B. TECH.

COURSE STRUCTURE AND SYLLABUS
FOR
CIVIL ENGINEERING
(AR23)

(Applicable for the batches admitted from 2023-24)

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION AFFILIATED TO JNTUGV, VIZIANAGARAM)

Approved By AICTE, New Delhi, Accredited By NBA, AICTE & NAAