobi's and Gauss-Siedel Iterative method.

Unit III Numerical Analysis -II
Difference Operators, Interpolation (Newton Forward and Backward Formulae), CentralInterpolation Formulae (Gauss, Bessel's and Sterling's formula), Lagrange's and Divideddifference formulae, Numerical Differentiation.

Unit IV Numerical Analysis -III
Numerical Integration, Numerical Solution of Ordinary Differential Equations (Taylor'sSeries, Picard's Method, Euler's Modified Method, Runge-Kutta Method, Milne's Predictorand Corrector method) .

Unit V Statistics
Mean, Median, Mode and Standard deviation, Correlation, Karl Pearson's Coefficient ofCorrelation, Spearman's Rank Correlation Coefficient , Linear Regression, Multiple linearregression and interpretation of results, Regression coefficients ,Curve fitting (Method ofLeast Square),Testing of Hypothesis , Analysis of variance(ANOVA), Student's t-test,Fisher's z-test, Chi-Square test.

Textbooks

1. Higher Engineering Mathematics, B.V. Ramana, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006.
2. Probability and Statistics, Ravichandran, Wiley India.

Reference Books
1. Sheldon M. Ross, "Introduction to Probability Models", Elsevier Publication, Academic Press, UK
2. 2.Numerical Methods for Scientific and Engineering Computation, *M .K. Jain, Iyengar and R. K. Jain*, New Age International Publication.

Course Outcomes (COs):

After completion of this course the students shall be able to:

C01. Understand the basic concept of interpolation, finite differences, probability distribution and test of significance.

CO2. Interpret the problem and apply the knowledge of correlation, regression, probability distribution and test of significance.

CO3. Examine and analyse the problem using the concept of numerical solution and test of significance.

C04. Evaluating numerical methods and correlation, regression coefficient for a variety of multidisciplinary applications.

Course Code	Course Name	Hours per Week			Total	
		L	T	P	Hrs.	Credits
CE3CO01	**Engineering Surveying**	**3**	**0**	**2**	**5**	**4**

Course Learning Objectives (CLOs):

CLO01   To provide understanding about working of survey instruments.
CLO02   To provide knowledge of more advance survey techniques
CLO03   To familiarize with latest survey techniques.

Unit-I TRAVERSING

Traversing by theodolite, field work checks, traverse computations, latitude and departures, adjustments, computations of co-ordinates, plotting & adjusting of traverse, omitted measurements, introduction to trigonometrical leveling.

Unit-II TACHEOMETRY, TOTAL STATION and EDM

Tacheometric systems and principles, stadia system, uses of analectic lens, tangential system, instrument constant, Total Station: Operation and application. EDM – Operation and types of Instruments

Unit-III CURVES

Curves: Classification and use; elements of simple circular curve, setting out of simple circular curve by offsets and by theodolites, Components of compound curve, reverse curves, transition curves, cubic spiral and lemniscate, vertical curves.

Unit-IV CONTROL SURVEY

Control Survey: triangulation principle and classification, angle measurement, base line measurement and corrections. Introduction to Remote Sensing, GIS & GPS, Active and Passive Remote Sensing.

Unit-V AERIAL AND HYDROGRAPHIC SURVEY

Principles of photographic surveying: aerial photography, tilt, and height distortions. Hydrographic Surveying: Soundings, methods of observations, computations, and plotting. Introduction to Geodetic Survey.

Textbooks

1. T.P. Kanetkar, Surveying &Leveling, Vol. I & II.

2. Duggal; Surveying vol I and II; TMH

3. Basak; Surveying and Leveling; TMH

Reference Books

1. R.E.Devis, Surveying theory & Practice, Mc.Graw Hill, New York

2. David Clark & J Clendinning, Plane & Geodetic surveying Vol. I & II, constable & Co. London.

3. S.K. Roy, Fundamentals of surveying, prentice - Hall of India New Delhi

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO01 Understand working of Surveying instruments.

CO02 Survey position of different points on ground and under water.

CO03 Prepare graphical representation of different measured points

CO04 Understand basic principles and application of latest technologies in the field of

surveying

List of Experiments

1. Theodolite traversing.
2. Profile levelling, cross sectioning.
3. To find height of an object by trigonometric leveling.
4. Contouring of a small area.
5. Determination of tachometric uses of tachometer in various field works
6. Curve setting by different methods.
7. Building lay-out work
8. Theodolite surveying Measurement of horizontal angle
9. Theodolite surveying measurement of vertical angle for determination of height of   object.
10. Study of Total Station

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	T	P		
CE3CO05	**Construction Material & Techniques**	**3**	**0**	**2**	**5**	**4**

Course Learning Objectives (CLOs):

CLO01   To learn the concept of concrete
CLO02   To understand the basic concept of fresh and hardened concrete
CLO03   To understand mix design of concrete.
CLO04   To learn the technique of masonry work and various construction equipments

Unit-I Brickwork, Plastering & pointing

constituents of brick earth, manufacturing, types, IS Classification of bricks, specification of mortar for brick masonry, commonly used types of bonds in brickwork, principles of construction, common defects in brick masonry, brick knogging, parapets, copings, sills and corbels, masonry construction using cement concrete blocks (solid & hollow) and clay blocks, reinforced brickwork, walls - cavity walls, load bearing and partition walls.

Plastering & pointing: Necessity, mortars used, methods of plastering, types of finishes, types of pointing, Temporary timbering: centering and formwork, scaffolding, painting: white washing, color washing and distempering, new materials & techniques, principle of acoustics, and sound insulation.

Unit-II Foundations Floors and roofs

Types of foundations and their suitability, details of shallow and deep foundations, bearing capacity of soils and its assessment, loads on foundations, causes of failures of foundations and remedial measures, foundation on black cotton soil, setting out foundation trenches, excavation, timbering of trenches, shoring, underpinning.

Floors and roofs: components, materials, types and method of construction, tiled flooring such as ceramic tiles, terracotta, introduction to upper floor, flat and pitched roofs, roof coverings, types and their constructional features, thermal insulation of roofs.

Unit-III Fresh concrete & Hardened Concrete

Constituents of concrete, gradation of aggregates properties of fresh concrete, Definition and Measurement methods of workability as per IS and ASTM standards, factors affecting workability, Segregation & Bleeding, Slump loss, Re-tempering, Site preparations for concreting, Mixing, Conveying, Placing, Compaction, Finishing of concrete. Curing & various methods of curing.

Hardened Concrete: Strengths of hardened concrete (Tensile & Compressive strength, Flexural & Bond strength), standard test methods as per IS and ASTM, Failure mechanism under compression & tension, Stress-strain behaviour of concrete, Overview of Modulus of elasticity, Dimensional stability –Creep & Shrinkage

Unit-IV Concrete Mix Design

Principles of concrete mix design, Parameters and factors influencing mix design, Indian Standard methods of mix design, Acceptability criteria, variability of results, Various provisions of IS code for sound concrete.

Unit-V

Special concrete and concreting methods advanced cement based composites, Fibre reinforced concrete, Polymer modified concrete, Self-compacting concrete, Light weight concrete, High strength concrete, Light-weight & heavy weight concrete, High volume fly ash concrete. Special concreting methods: Pumped concrete, Ready mix concrete, Under-water concreting, Hot & cold weather concreting, Precast concrete.

Non-Destructive testing of concrete – Introduction to Destructive, semi-destructive & Non-destructive testing methodology, Problems faced during Non-destructive evaluation, Test methods like Rebound Hammer test, Ultra-sonic pulse velocity, Penetration tests, Pull out tests

Text Books
1. S.C. Rangwala, Building materials, Charotar Publishing House, Pvt. Limited.
2. P.K. Mehta and P.J.M. Monteiro, "Concrete Microstructure, Properties and Materials", Third Edition,Tata McGraw Hill 2006
3. ML Gambhir, Concrete Technology, Tata McGraw Hill

Reference Books

1. I.K.V.B. Raju and P.T. Ravichandran, Basics of Civil Engineering, Ayyappa Publications,Chennai,2012.
2. A.M. Neville and J.J. Brooks, "Concrete Technology", Pearson Education Ltd. 1987
3. AR Santakumar, Concrete Technology, Oxford University Press
4. Ken W. Day (2006) ,Concrete Mix Design, Quality Control and Specification,Taylor & Francis Group

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Develop an basic understanding of concrete and its types
CO_{02} Develop an understanding of fresh and hardened concrete
CO_{03} Understand process of design mix concrete
CO_{04} Understand and learn techniques 0f masonry work
CO_{05} Gain knowledge about various construction equipments

List of Experiments

1.   Lab test of bricks (Water absorption, Cursing Strength, Efflorescence).

2.   Comparison of workability of concrete by different method.

3.   To determine bulking of sand.

4.   To determine compressive strength of concrete mix sample.

5.   To determine compressive strength of cement mortar cube.

6.   To perform soundness test for cement.

7.   To perform NDT.

8.   To compare compressive strength of nominal mix and design mix concrete.

9.   Flow test of concrete.

10.   J-Ring test of concrete.
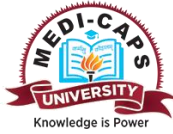
Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	T	P		
CE3CO19	**Fluid Mechanics**	**3**	**0**	**2**	**5**	**4**

Course Learning Objectives (CLOs):

CLO$_{01}$ To give the knowledge of fluid, types, properties, how to measure pressure, associated laws of pressure, instruments. Theory of models and prototype, different laws and theorems.

CLO$_{02}$ To provide basic understanding of the buoyancy, principle of floatation, floating and submerged bodies, Magnus effect, Drag and lift forces.

CLO$_{03}$ To understand fluid kinematics terminology such as streamline, path line, streak line, velocity potential function, stream function, concept of flow net.

CLO$_{04}$ To provide basic knowledge about Euler's theorem, Navier-Stokes equation, various instruments like Orifices, Nozzles, Mouth pieces, Orifice meter, Rota meter, Venturimeter, Weirs and Notches, Pitot tube.

CLO$_{05}$ To understand the flow in pipe, various losses, pipe network and analysis.

Unit-I Introduction Scope and application of fluid mechanics

Physical Properties of Fluid- Mass, Density, Specific weight, Specific gravity, Specific volume, Vapour pressure, Compressibility, Elasticity, Surface Tension, Capillarity; Newton's law of viscosity, Classification of fluids, dynamic viscosity and kinematic viscosity, variation of viscosity with temperature.

Fluid Statics- Measurement of pressure: pressure variation in a static fluid, PASCAL's law, Units and scale of measurement-Atmospheric pressure, Absolute pressure, Gauge pressure and vacuum pressure, Piezometer, Types of Manometers

Buoyancy

Buoyant force, buoyancy and center of buoyancy, Archimedies principle, Principle of Floatation. Metacenter and metacentric height, Equilibrium of floating and submerged bodies, Evaluation of metacentric height- theoretical and experimental method. Oscillation of floating body. Drag and Lift- Types of drag, drag on a sphere, cylinder, flat plate and airfoil. Development of lift on immersed bodies, magnus effect and circulation.

Unit-II Kinematics of fluid flow

Fluid flow methods of analysis of fluid motion, Streamlines, Path lines, Streak lines, Stream Tubes. Types of fluid flow, classification of flow, Reynolds number and Reynold experiment, circulation and vorticity, velocity potential and stream functions, flow net

Dynamics of fluid flow

Concept of control mass and control volume, Reynolds transport theorem, conservation of mass, momentum equation, Euler's equation, Navier-Stokes equations. Derivation of Bernoulli's equation from Euler's equation and application of momentum and energy equations, energy and momentum correction factors. Measuring devices: Orifices, Nozzles, Mouth pieces, Orifice meter, Rotameter, Venturi meter, Weirs and Notches, Pitot tube.

Unit-III Dimensional Analysis and model study
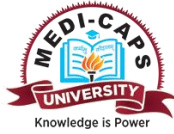
Dimension and units. Dimensional homogeneity, Buckingham pi Theorem Dimensionless number, principal of similitude and application

Unit-IV Flow through pipe

Laminar flow, flow between parallel stationary and moving plate, plat measurement of viscosity, Reynold experiment Turbulent flow in pipe, Loss of head through pipes, Darcys-Wiesbach equation, minor losses, total energy equation, hydraulic gradient line, Pipes in series, pipes in parallel, concept of equivalent length, branching of pipes, siphon, power transmission through pipes, Concept of water hammer and surges, three reservoir problems, Analysis of Pipe networks: Hardy Cross method

Unit-V Flow through open channel

Classification, Geometric Element, continuity, Energy and momentum equation, Pressure ,Velocity distribution, uniform flow, concept of normal depth, Chezzy's, Manning's and other formulae. Best hydraulic section, Specific Energy, Specific force, Hydraulic Jump Gradually Varied flow, dynamic equation.

Textbooks

1. Fluid Mechanics & Hydraulics Machine Modi & Seth, Standard Book House

2. Fluid Mechanics & Hydraulics Machine R K Bansal, Lakshmi Publications

3. Fluid Mechanics & Hydraulics Machine RK Rajput, S Chand Publications

Reference Books

1.   Garde R.J. and mirjagaokar A.G. "Engineering Fluid Mechanics" scitech publications (india) pvt. Ltd. Chennai 2003.
2.   Fox W.R. MacDonald A.T. "Introduction to Fluid Mechanics" Wiley & Sons Inc. New York, 1998.
3.   Asawa G.L. "Fluid Flow in Pipes and channels", CBS Publishers, New Delhi, 2008
4.   Streeter V.L., Bedford K. and Wylie E.B., "Fluid Mechanics", McGraw Hill Book Compony Ltd., New York, 1998.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO$_{01}$ To Understand the knowledge of fluid, Properties of fluid , Basic understanding of the buoyancy, Fluid kinematics terminology, Discharge measuring Instrument, Pipe network.

CO$_{02}$ To Classify type of fluid, types of drag, types of discharge &velocity measuring instrument, Types of network used in pipe.

CO$_{03}$ To Calculate various Problem such as Manometer, Buoyancy ,Drag and lift forces, path line, velocity potential function, stream function, flow net, Various Instrument Venturimeter, orifice meter, Nozzles, Mouth pieces, Rota meter, Weirs and Notches, Pitot tube. etc, Various losses ,Pipe network .

CO$_{04}$ To Analysing Various Problem in fluid ,Pipe networks by Hardy Cross method.

List of Experiments

1. To verify Bernoulli's Theorem.
2. Measurement of flow through Venturi meter, Orifice meter, Rotameter.
3. To study the impulse momentum factor by Impact Jet
4. To Determine metacentric height of a given vessel under (a) Unloaded condition (b) Loaded condition
5. To study Laminar Flow with the help of Reynold's number
6. To determine the frictional coefficient 'f' for the given fittings
7. To determine frictional factor 'f' for given pipes
8. To measure discharge rate with the help of pitot tube
9. To study the flow pattern in free and forced vortex flow with the help of vortex apparatus
10. To find the value of coefficient of contraction, coefficient of velocity and coefficient of discharge for given; (a) Orifices (b) Mouthpieces

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	T	P		
CE3ES11	**Strength of Material**	**3**	**0**	**2**	**5**	**4**

Course Learning Objectives (CLOs):

CLO$_{01}$ To Understand the basic concepts and principles of stress, strain and torsion analysis

CLO$_{02}$ To Analyze and determine the stresses and strains in various types of beams.

CLO$_{03}$ To Analyze the behavior of beams under different loading conditions and determine their deflection.

CLO$_{04}$ To Analyze the stability of columns and struts under different loading conditions.

Unit-I Simple and Complex stress and strains

Simple Stress and Strains

Stresses in compound bars, composite and tapering bars, Thermal stresses and strains, principle of superposition.
Complex Stress and Strains-Two dimensional and three-dimensional stress system, Normal and tangential stresses, Principal Planes, Principal Stresses and strains, Mohr's circle of stresses,
Engineering properties of material.

Unit-II Bending & shear stresses:

Theory of simple bending, Concept of pure bending and bending Stress, Equation of bending, Neutral axis, Section-Modulus, Determination of bending stresses in simply supported, Cantilever and Overhanging beams subjected to point load and uniformly distributed load. Bending & shear stress distribution across a section in Beams.

Unit-III Deflection of Beam

Deflection of beams by Double Integration Method, Macaulay's Method, and Conjugate Beam Method Area Moment area Method.

Unit-IV Torsion of Shafts

Concept of pure torsion, Basic assumptions, Torsion equation, Determination of shear stress and angle of twist of shafts of circular section, Hollow shafts, Combined Bending and Torsion.
Pressure Vessels: -Thin walled cylinders and spheres. Stress due to internal pressure, Change in diameter and volume.

Unit-V Columns and Struts

Stability of Columns; buckling load of an axially loaded column with various end conditions; Euler's and Rankine's formula; Columns under eccentric load.
Introduction of Unsymmetrical Bending, Shear center and Theory of failure.

Text Book:-
1. Rajput R. K., Strength of Materials, S. Chand.
2. S. Ramamrutham, R. Narayanan, Strength of Materials, Dhanpat Rai Publications.
3. Sadhu Singh, Strength of Material, Khanna Publishers.

Reference Book:-
1. Punmia B.C., Mechanics of Materials, Laxmi Publications (P) Ltd.
2. R. Subramaniam, Strength of Materials, Oxford University Press.
3. Stephen P. Timoshenko, Strength of Materials (Part 1) Krieger Pub Co.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO$_{01}$ Understand the concept of unsymmetrical bending, shear center, and theory of failure in structures.

CO$_{02}$ Determine the deflection of beams using different methods such as Double Integration Method, Macaulay's Method, and Conjugate Beam Method.

CO$_{03}$ Analyze simple and complex stress and strain systems in beams and shafts.

CO$_{04}$ Students will be able to calculate the stresses due to torsion, effect of combined bending and torsion in a beam.

CO$_{05}$ Analyze the stability of columns and struts under different loading conditions.

List of Experiments

1. To determine the reaction and shear force of beam and compare it with theoretical value.
2. Determination of bending moment of beam and comparison with the theoretical values.
3. To determine the flexural rigidity of beam and compared it with theoretical value.
4. To determine the deflection of Beam by the use of deflection-beam apparatus.
5. Determination of elastic constants by Universal testing Machine.
6. To study the Mohr circle of stresses.
7. Determination of effective length of columns with different and conditions.

8. To determine torsional rigidity.
9. To study unsymmetrical bending.
10. To determine the shear center of a given section.

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
CE3ES12	Python for Civil Engineering	0	0	2	2	1

Course Learning Objectives (CLOs):

COURSE OBJECTIVES

CO01	Define basic operators, variable of python.
CO02	Understand data types and OOPS concept of python.
CO03	Choose right conditional block for python
CO04	Explain OOPS concepts.

SYLLABUS

Introduction to Python: Installation and working with Python, Variables, Basic Operators

Python Data Types: int , float, complex, User Input, Arithmetic Expressions ,Using Strings and Operations on Strings, Use of list and list slicing, Use of Tuples

Flow Control: Conditional blocks: if, else, elseif, For Loops in Python: Loops with range, Strings, List and Dictionaries, While Loop

Python Functions: Defining a function, Block structure, recursion, conditional and, inbuilt function using a function Python String, List and Dictionary manipulations

Files: Reading and Writing Files in Python, File Operations, Reading config files in python, Writing log files in Python.

OOPS Concepts: Object oriented concepts – Introduction, Classes, Polymorphism

COURSE OUTCOMES

On successful completion of the course, students will be able to:

1. Learn basic fundamentals of writing a python code

2. Understand Lists, Dictionaries in Python.

3. Create Functions in Python

4. Handle Strings and Files in Python

PROBABLE LIST OF PRACTICAL TO BE CONDUCTED BASED ON ABOVE SYLLABUS

1. Introduction to python and its basic command.
2. Basic Arithmetic operations
3. Basic Statistical operations.
4. Applications of functions: Block structure, recursion, conditional and, inbuilt function.
5. Applications of sequences: as looping and controlled flow, list iteration, string method and formatting in python
6. Application of file operation: Files in python understanding of read and write function, Reading config files in Python, Writing log files in Python
7. Basic permutation and combination programs
8. Program for calculation of quantity
9. Program for population forecasting/analysis of beam.
10. Introduction to OOPS Concept

Textbooks

1. Python Programming Using Problem Solving Approach: Reema Thareja, Oxford University Press; First edition
2. Programming Python, Mark Lutz.
3. Python 3 for Absolute Beginners, Tim Hall and J-P Stacey.
4. Beginning Python: From Novice to Professional, Magnus Lie Hetland. Edition, 2005
5. Python for Water Resources Engineering, Jon Herman, University of California
6. Vittorio Lora, PYTHON for Civil and Structural Engineers.
7. Dr.R.Nageswara Rao, Core Python Programming, dreamtech press.

REFERENCE BOOK:

1. Mark Luiz, Learning Python, O'REILLY.
2. Jamie Chan, Learn Python in One Day, LCF Publishing.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO01	Define basic operators, variable of python.
CO02	Understand data types and OOPS concept of python.
CO03	Choose right conditional block for python
CO04	Explain OOPS concepts.

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
EN3HS04	Fundamentals of Management, Economics and Accountancy	3	0	0	3	3

Course Learning Objectives (CLOs):

CLO 01 To introduce with the Fundamental knowledge of Management.

CLO 02 To give knowledge about the Marketing and Human Resource Management.

CLO 03 To provide basic information of Applied Economics.

CLO 04 To get acquainted with the knowledge of Financial Accounting.

CLO 05 To give sufficient knowledge of Financial Management.

Unit I: Concepts of Management

Definition, characteristics and importance of management; Management: Science or Art, Difference between Management and Administration, Levels of management, Functions of Management, Managerial Roles, Managerial skills and competencies; Decision Making: Definition, process and types; Decision making under certainty, uncertainty and risk; Cross cultural issues in management and challenges.

Unit II: Fundamentals of Marketing and Human Resource Management

Introduction to Marketing: Definition, importance, function and scope of marketing, Core concepts of marketing, Marketing concepts and orientations, Marketing environment, Marketing-mix, Holistic marketing concept, Customer Relationship Management (CRM).

Introduction to Human Resource Management (HRM): Nature, Scope, Objectives and Functions; Role of HR manager, Process and need for Human Resource Planning, Human resource policies, Changing role of Human Resource in India, Globalization and its impact on Human Resource.

Unit III: Fundamentals of Economics

Introduction to Economics: Definition, nature, scope and significance; Difference between micro and macro economics; Time value of money, Law of diminishing marginal utility; Theory of Demand and Supply, Price elasticity of demand; Meaning and types of costs, Law of variable proportions; Types of market structure; National income and related aggregates; Meaning and types of Inflation; Meaning and phases of business cycle.

Unit IV: Basic Accounting Principles

Accounting Principles and Procedure, Double entry system, Journal, Ledger, Trail Balance, Cash Book; Preparation of Trading, Profit and Loss Account; Balance sheet; Cost Accounting: Introduction, Classification of costs, Methods and Techniques of costing, Cost sheet and preparation of cost sheet; Breakeven Analysis: Meaning and its application.

Unit V: Fundamentals of Financial Management

Introduction of Business Finance: Meaning, Definition of Financial Management, Goals of Financial Management (Profit Maximization and Wealth Maximization), Modern approaches to Financial Management – (Investment Decision, Financing Decision and Dividend Policy Decisions).

Text Books

1. R. D. Agarwal, "Organization and Management", McGraw Hill Education.
2. P. C. Tripathy and P. N. Reddy, "Fundamentals of Management, Economics and Accountancy", Tata McGraw Hill
3. Kotler Philip and Keller Kevin Lane, "Marketing Management", Pearson

Reference Books

1. Peter F Drucker, "The Practice of Management", McGraw Hill

2. Harold *Koontz,* "Essentials for Management", Tata McGraw Hill

3. M Y Khan and P K Jain, "Management Accounting", Tata McGraw Hill

Website Link

1. https://nptel.ac.in/courses/122108038/ (Management Concepts)

2. https://nptel.ac.in/courses/110104068/ (Marketing)

3. www.hrmguide.net (Human Resource Management)

4. http://economicsconcepts.com (Economics)

5. https://nptel.ac.in/courses/110101003/ (Accounting)

6. https://nptel.ac.in/courses/105103023/39 (Financial Management)

Course Outcomes (COs):

After completion of this course the students shall be able to:
CO 01 Students will be able to understand Basics of Management Theory.

CO 02 Student will be gaining knowledge of Marketing & Human Resource Management.

CO 03 Students will be able to understand basic information for Economics.

CO 04 Students will be able to get acquainted with the Financial Accounting System.

CO 05 Students will be able gain sufficient knowledge of Financial Management

SEMESTER – IV

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CE3CO20	Environmental Engineering -I	3	0	0	3
2	CE3CO21	Building Planning & Drawing	2	0	2	3
3	CE3CO22	Transportation Engineering -I	2	0	0	2
4	CE3CO23	Structural Analysis -I	3	0	2	4
5	CE3CO24	Hydraulic Engineering	3	0	0	3
6	CE3CO27	Geotechnical Engineering - I	3	0	2	4
7	CE3CO28	RCC Design	3	0	0	3
8	CE3CO32	Quantity Surveying & Estimation	2	0	0	2
9	EN3NG10	Soft Skills -II	2	0	0	2
		Total	**23**	**0**	**6**	**26**
		Total Contact Hours			29	

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
CE3CO20	Environmental Engineering-I	3	0	0	3	3

Course Learning Objectives (CLOs):

CLO01 To understand the principles and concepts of wastewater engineering, including the collection, conveyance, and treatment of sewage.

CLO02 To identify different types of sewer systems, their components, and the factors influencing their hydraulic design.

CLO03 To analyze the quantity of sewage and stormwater and apply appropriate methods for sizing and designing sewer systems.

CLO04 To evaluate the characteristics of wastewater and comprehend the different stages of sewage treatment, from preliminary to secondary treatment.

CLO05 To gain an introductory understanding of air pollution, noise pollution, and solid waste management, including their sources, effects, measurement, and control methods.

Unit-I

Water Sources: springs, galleries, wells, tube well, Estimation of surface water resources, Ground water velocity, Demand of water for various uses, Fluctuations in demand and Population Forecasting.

Unit-II:

Conveyance of water: Intake structure, Types of pipe materials, Pumps - operation & pumping stations, Layout and hydraulics of different distribution systems, Pipe fittings, valves and appurtenances, **Distribution system:** Analysis, Hardy cross method, Leak detection, Service reservoir capacity and its height.

Unit-III

Quality of water: physical, chemical and Bacteriological analysis of water, Water standards for different uses, water-borne diseases, **Water treatment methods:** Operation of sedimentation tank, coagulation, filtration, disinfection, flocculation, aeration, hardness removal & miscellaneous treatments, rural water supply scheme, water pollution control act.

Unit-IV

Sources of Noise Pollution, Sources and its effects on human body, Measurement of noise and its propagation, Control methods, noise pollution rules and standards.

Unit-V

Characteristics, generation, collection, and transportation of solid wastes engineered systems for solid waste management (reuse/ recycle), energy recovery, treatment and disposal.

Textbooks:

1. B. C. Punmia, Water Supply Engineering- - Laxmi Publications (P) Ltd. New Delhi.

2. G.S. Birdie, Water Supply & Sanitary Engineering- - Dhan Patrai Publications (P) Ltd. New Delhi.

3. Metcalf & Eddy, Wastewater Engineering - -McGraw Hill Book Company New Delhi

Reference Books

1. H. S. Peavy& D. R. Rowe, Environmental Engineering- - Mc-Graw Hill Book Company, New Delhi.
2. S.C. Rnagwala, Water Supply and Sanitary Engineering, Charotar Publishing House Pvt. Ltd., Gujrat
3. G.M. Fair & J.C. Geyer, Water & Wastewater Technology -, New York Wiley.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01}.	Demonstrate knowledge of the principles and practices involved in the collection and conveyance of sewage, including the design of sewer systems.
CO_{02}.	Analyze the characteristics of wastewater and apply appropriate treatment methods to achieve desired effluent quality.
CO_{03}.	Evaluate the impact of air pollution on human health, animals, and materials, and propose effective control measures.
CO_{04}.	Understand the characteristics of sound, measure noise levels, and propose strategies for noise abatement and control.
CO_{05}	Identify different types of solid waste, analyze methods for collection and disposal, and propose sustainable solutions for solid waste management.

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
CE3CO21	Building Planning and Drawing	2	0	2	4	3

Course Learning Objectives (CLOs):

CLO01 To understand the basic principles and concepts of building planning and design.

CLO02 To develop the skills to create and modify building plans and drawings using drafting tools, computer-aided design (CAD) software, and other relevant technologies.

CLO03 To develop an understanding of building codes and regulations related to building planning and design.

CLO04 To develop critical thinking skills and problem-solving abilities to resolve planning related issues that may arise during the planning.

UNIT I

Drawing of footings and foundations. Elements of doors and windows, Lintel and Arches, Geometrical design and drawing of different type of stairs.

UNIT II

Building classification as per the provisions of national building code, building bye-laws, open spaces within a plot, area and height limitations, requirements of parts of buildings, green belts, land spacing and water conservation, fire protection of building.

UNIT III

Introduction and drawing of building services like water supply and drainage systems, sanitary fittings and fixtures, electrification, ventilation and lighting and staircase, fire safety, thermal insulation, acoustics of buildings.

UNIT IV

Climate Regions in India, Orientation of Building. Principles of planning, Anthropometric science, Space standards, Law of composition, Functional Design, Space function relationship diagram, form follows function. Principle of architectural compostion.

UNIT V

Concept of line plan, Design and preparation of detailed drawings of residential buildings and institutional buildings. Scaling of objects. Introduction to the code of practice for building drawing: plan, elevation and section of different residential and institutional buildings (Indian Standard);

Introduction to perspective drawing: one point, two point and three point perspectives, Bird Eye View

Text Books

1. Building Science and Planning, S V Deodhar, Khanna Publishers

2. Gurucharan Singh and Jagdish Singh, Building Planning, Designing and Scheduling, Standard Publishers Distributors.

3. Building Design and Drawing, LS Layal & Dr. Ashish Dongre, Satya Prakashan Pub.

Reference Books

1. Shah, Kale &Patki; Building Design and Drawing; TMH

2. Construction Material & Techniques, VK Kumawat, Tech Max Publication.

3. AutoCAD training guide, Linkan Sagar, BPB Publications.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO01 Use drafting tools, computer-aided design (CAD) software, and other relevant technologies for creating and modifying building plans and drawings.

CO02 Understand the principles of building design and planning.

CO03 Understand building codes, regulations, building planning and design.

CO04 Solve critical design and construction issues that may arise during the planning.

CO05 Develop building plans based on technical, aesthetic, and practical considerations.

List of Practical

1. Introduction to AutoCAD and its tools.

2. Application of AutoCAD tools on software.

3. Conventional representation and symbols of building elements.

4. Design and drawing of Staircase

5. Drawing of various types of Foundations.

6. Draw a line plan of 1 or 2 BHK residential building with respect to the principle of planning.

7. Draw a plan of 1 or 2 BHK residential building.

8. Draw an elevation of above plan of residential building.

9. Draw a plan of Institutional Building.

10. Draw a plan of Educational Building.

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
CE3CO22	Transportation Engineering-I	2	0	0	2	2

Course Learning Objectives (CLOs):

CLO01. To provide the knowledge of principles of Highway Planning, classification of roads, computation of its Alignment & Geometric Design, brief idea about Construction & Maintenance and highway economics.

CLO02 To understand the concepts and processes related to design, specifications and maintenance of Bituminous & Cement Concrete Pavements.

CLO03 To provide information of detailed understanding of the design of pavements.

CLO04 Highway maintenance and drainage of roads, study different materials used in highways and their testing,

CLO05 To understand the various elements of Airport Planning, Runway & Taxiway.

UNIT-I

History, Indian railways, recent developments. types of gauge problems caused by change of gauge. alignment of railway track, forces acting on track, coning of wheels. rails functions, types of rails, standard rail sections, creep, function and types of sleepers, function and types of ballast, calculation of materials required, relaying of track rail fastenings

UNIT-II

Necessity for geometric design, geometric design of track, gradients, grade compensation on curves. curves and super elevation.

resistance to traction: resistance to-friction, wave action, speed, track irregularity, wind, gradient, curvature, starting and accelerating. stress in rails, sleepers, ballast and formation.

UNIT-III

Important terms about track layouts crossing, types of crossing railway stations and yards:

purpose, facilities requirements and classification of railway stations and yard, signaling and interlocking: objectives of signaling, classification of signals, interlocking.

UNIT-IV

Site Selection for airport, aircraft characteristic and their effects on runway alignments, wind-rose diagrams. Geometrical elements: taxi ways and runways, pattern of runway capacity. Zoning regulations, approach area,

approach surface-imaginary, conical, horizontal. Rotating beacon, boundary lights, approach lights, runway and taxiway lighting etc.

UNIT-V

Selection of route: Engineering surveys, alignment. shape and size of tunnel, bridge action, pressure relief phenomenon, Tunnel approaches, Shafts, pilot shafts , Construction of tunnels: In soft soil, hard soil and rock, Different types of lining, methods of lining, Mucking operation, Drainage and ventilation. Examples of existing important tunnels in India and abroad.

TEXT BOOK

1. Railway, Bridges & Tunnels by Dr. S.C. Saxena

2. Bridge Tunnel & Railway Engineering, by Dr. S.P. Bindra, Dhanpat Rai Publication LTD.

3. Airport Engineering, by S. C. Rangwala, Charotar Publishing House Pvt. Ltd.

REFERENCE BOOKS

1. Principles of Railway Engineering- S.C. Rangwala, K.S. Rangwala and P.S. Rangwala- Charotar Publishing House, Anand

2. Principles and Practice of Bridge Engineering- S.P. Bindra- Dhanpat Rai & Sons, New Delhi

3. Tunnel Engineering- S.C. Saxena- Dhanpat Rai & Sons, New Delhi

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO01   To distinguish different cross-sectional elements of highway and understand the systems of road planning in India.

CO02   To know the construction and design of flexible pavement.

CO03   To know the comparison of different types of pavements, and design flexible & rigid pavements (as per IRC: 37-2012&IRC: 58-2011), and find stresses in them.

CO04   To know about the method of maintenance of rigid and flexible pavement

CO05   To conversant about Airport Planning, Runway & Taxiway and their elements.

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
CE3CO23	Structural Analysis -I	3	0	2	5	4

Course Learning Objectives (CLOs):

CLO₀₁ To provide concept about redundancy and degree of freedom.

CLO₀₂ Familiarise the student with energy concepts internal energy and principal of energy conservation

CLO₀₃ Provide conceptual idea about calculation of unknowns using various methods in determinate indeterminate structures such as ILD, Moment distribution ETC.

CLO₀₄ Impart practice of various examples (simple as well as complex) using different methods

CLO₀₅ Develop the ability of solving various theoretical and realistic problem and select appropriate analysis methods.

UNIT-I

Types of structures, different type of loading and supports, static and kinematic indeterminacy, principle of virtual work, displacements of beams by unit load method. maxwell and betti's law of reciprocal deflection method of consistent deformation (force method) for beams, and frames up to two degrees of indeterminacy. method of strain energy for beams and frames castigliano's 1st and 2nd theorem.

UNIT-II

Analysis of trusses by method of section and joint application of energy and virtual work method on trusses effect of temperature, lack of fit, support movements, least work method for trusses. analysis of continues beam by three moment theorem, effect of settlement of supports.

UNIT-III

Analysis of beam, frames by slop deflection method and moment distribution method (with and without sway).

UNIT-IV

Rolling loads and Influences lines for determinate beams and frames, Muller Breslau principle

UNIT-V

Arches: Three hinged parabolic and circular arches, two hinged arches, introduction to Cable and Suspension bridges.

Text Books

1. C S Reddy , Basic Structural Analysis, Tata McGRAW Hill, New Delhi.

2. S Ramamrutham , Theory of Structures Analysis, DhanpatRai Publishing Companey

3. Norris and Wilbur , Structural Analysis, McGRAW Hill International.

References Books

1. Timoshenko and Young , Theory of Structural Analysis, McGRAW Hill International.

2. V. N. Vazirani and M MRatwani, Analysis of Structures, Khanna Publishers, New Delhi.

3. MCWang C.K. , Indeterminate Structural Analysis, McGRAW Hill , New York

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Identify the various structural components their indeterminacy, and formulization of various analysis methods

CO_{02} Understand the process of analysis using various methods along with consideration of stiffness and surrounding boundary conditions.

CO_{03} Calculate the desired internal forces using different analysis methods

CO_{04} Apply appropriate method of analysis for specific cases.

CO_{05} Develop a significant bunch of different method to solve complex problems.

Proposed List of Practicals:-

1. To verify clerk's Maxwell Reciprocal Theorem.

2. To determine slop and deflection of a beam with one end hinged and other and roller.

3. To determine slop and deflection of a overhanging beam.

4. To obtain influence line diagram for banding movement and shear force of a simply supported beam.

5. To find horizontal thrust at support of a three hinged arch.

6. To find horizontal thrust and displacement in a two hinged arch.

7. To determine horizontal thrust and sway on portal frame due to horizontal load.

8. Study of a pin jointed truss.

9. Analysis of beam using E-tab software

10. Analysis of portal frame by using E-tab.

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
CE3CO24	Hydraulic Engineering	3	0	0	3	3

Course Learning Objectives (CLOs):

CLO₀₁ To provide information about basic and effective parameters of nature of flow and its dynamic behaviour on different conditions.

CLO₀₂ To provide different conceptual information about flow of water and its kinetic and kinematic behaviour on different conditions such as open channel in different slopes.

CLO₀₃ To develop the ability to measure or calculate the flow and drag and erosive properties of flow such as conversion of energy in different base condition and stability analysis of dam

CLO₀₄ To develop conceptual ability to design different hydraulic parameter such as slope of earthen dams and diaphragm width.

CLO₀₅ To develop the ability to analyse and design realistic and complex parameter of hydraulic structures using appropriate design fundamental.

UNIT-I

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 open channel flow.

Uniform flow in open channels : Continuity equation, Energy equation and Momentum equation, Characteristics of uniform flow, Computation of uniform flow, Chezy's and Manning's formulae, Determination of normal depth and velocity, Normal and critical slopes, Economical sections

UNIT-II

Non uniform flow in open channels: Specific energy, Specific energy curve, Critical flow computation and its applications, transitions with sub critical and super critical flows.

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

UNIT-III

Rapidly varied flow or Hydraulic Jump & Boundary layer: Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular channel, length and height of jump, Types, application and location of hydraulic jump, Energy dissipation and other uses, Surge length as a moving hydraulic jump, Positive and negative surges

Concept of Boundary Layer Theory

Introduction, Development of boundary layer over a flat plate, boundary layer thickness, displacement, momentum and energy thicknesses, Hydro-dynamically rough and smooth surfaces, boundary layer separation and its control.

UNIT-IV

Gravity dams and Spillway: Design Criteria, forces acting on gravity dams, elementary profile, low and high gravity dams, stability analysis, evaluation of profile by method of zoning, practical profile, construction joints, galleries in gravity dams.

Spillways **:** Ogee spillway and its design, details of syphon, shaft, chute and side channel spillways, emergency spillways.

UNIT-V

Earth and Rock fill dams : Earth Dams: Types, causes of failure and design criteria, soils suitable for earth dam construction, construction methods, foundation requirements, typical earth dam sections, estimation of seepage through and below the dam, seepage control, stability of slopes by slip circle method of analysis.

Rock fill dams: Types, merits and demerits, conditions favourable for their adoption.

Text Books

1. Modi & Seth, Fluid Mechanics, Standard Book house, Delhi

2. Dr. B.C.Punmia, "Irrigations and Water Power Engineering," Laxmi Publications Ltd.

3. A.K. Jain, Fluid Mechanics - Khanna Publishers, Delhi

Reference Books

1. R.S.Varshney ,Engineering Hydrology, Nem Chand & Brothers.

2. Chow V.T., Open Channel Hydraulics - McGraw Hill, New York

3. H. Rouse, Engineering Hydraulics

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO01   To understand the fundamentals of boundary layer, open channel flow, nonuniform flow, hydraulic jump, Gravity dam, spillway, Earthen dam.

CO02   To classify different types of open channels, flow in open channel, surface profile, channel bottom slope, dam, Spillway.

CO03   To calculate various problem in boundary layer, open channel flow, nonuniform flow, hydraulic jump, gravity dam, spillway, earthen dam.

CO04   To apply theoretical knowledge about the elements of hydraulic structure in practical manner.

CO05   To create complex design of different hydraulic element using fundamentals.

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
CE3CO27	Geotechnical Engineering-I	3	0	2	5	4

Course Learning Objectives (CLOs):

CLO$_{01}$ To understand the scope of soil mechanics, including the origin and general types of soil, soil composition, and the behavior of clay minerals.

CLO$_{02}$ To comprehend the two-phase and three-phase systems in soil mechanics, along with the mass-volume relationships and numerical problem-solving related to soil properties.

CLO$_{03}$ To identify and apply various index properties of soil, such as consistency limits, textural classification, and different soil classification systems.

CLO$_{04}$ To analyze the permeability and seepage characteristics of soil, including the factors affecting permeability, laboratory measurement methods, and the concepts of seepage pressure and flow nets.

CLO$_{05}$ To gain knowledge of compaction and consolidation in soil mechanics, including compaction tests, factors influencing compaction, field compaction methods, consolidation tests, settlement analysis, and the effects of stress on soil properties.

Unit - I

scope of soil mechanics, origin and general types of soil, Formation of soils, Soil composition, clay Minerals and its behavior, Soil structure. Three phase and two phase system and its mass- volume relationships (numerical problems). Index properties of soil, Consistency limits, unified soil classification system and IS soil classification system.

Unit - II

Soil water, capillarity, Permeability definition and necessity of its study, Darcy's law, Factors affecting permeability. Laboratory measurement of permeability: constant head and falling head method as per IS 2720.permeability of stratified soil deposits.

Seepage and seepage pressure, Quick sand condition, critical hydraulic gradient, flownet, General flow equation for 2-D flow(laplace equation), properties and Applications of flownet, Effective, neutral and total stresses.

Unit –III

Introduction of Compaction and Consolidation, Comparison between compaction and consolidation, compaction tests- Standard Proctor test, Modified Proctor test, Zero air void line. Factors affecting compaction. Effect of compaction on soil properties, Field compaction methods and compaction equipment for different types of soil, Placement water content.

consolidation, primary and secondary consolidation, Relationship between pressure and void ratio, Theory of one dimensional consolidation. Consolidation test, total settlement and time rate of settlement, Fitting Time curves. Normally and over consolidated clays.

Unit - IV

Stress distribution beneath loaded areas by Boussinesq and westargaard's analysis. Newmark's influence chart. Contact Pressure distribution. Mohr - Coulomb's theory of shear failure of soils, Mohr's stress circle, Measurement of shear Strength :- Shear box test, Triaxial compression test, unconfined compression test, Vane shear test, Measurement of pore pressure, pore pressure parameters, critical void ratio, Liquefaction.

Unit - V

Infinite and finite slopes, Types of slope failures, Rotational slips. Stability number. Effect of ground water. Selection of shear strength parameters in slope stability analysis. Analytical and graphical methods of stability analysis. Stability of Earth dams.

Rankine's state of Plastic Equilibrium in soils- Active and Passive states due to wall movement, Earth Pressure at rest. Rankine's Theory: Earth pressure on Retaining wall due to submerged backfill. Backfill with uniform surcharge, backfill with sloping surface, layered backfill. Coulomb's Wedge theory.

Text Books

1. Dr. K.R. Arora, Soil Mechanics & Foundation Engineering Std. Publishers Delhi.

2. Dr. B.C.Punmia, Soil Mechanics & Foundation Engineering, Laxmi Publications, Delhi.

3. Dr. Alam Singh, Modern Geotech Engineering - IBT Publishers, Delhi.

Reference Books

1. C. Venkatramaiah, Geotechnical Engineering, New Age International Publishers.

2. Braj M.Das, Principles of Geotechnical Engineering, Cengage Learning.

3. Donald. P. Coduto, Geotechnical Engineering by Principles & Practices, Pearson

Education.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO₀₁ Apply the principles of soil mechanics to identify and classify different types of soil based on their origin, composition, and behavior.

CO₀₂ Analyze and interpret the index properties of soil, including consistency limits and textural classification, using various soil classification systems.

CO₀₃ Calculate and evaluate the permeability and seepage characteristics of soil, and apply appropriate methods for laboratory measurement and analysis.

CO₀₄ Understand the concepts of compaction and consolidation in soil mechanics, perform compaction tests, and analyze the settlement behavior of soils under load.

CO₀₅ Apply principles of stress distribution, shear strength, and stability analysis to assess the behavior of soil slopes, earth pressure on retaining walls, and the stability of earth dams.

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	T	P		
CE3CO28	RCC Design	3	0	0	3	3

Course Learning Objectives (CLOs):

CLO$_{01}$ To describe the properties of concrete making material IS codal provision and basic concept of Working stress and Limit state method.

CLO$_{02}$ To explain the design of various components like rectangular Singly and Doubly Reinforced beam, T-beam, L-beam, columns foundation etc by Limit state method of design.

CLO$_{03}$ To familiarise with design and detailing of various members with various conditions

CLO$_{04}$ To develop an ability of solving various case studies for design with different condition.

Unit-I

Concrete making materials, Properties of concrete and reinforcements, Introduction to working stress method and limit state methods of design, Compression stress block, Estimation of ultimate moment by strain compatibility

Unit-II

Design of Beams: Design of Rectangular Singly and Doubly Reinforced beams, T-beams, L-beams by Limit State Design in collapse and serviceability.

Unit-III

Design of Slabs: Design of one way and two way solid slabs by Limit State Design Method, Serviceability Limit States, Control of deflection, Torsion and cracking.

Unit-IV

Design of Columns: Design of Columns by Limit State Design Method- Effective height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of columns under bi-axial loading by Design Charts.

Unit-V

DESIGN OF FOOTING : Design of wall footing – Design of axially and eccentrically loaded rectangular pad and sloped footings – Design of combined rectangular footing for two columns only

TEXTBOOKS:

1. Ramamrutham, Plain & reinforced concrete - Dhanpat Rai publishing Company (P) Ltd-New Delhi

2 B.C. Punnia, Plain & reinforced concrete – Laxmi Publication

3 Jain A. K., Reinforced Concrete Limit State Design, Nem Chand Brothers, Roorkee

REFERENCE BOOKS:

1 Unnikrishna Pillai and Devdas Menon, Reinforced Concrete Design, Tata McGrawHill

2 Sinha S. N., Reinforced Concrete Design Tata McGraw Hill

3 M.L.Gambhir, Fundamental of reinforced concrete design, PHI

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO01. Recognise various material properties and codal limitation about RCC structure

CO02. Analyse the existing strength of structural components Like MOR of beam load carrying capacity of columns etc.

CO03. Design various components by using concepts of analysis and IS recommendations.

CO04. Select appropriate type of approach and design a suitable components according to the existing condition

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
CE3CO32	Quantity Surveying & Estimation	2	0	0	2	2

Unit I

Introduction to estimates and related terms: Definitions of estimation and valuation. Significance (application) of the Course. Purpose of estimation. Type of estimates, data required for estimation as a prerequisite. Meaning of an item of work and enlisting the items of work for different Civil Engineering projects. Units of measurement. Mode of measurement of building items/ works. Introduction to components of estimates: abstract sheet (BOQ), measurement sheet, lead & lift. Provisional sum & prime cost items, contingencies, work charge establishment, centage charges. Introduction to S.O.R. Types of sanction, Introduction to DPR and its content.

Unit II

Estimate of RCC works (Slab, Beams, Columns) Material's Estimate for various works (Brickwork, Plastering, RCC) Detailed estimate of two room building, earth work calculation for roods.

Unit III

Purpose of valuation. Meaning of price, cost and value. Factors affecting 'value'. Types of value: Fair Market Value, Book Value, Salvage/ Scrap Value, Distressed Value and Sentimental Value. Concept of free hold and lease hold property. Estimation versus valuation. Meanings of depreciation & obsolescence. Gross and net income, dual rate interest, methods of valuation, rent fixation of buildings (Numerical).

Unit IV

Methods of inviting tenders, tender notice, tendering procedure, Pre and post qualification of contractors, tender documents. 3 bid/ 2 bid or single bid system. Qualitative and quantitative evaluation of tenders. Comparative statement, Pre-bid conference, acceptance/ rejection of tenders. Various forms of BOT &Global Tendering, E-tendering.

Unit V

Contracts: Definition, objectives & essentials of a valid contract as per Indian Contract Act (1872), termination of contract. Types of contracts: lump sum, item rate, cost plus. Defect liability period, liquidated damages, retention money, interim payment or running account bills, advance payment, secured advance, final bill.

Arbitration: Introduction to Arbitrations as per Indian Arbitration & Conciliation Act (1996) Meaning and need of arbitration, qualities and powers of an Arbitrator.

Textbooks:

1. B.N. Dutta, Quantity Surveying & Costing, U.B.S. Publisher.

2. G.S. Birdi, Estimating & Costing for Civil Engineering, Dhanpat Rai Publishing Company

3. Chakraborty, Quantity surveying & costing, M. Chakraborti Publishers.

Reference Books

1. S.V Deodhar, Estimating & Costing and valuation, Khanna Publishers
2. Dr.M.S. Roy, Quantity Surveying & Contract and Tenders, Vayu Education of India.
3. S.C. Rangwala, Estimating Costing and Valuation, Charotar Publishers.

SEMESTER – V

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CE3CO25	Structural Analysis -II	3	0	0	3
2	CE3CO26	Environmental Engineering-II	3	0	2	4
3	CE3CO29	Water Recourse Engineering	3	0	0	3
4	CE3CO31	Design of Steel Structures	3	0	0	3
5	CE3CO33	Geotechnical Engineering - II	3	0	0	3
6	CE3EL**	Elective-I	3	0	0	3
7	CE3EL**	Elective-II	3	0	0	3
8	OE**	Open Elective-I	3	0	0	3
9	EN3NG06	Open Learning	1	0	0	1
10	EN3NG09	Soft Skill-III	2	0	0	2
		Total	**27**	**0**	**2**	**28**
		Total Contact Hours		**29**		

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	T	P		
CE3CO25	Structural Analysis-II	3	0	0	3	3

Course Learning Objectives (CLOs):

CLO_{01} Analysis of structure as well as their implementation in construction.

CLO_{02} To understand the concept of determinate and indeterminate structures

CLO_{03} To understand the principle of virtual work and the application of influence line diagrams in structural analysis problems.

CLO_{04} To analyze determinate and indeterminate structures.

CLO_{05} To use influence line diagrams as a valid tool for structural analysis.

Unit-I

Introduction, Development of method, Analysis of frames and beams with varying cross section and by Column Analogy Method and Analysis of frames and beams by Kani's method.

Unit-II

Matrix Method of Analysis: Introduction to Matrix Algebra. Flexibility and Stiffness Coefficient, Direct Stiffness Method. Energy approach, Flexibility Method, Analysis of beams and frames using stiffness method.

Unit-III

Analysis of tall frames, wind and earthquake loads, codal provision for lateral loads. Approximate analysis of multistory frames for vertical and lateral loads

Unit-IV

Influence lines for Indeterminate structures like two hinge arches and indeterminate frames, Muller Breslau principle, Analysis of Columns, Cables and suspension bridges three hinge stiffened suspension bridges, I.L.D. for suspension bridges.

Unit-V

Plastic Analysis: Stress-strain curve of steel. Theory of Plastic Bending and Plastic Hinge Formation. Redistribution of moments and Plastic Analysis. Static and Kinematic method of Analysis

Text Books

1. Reddy C.S., Basic Structural Analysis, Tata McGraw Hill Publishing Company, New Delhi.
2. Punmia. B. C., Ashok Kumar Jain and Arun Kumar Jain, "Theory of Structures", Laxmi Publications
3. Bhavai Katti, S.S, "Structural Analysis – Vol. 1 Vol. 2", Vikas Publishing House Pvt. Ltd., New Delhi

References Books

1. Wang C.K. Intermediate structural analysis, McGraw Hill, New York.
2. Kinney Sterling J. Indeterminate structural Analysis, Addison Wesley.
3. Norris C.H., Wilbur J.B. and Utkys. Elementary Structural Analysis, McGraw Hill International, Tokyo

Course Outcomes (COs)

After completion of this course the students shall be able to:

CO$_{01}$ Distinguish between determinate and indeterminate structures, sway and non-sway structures

CO$_{02}$ Analyze structures with matrix methods.

CO$_{03}$ Analysis the tall structure by different methods

CO$_{04}$ Use influence line diagrams as a valid tool for structural analysis.

CO$_{05}$ Perform plastic analysis. Understand and able to apply plastic theory to structures

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
CE3CO26	Environmental Engineering-II	3	0	2	5	4

Course Learning Objectives (CLOs):

CLO₀₁ To identify different types of sewer systems, their components, and the factors influencing their hydraulic design.

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CLO₀₂ To analyze the quantity of sewage and stormwater and apply appropriate methods for sizing and designing sewer systems.

CLO₀₃ To evaluate the characteristics of wastewater and comprehend the different stages of sewage treatment, from preliminary to secondary treatment.

CLO₀₄ To gain an introductory understanding of air pollution, noise pollution, and solid waste management, including their sources, effects, measurement, and control methods.

Unit- I
Collection & conveyance of sewage, Fluctuation in sewage flow, Flow through sewer, Design of sewer, Construction &Maintenance of sewer, Sewer appurtenances, Conservancy and Water carriage system, storm water Quantity.

Unit- II
Physical, Chemical & Biological parameters. Oxygen demands - BOD & COD, TOC, TOD, Relative Stability, Population equivalent, Instrumentation involved in analysis, Natural methods of wastewater disposal i.e., by land treatment & by dilution, Self-purification capacity of stream, Oxygen sag analysis.

Unit-III
Characteristic of sewage (i.e., Physical, Chemical, Biological), Flow chart of Treatment, Screening, Grit Chamber, Skimming Tank, and their Disposals. Primary Sedimentation Tank.

Unit-IV
Secondary Sedimentation Tank, Activated Sludge Process, Trickling Filter Process (contact beds), oxidation pond and ditch, sludge digestion and Septic tank, Sludge conditioning, Sewage, sickness, sludge disposal.

Unit-V
Introduction of air pollution, Sources of Air pollution, Types of Air Pollutants (i.e. Primary and secondary), Effects of air pollution, Air quality Standards, Measures (Gravitational settling chambers).

Text Books:
1. NN Basak, Environmental Engineering, Tata McGraw Hill

2. G.S.Birdie, Water Supply & Sanitary Engineering, Dhanpat Rai Publishing Company
3. Rangwala, Water supply and sanitary Engineering (Environmental Engineering), Charotar Publishing House Pvt. Ltd.

References Books:
1. Dr. PN Modi, Water Supply Engineering, Standard Book House
2. SK GARG, Water supply Engineering, Khanna Publishers
3. Balram Pani, Text Book of Environmental Chemistry, I K International Publishing House;

Course Outcomes:

By the end of the course, students will be able to:

CO01	Demonstrate knowledge of the principles and practices involved in the collection and conveyance of sewage, including the design of sewer systems.
CO02	Analyze the characteristics of wastewater and apply appropriate treatment methods to achieve desired effluent quality.
CO03	Evaluate the impact of air pollution on human health, animals, and materials, and propose effective control measures.
CO04	Understand the characteristics of sound, measure noise levels, and propose strategies for noise abatement and control.
CO05	Identify different types of solid waste, analyze methods for collection and disposal, and propose sustainable solutions for solid waste management.

Proposed List of Practical's
1. To determine Biological Oxygen demand of a wastewater sample.
2. To study the sampling techniques for water and wastewater.
3. To determine the turbidity of water and wastewater.
4. To deter mine the coagulant dose required to treat the given turbid water sample
5. To determine the concentration of chlorides in a given water samples
6. Determination of hardness of the given sample
7. Determination of residual chlorine
8. Determination of Alkalinity in a water sample
9. To determine Chemical Oxygen demand of a given water/wastewater sample.
10. Determination of Dissolved Oxygen (DO) in the water sample.

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	T	P		
CE3CO29	Water Resource Engineering	3	0	0	3	3

Course Learning Objectives (CLOs):

CLO₀₁ To give the information about hydrologic cycle, precipitation, runoff, hydrographs used in various civil engineering operations.

CLO₀₂ To provide basic understanding of floods, its types, its control measures and routing through reservoirs and channels.

CLO₀₃ To study ground water and its characteristics with the necessary terms and well irrigation

CLO₀₄ To provide knowledge about irrigation and various calculations related to it required for an irrigation engineer.

CLO05 To understand various aspects of canal irrigation and design of canals by different methods.

Unit-1

Introduction to hydrology, Hydrologic cycle, The water Budget, Concept and characteristics of watershed, Precipitation, Measurement of rainfall, Rain-gauge network, Estimation of missing rainfall data, Computation of average rainfall, Presentation and interpretation of rainfall

data, Evaporation, Infiltration and infiltration indices, Runoff, Computation of run-off. Hydrograph analysis, Unit hydrograph and its derivation from isolated and complex storms, S-Hydrograph, Synthetic unit hydrograph,Summation Hydrograph.

Unit- 2

Introduction to flood, Types of floods, Peak flow determination, Empirical formulae for flood discharge, Flood frequency studies, Gumbel's method, Flood discharge by rational formula, Flood control measures, Flood routing through reservoirs and channels.

Unit- 3

Introduction to ground water, Some definitions, Divisions of sub-surface water, Types of Aquifers, Storage coefficient, Well hydraulics, Determination of aquifer constant T, Characteristic well losses, Interference among well, Tube wells, Methods for drilling tube wells, Open well, Yield of an open well, Methods of lifting water, Advantages and disadvantages of well irrigation over canal irrigation, Selection of suitable site for a tube well.

Unit- 4

Introduction to irrigation, Definition, Necessity, Benefits of irrigation, Ill-effects of irrigation, Types of irrigation, Methods of irrigation, Functions of irrigation water, Quality of irrigation water, Types of Soils, Preparation of land for irrigation, Classes and availability of soil water, Limiting soil moisture conditions, Depth and frequency of irrigation, Principal crops and crop seasons, Duty and delta, Factors affecting duty, Methods of

improving duty, Definitions of irrigation terminologies, Consumptive use of water, Irrigation efficiencies, Crop rotation, Assessment of irrigation water.

Unit- 5

Introduction to canal irrigation, Classification of canals, Canal alignment, Types of irrigation channels, Design of alluvial channels, Kennedy's Theory, Kennedy's method of channel design, Lacey's regime theory, Lacey's theory applied to channel design, Comparison of Kennedy's and Lacey's Theories, Introduction to sediment transport, Losses in canals, Lining of irrigation channels,Canal Regulation Structures.

Text Books:-

1. Dr. B.C.Punmia, "Irrigations and Water Power Engineering," Laxmi Publications Ltd.

 2. K.Subramanya, Engineering Hydrology, Tata McGraw-Hill Education.

3. Santosh Kumar, Hydrology & Flood Control - Khanna Publishers.

Reference Books:-

1. Santosh Kumar Garg, "Irrigation Engineering & Hydraulic Structures," Khanna Publishers.

2. R.S.Varshney ,Engineering Hydrology, Nem Chand & Brothers.

3. Prof. K.N.Dugal & Prof. J.P. Soni. "Elements of Water Resource Engineering," ,New age international publishers.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01}	Understand about components of hydrologic cycle, precipitation, runoff , formation of flood hydrographs used in various civil engineering operations, different types of floods and various methods of its control and routing, importance of irrigation and various methods of irrigation a calculation water supply for irrigation.
CO_{02}	Classify precipitation, hydrograph, floods, various method of irrigation system, types of canal.
CO_{03}	Calculate various problem of hydrological analysis as well as crop requirement
CO_{04}	Design various parameter of canal ,dam ,spillway according to various existing condition.

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
CE3CO31	**Design of Steel Structures**	3	0	0	3	3

UNIT I

Introduction: General, types of steel, properties of steel, structural steel sections, Introduction to I.S. 800 connections using rivets, welding, bolts, design of bolted and welded connection, design examples, efficiency of joints, eccentrically loaded connection .

UNIT II

Design of Beam: General, Lateral Stability of Beams, design of laterally supported beams, bending Strength, plastic section modulus, design examples, design of plated beams.

UNIT III

Tension Members & Compression Members; Tension Members, modes of failure of tension member, design of tension members.

Compression Members: types of compression members, end conditions of compression members, design of compression members.

UNIT IV

Design of compound columns, design of lacing and battens.

Design of column bases: Gusseted base, slab bases, design of column splice.

UNIT V

Roof Trusses: Roof trusses – Types of trusses, purlin and elements of truss, design of purlin and Introduction of lug & cleat angle.

Textbooks

1) Subramanian N, Design of Steel Structures, Oxford University Press, New Delhi.

2) L. S. Negi, Design of Steel Structures, Tata McGraw Hill.

3) S K Duggal, Design of Steel Structures, Tata McGraw Hill Education.

Reference books

1) Ramachandran, Design of steel structures- Vol. II, Standard Book House, Delhi.

2) A.S.Arya, J.L.Ajamani, Design of steel structures-, Nemchand and brothers.

3) B.S.Taranath ,Structural analysis and design of tall buildings ,McGrawhill.

Proposed List of Practical

1. Types of steel sections –drawing.

2. Types of bolted connections - design & drawing.

3. Types of welded connections - design & drawing.

4. Design and drawing of tension and compression member

5. Plated beam- design & drawing.

6. Plate girder beam- design & drawing.

7. Laced column with slab base - design & drawing.

8. Battened column with gusseted base- design & drawing.

9. Roof truss- analysis.

10. Joints of roof truss- detailed drawing.

New Course Code	New Course Name	Hours Per Week				
CE3CO33	**Geotechnical Engineering-II**	**L**	**T**	**P**	**Hrs.**	**Credits**
		3	0	0	3	3

Unit - I

Shallow Foundation: Types – choice of foundation – Location of depth – Safe Bearing Capacity – Terzaghi`s, Meyerhoff 's and Skempton`s Methods

Unit - II

Deep Foundation: Pile foundation, Types of piles, estimation of individual and group capacity of piles in cohesion less and cohesive soils. Static and dynamic formulae. Pile load test, Settlement of pile group, Negative skin friction, under- reamed piles and their design. Piles under tension, inclined and lateral load Caissons.

Unit - III

Soil Improvement Techniques: Compaction. Methods (Field and laboratory), Factors affecting compaction. Field compaction control. Lift thickness.

Soil stabilisation: Mechanical, Lime, Cement, Bitumen, Chemical, Thermal, Electrical stabilisation, and stabilisation by grouting. Geo-synthetics, its types, functions, materials and uses.

Unit - IV

Soil Exploration: Need – Methods of soil exploration – Boring and Sampling methods – Field tests – Penetration Tests – Plate load test – Pressure meter – planning of Programme and preparation of soil investigation report.

Unit - V

Sheet piles/Bulkheads and Machine foundation: Classification of sheet piles/bulkheads/Cofferdams Materials, Types, and Applications.

Introduction to machine foundation, Type of machine foundation, Basic definitions, Mass-spring analogy, Degree of freedom of Block foundation, Introduction to free & forced vibration, Vibration isolation. Design criteria of block foundation.

TEXTBOOKS:

1. Geotechnical Engineering by C.Venkataramaiah,

2. Foundation Engineering by V.N.S.Murthy, CRC Press, New Delhi.

3. Found. Engg. by G A Leonards McGraw Hill Book Co. Inc.

4. Relevant IS Code

Reference Books: --

1. Soil Mechanics & Foundation Engg. by Dr. K.R. Arora - Std. Publishers Delhi

2. Soil Mechanics & Foundation Engg. by B.C. Punmia - Laxmi Publiscations Delhi

3. Modern Geotech. Engg. by Dr. Alam Singh-IBT Publishers Delhi.

4. Geotech. Engg. by C.Venkatramaiah-New AGE International Publishers, Delhi

		SEMESTER – VI				
Sr. No.	Course Code	Courses	L	T	P	Credit
1	CE3CO30	Transportation Engineering - II	3	0	2	4
2	CE3CO34	Civil Engineering Software Lab	0	0	2	1
3	CE3CO35	Advance RCC Design	3	0	0	3
4	CE3PC08	Mini Project	0	0	4	2
5	CE3EL**	Elective-III	3	0	0	3
6	CE3EL**	Elective-IV	3	0	0	3
7	CE3EL**	Elective-V	3	0	0	3
8	OE**	Open Elective-II	3	0	0	3
9	EN3NG08	Soft Skills-IV	2	0	0	2
		Total	**20**	**0**	**8**	**24**
		Total Contact Hours	**28**			

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
CE3CO30	Transportation Engineering -II	3	0	2	5	4

Unit I

Highway planning, Alignment & Geometric Design

Principles of highway planning, road planning in India and financing of roads, classification patterns, Requirements, Engineering Surveys for highway location. Cross sectional elements- width, camber, super-elevation, sight distances, extra widening at curves, horizontal and vertical curves, Numerical problems.

Unit II

PIEV Theory, Traffic studies

spot speed studies and volume studies. Accident study, Origin and Destination Studies (O & D): Various methods, collection and interpretation of data, planning and sampling. Traffic Capacity Studies: Volume, density, level of service. Types of traffic signals and problems on signal design by Webster Method. Brief study of mass transportation available in the country. Traffic signs.

Unit III

Design of Flexible Pavement

Introduction of WBM, WMM, BM, IBM, surface dressing, interfacial treatment- seal coat, tack coat, prime coat, wearing coats, grouted macadam, bituminous concrete specification, construction, fillers, and sealers. Cutback & Emulsions modified Bitumen IRC/IS Standards. Design of flexible pavement as per IRC: 37-2012, design of Marshall mixes and stability.

Unit IV

Design of Rigid pavement

Pavement design factors - design wheel load, equivalent single wheel load, repetition of loads, equivalent wheel load factors, and strength characteristics of pavement materials, climatic variation, and design of rigid pavement as per IRC: 58-2011-Stresses in rigid pavements, critical load positions, combined loading and temperature stresses, Transverse joints, longitudinal joints, dowel bars, tie bars.

Unit V

Maintenance and failure of pavements

Surface and sub-surface drainage, highway materials: properties and testing etc. Pavement strengthening object types & design of overlays. Pavement failures and maintenance Fatigue and reliability.

Textbooks:

1. Highway Engineering by Gurucharan Singh, Standard Publishers Distributors.

2. Highway Engineering by S.K. Khanna & amp; C.E.G. Justo, Nem Chand Bros

3. Airport Planning & amp; Design by S.K. Khanna & amp; M. G. Arora, Nem Chand Bros.

Reference Books

1. O'FlehertyEdward, Highway Engineering, Arnold Publishers Ltd, UK

2. Dr. S.K. Khanna, Laboratory Manual, S.Chand

3. Horonjeff Robert "The Planning & amp; Design of Airports" TMH

Propose List of Practical's

1. Los Angeles abrasion test

2. Aggregate crushing value test

3. Aggregate impact test

4. Shape test

5. Bitumen content by centrifuge extractor

6. Ductility test

7. Flash and fire point test

8. Penetration test

9. Softening point test

10. Marshall mix design

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
CE3CO34	Civil Engineering Software Lab	0	0	2	2	1

Course Learning Objective

CLO₀₁ To explain the working of commands of software

CLO₀₂ To understand concept loading and boundary condition

CLO₀₃ To design different structures of building elements

List of Practicals

1- Introduction to ETABS
2- use of different tools in ETABS
3- analysis of simply supported beam in various loading condition
4-analysis of indetermine structure such as continuous beam and portal frame
5- analysis of multi storey frame
6-design of simply supported beam
7-design of continuous beam
8- design of column
9- Design of single storey building
10- design of g+3 building

Textbooks
1- Mahesh navnath patil, Vinay Ashok rangari Step by Step Analysis and Design of High Rise Building Using ETABS: A complete Guide
2- AZUKO, ETABS Hand book
3- ER. Amir Riyazdar, ER. Simranjeet singh, DYNAMIC ANALYSIS OF BASE ISOLATED TUBULAR TALL BUILDING SYSTEM (LEAD RUBBER BEARING) IN ETABS, Independently published

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO₀₁ Learn different Command of software

CO₀₂ understand the different loading condition for design

CO₀₃ Analysis of different elements of building structures

CO₀₄ Design the multi storey buildings

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
CE3CO35	Advance RCC Design	3	0	0	3	3

UR

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO01   To Identify various component of public utility structure and retaining structure.

CO02   To understand the load behaviour of component of public utility structure and retaining structure

CO03   To Calculate load ,stresses, moment of component of public utility structure and retaining structure

CO04   To design component of public utility structure and retaining structure.

UNIT -I
Building Frames- Introduction to building frames, Various load combinations, Substitute method of frame analysis, Portal frame method, Cantilever method,and design of frames,Design of shear walls

UNIT -II
Earth Retaining Structures: Cantilever and counter fort type retaining walls.

UNIT -III
Design of Circular Water Tanks-Water tanks: Design criteria, material specifications and Permissible stresses for water retaining structures, Design of circular water tanks with fixed & flexible base situated on the ground/underground
Design of Rectangular Water Tanks-Design of square /rectangular tanks situated on the ground/underground using approximate method and IS-code method.
Overhead tanks: Circular and Intze tanks.

UNIT -IV
Silos and Bunkers: Introduction, difference between Bunker and Silo, design of bunkers(Single Unit), design of silos by Airy's theory and Janssen's theory.

UNIT -V
T-beam & Slab bridges-for highway loading (IRC Loads). Principles of prestressed concrete design, materials, methods of prestressing, losses, Analysis of beam sections at transfer and service loads, Design of simple members and determinate structures, Introduction to working and limit state design.

TEXT BOOKS
1. J. Krishna and O.P. Jain, Plain and Reinforced Concrete,Vol. I and II, Nemchand Bros. Roorkee, 1968.
2. Advanced reinforcement concrete design Krishnaraju, CBS Publisher
3. Jain, A.K., "Reinforced Concrete Limit State Design", 7th Ed., Nem Chand & Bros., Roorkee, 2012

REFERENCE BOOK
1. IS 456: 2000. Code of Practice for Plain and Reinforced concrete.
2. Pillai, S.U. and Menon, D., "Reinforced Concrete Design", Tata McGraw-Hill, 2003.
3. Reinforced concrete design, Sinha &Roy, McGraw Hill Education, 2002.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CLO$_{01}$ To Study the structural behaviour of building frames under vertical and lateral loads and their analysis by portal and cantilever method, Analysis and design of shear wall.

CLO$_{02}$ To learn the design of earth retaining structure particularly cantilever and counter fort retaining wall

CLO$_{03}$ To learn the design of various type of water tanks

CLO$_{04}$ To learn the design of silo and bunkers

CLO$_{05}$ To learn the design and analyze T beam slab bridge and to understand principle and analysis of pre stressed concrete structure.

Course Code	Course Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
CE3PC08	Mini Project	0	0	4	4	2

Course Outcomes (COs):

After completion of this course the students shall be able to:

CO_{01} Develop analytical skills through the collection and analysis of data related to the project.

CO_{02} Work effectively in a team and collaborate with others to complete the project successfully.

CO_{03} Manage their time effectively to meet project deadlines.

CO_{04} Communicate their ideas effectively through oral and written presentations, technical reports, and other forms of communication.

CO_{05} Solve problems as they encounter challenges and obstacles during the project.

CO_{06} Develop practical skills related to the project, such as surveying, construction, design, or materials testing, depending on the specific focus of the project.

CO_{07} Apply ethical principles to their project work.

CO_{08} To develop new solutions to engineering problems through innovative thinking

The student will perform a project on the he is learnt & being taught in the current semester preferable works are listed:

1. Survey of a land and reporting.
2. Architectural design of any public building with services.
3. To prepare drawing of existing building with all details and comment on plan.
4. To design a high strength concrete mix.

Project Guideline: -

1. Each group will be not more than 3 students.
2. They will be assigned a guide as per work.
3. They will find topic & within a week time.
4. They will give presentation of the work after MST-I for this marks will be awarded.
5. Second presentation will be after MST-II.

Course Outcomes (COs):

After completion of this course the students shall be able to:

CLO$_{01}$ To provide students with an opportunity to apply the theoretical knowledge they have gained during their course of study to a real-world problem or situation.

CLO$_{02}$ To help students develop project management skills such as planning, scheduling, resource allocation, and risk management.

CLO$_{03}$ To provide students with an opportunity to develop technical skills related to civil engineering, such as surveying, design, analysis, and construction.

CLO$_{04}$ To promote teamwork and collaboration among students.

CLO$_{05}$ To develop skill to communicate their findings and recommendations clearly and effectively, both orally and in writing.

SEMESTER – VII

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CE3ELXX	Elective-VI	3	0	0	3
2	OEXX	Open Elective-III	3	0	0	3
3	CE3PC03	Industrial Training	0	2	0	2
4	CE3PC06	Project-I	0	0	8	4
		Total	**6**	**2**	**8**	**12**
		Total Contact Hours	**16**			

Subject Code	Subject Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
CE3ES02	Advanced Design of RCC Structures	3	0	0	3	3

UNIT -I

Building Frames- Introduction to building frames, Various load combinations, Substitute method of frame analysis, Portal frame method, Cantilever method,and design of frames,Design of shear walls

UNIT -II

Earth Retaining Structures: Cantilever and counter fort type retaining walls.

UNIT -III

Design of Circular Water Tanks-Water tanks: Design criteria, material specifications and Permissible stresses for water retaining structures, Design of circular water tanks with fixed & flexible base situated on the ground/underground

Design of Rectangular Water Tanks-Design of square /rectangular tanks situated on the ground/underground using approximate method and IS-code method.

Overhead tanks: Circular and Intze tanks.

UNIT -IV

Silos and Bunkers: Introduction, difference between Bunker and Silo, design of bunkers(Single Unit), design of silos by Airy's theory and Janssen's theory.

UNIT -V

T-beam & Slab bridges-for highway loading (IRC Loads). Principles of prestressed concrete design, materials, methods of prestressing, losses, Analysis of beam sections at transfer and service loads, Design of simple members and determinate structures, Introduction to working and limit state design.

TEXT BOOKS

1. J. Krishna and O.P. Jain, Plain and Reinforced Concrete,Vol. I and II, Nemchand Bros. Roorkee.
2. Krishnaraju, Advanced reinforcement concrete design, CBS Publisher
3. Jain, A.K., "Reinforced Concrete Limit State Design", 7th Ed., Nem Chand & Bros., Roorkee.

REFERENCE BOOK

1. IS 456: 2000. Code of Practice for Plain and Reinforced concrete.
2. Pillai, S.U. and Menon, D., "Reinforced Concrete Design", Tata McGraw-Hill.
3. Sinha &Roy, Reinforced concrete design, McGraw Hill Education.

Subject Code	Subject Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
CE3EC06	Construction Quality Control & Management	3	0	0	3	3

Unit – I

Construction Quality Management: Concept, Definition and evolution, inspection, Quality control and quality Assurance, Total quality Management (TQM), Cost of Quality.

Unit-II

Practical Aspect of Quality Matter: Quality system in Architectural and structural Design, Drawing and Quality Audit, Aspects of Quality Management in Construction.

Unit-III

Achieving TQM in Construction Projects: Major determinants of Quality control, Semantics of Quality, Quality Assurance Program (QAP), Templates for quality assurance, Quality dimensions for Earthwork, Quality dimensions for RCC work, Quality Audit in Construction works as per ISO 9000, TQM in Building design.

Unit-IV

Inspection of Quality Control: Inspection benefits and item wise check list for Quality control, TQM in Building maintenance, Quality checking as per PWD /CPWD specifications and BIS codes

Unit V

Quality Assurance: Contractor's quality assurance and Quality control plan, Laboratory for Quality control of construction works, Quality effect using modern materials and construction machinery, Quality control of service lines, water supply, drainage, sewerage, sanitary installations, Quality assurance circulars issued by CPWD.

Text books

1. S.C. Basu Roy, "Modern concept of Total Quality control and management for construction", A Nabhi Publication, New Delhi.

2. K. A, N, Talpasai, "Quality Dimensions in Civil construction", J. M. Jain and brothers, Mori gate, Delhi.

3. Kumar Neeraj Jha, "Construction Project Management ,Theory and Practice", Pearson Education, New Delhi.

Reference books

1. Projects ,Planning, analysis, selection, financing, implementation and review by Prasanna Chandra, 7th edition, McGraw Hill Education India Pvt. Ltd., New Delhi.

2. P.S. Gahlot and Deep Gahlot, "Quality Management of Cement Concrete Construction", CBS Publishers and Distributors, New Delhi.

3. Abdul Razzak Rumane "Quality Management in Construction Projects",2nd edition.

Subjec tCode	Subject Name	Hours per Week			Total	Total
		L	**T**	**P**	**Hrs.**	Credits
CE3ES03	Advanced Design of Steel Structures	3	0	0	3	3

Unit-I

Plate girder bridges (Riveted and welded)

Unit- II

Trussed girder bridges for railway and highways (IRC & IRS holding). Types of bearing for bridges,sliding, rocker and pin, Roller, Elastomeric, Curve, Pot & Disk. Design of Rocker and Pin bearing.

Unit-III

Details of components of Industry building, and design of industry building with all components like purlins, Rafter, Roof bracing, Roof Truss, Column, Base plate anchore end connection etc. Apex Hauner,Tubelar truss.

Unit-IV

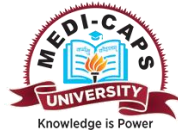Chimneys: Guyed and self supporting steel stacks.

Unit V

Bunkers, Silos & types of Towers and design of lattice towers.

Text Books

1.S. Ramammutham, Design of steel structures, Dhanpat Rai Publication.

2. B.C. Punmia, Design of steel structures, Laxmi Publication .

3. Ramchandra, Design of steel structures Vol. I & II , Scientific Publication, Jodhpur.

Reference Books

1. L.S. Negi, Design of steel structures, MC grow Hill Education.

2. N. Subramanian, Design of steel structures, Oxford University

3. Arya & Ajmani, Steel Structure, New Chand & Brothers

Subject Code	Subject Name	Hours per Week			Total Hrs.	Total Credits
		L	T	P		
CE3EC02	**Construction Laws and Regulations**	3	0	0	3	3

UNIT-I

Construction Contracts – Elements Of Contracts- Type Of Contract -Design Of Contract Documents- International Contract Document Standard Contract Document.

UNIT-II

Tender- Prequalification – Bidding- Accepting- Evaluation Of Tender- Potential Contractual Problm World Bank Procdures.

UNIT-III

Arbitration- Action- Law- Appoinment Of Arbitratior Power Rule Of Evidence. Claims And Disputes; Arbitration Case Studies;

UNIT-IV

Legal Requirement- Insurance- Bonding- Sale- Purchasee- Land Revencue Codes -Tax Laws -Income Tax Laws- Sales Tax- Custom Duties- Influence On Construction Cost.

UNIT-V

Local Government Laws For Approval Statutory Regulations (Development Control Rules For Local Body For A Class, B Class And C Class) Town Planning Act. Labor Regulation-Social Security- Welfare Legislation-Laws Relating To Wages- Bonus And Industrial Disputes- Labor Administration- Insurance And Safety Regulations- Workmen's Compensation Act-Other Labor Laws.

Text Books:

1. Dr. V. K. Raina, "Construction & Contract Management Practice", Shroff publishers and distributorspvt. Ltd. New Delhi.

2. B. N. Dutta, "Estimating and costing in civil engineering", 26th revised edition, UBS Publishera anddistributor's pvt ltd, New Delhi.

3. K.A.N. Taloasai, "Practical Aspect of Tendering and Contractual Operations of Civil Work", J. M.Jaina & Brothers, Delhi

Reference Books:

1. Justice P. S. Narayana & S. R. C. Nayar, " Law of contracts with special reference
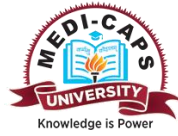
to Tenders andConstruction Agreement"

2. FIDIC- Construction, Insurance and Law- A discussion Document.

3.R. A. Sharma, "Handbook of Arbitration in Construction Contracts", Om Law Book House, Delhi.

Subject Code	Subject Name	Hours per Week			Total Hrs.	Total Credits
		L	**T**	**P**		
OE00038	Remote Sensing and GIS	3	0	0	3	3

Unit 1

Introduction to GPS:- The History of GPS, The Evolution of GPS, GPS working principle,Trilateration, Other Global Navigation Satellite Systems, GLONASS, GALILEO, GPS Satelliteconstellation and SignalsGPS system segments, Space segment, Control segment, User segment. Coordinate Systems: Geoid, Ellipsoid, Coordinate Systems, Geodetic and Geo centric coordinatesystems, ECEF coordinates, Datum, world geodetic 1984 (WGS 84), Conversion betweenCartesian and geodetic coordinate frame,, approximation of earth.

Unit 2

Remote Sensing Overview:- Definition, Remote Sensing Concept, Components in Remote Sensing, Types of Remote Sensing, Energy sources and radiation principles, Energy interaction in atmosphere, Energy interaction with earth surface features, spectral response patterns. Multistage Remote Sensing Data Collection, Types and Uses of Satellites, Remote sensing satellite orbits, Preprocessing of remotely sensed imagery.

Unit 3

Characteristics of photographic images and colour, tone, texture. photo-image interpretationkeys.Digital image analysis techniques: False color Composite (FCC), digital image classification techniques and extraction of thematic information Application of remote sensing in terrain investigation and advantages over conventional mapping techniques.

Unit 4

Basics of GIS:- Introduction to GIS: Definition, GIS applications, Components of a GIS, Geospatial Data, spatial data and attribute data, GIS operations.Map projections, Types of map projection, projected coordinate system, UTM grid system, UPS grid system, SPC system.
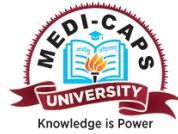
Unit 5

Data Models in GIS:- Geo-relational Vector Data Model: Definition of Geo-relational Vector Data Model, Representation of Simple features, Topology, Nontopological vector data, Data models for composite features.
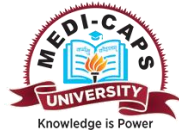
Raster Data Model: Elements of raster data model, types of raster data, Raster data structure,Data compression, Data conversion, Integration of raster and vector data.

Text Books

1.) Lillesand T.M. and Kiefer R. W., Remote Sensing and image interpretation- Willey.

2.) G. S. Rao,"Global Navigation Satellite Systems with Essentials of Satellite communications,"McGraw Hill, New Delhi

3) Kang-Tsung Chang, Introduction to Geographic Information Systems- McGraw HillInternational Edition.

Reference Books

1.) J. B. Campbell, Introduction to remote sensing , John Villey.

2.) J. R., Jensen, Introductory digital image processing, Prentice Hall.

3.) P.A. Burrough, Principles of Geographic Information Systems for land ResourcesAssessment, Wiley.

SEMESTER VIII

Sr. No.	Course Code	Courses	L	T	P	Credit
1	CE3PC07	Project-II	0	0	20	10
		Total	**0**	**0**	**20**	**10**
		Total Contact Hours			**20**	

		Medi-Caps University, Indore **Department of Civil Engineering** **List of Elective**						
1	CE3EL07	Transportation Bridges &Tunnels	3	0	0	3	III	
2	CE3EL04	Building Maintenance & Repairs	3	0	0	3	IV	
3	CE3ES05	Concrete Technologey	3	0	0	3	IV	
4	CE3EL01	Environmental Engineering	3	0	0	3	V	
5	CE3ES08	Prestressed Concrete	3	0	0	3	V	**Structural Engineering**
6	CE3ES01	Advance Geotechnical Engineeirng	3	0	0	3	VI	
7	CE3ES07	Experimental Stress Analysis	3	0	0	3	VI	
8	CE3ES02	Advanced Design of RCC Structures	3	0	0	3	VII	
9	CE3ES03	Advanced Design of Steel Structures	3	0	0	3	VII	
10	CE3ES04	Bridge Engineering	3	0	0	3	VII	
11	CE3ES06	Earthquake Resistant Design	3	0	0	3	VII	
12	CE3EE03	Environment and Energy Studies	3	0	0	3	III	
13	CE3EE04	Environmental Impact Assesment	3	0	0	3	IV	
14	CE3EL01	Environmental Engineering	3	0	0	3	V	
15	CE3EE05	Hazardous & Bio Medical waste Management	3	0	0	3	V	**Environmental Engineering**
16	CE3EE02	Energy Efficient Buildings	3	0	0	3	VI	
17	CE3EE01	Air & Noise Pollution	3	0	0	3	VII	
18	CE3EE06	Industerial Waste Water Management	3	0	0	3	VII	
19	CE3EE07	Planning for Sustainable Devlopment	3	0	0	3	VII	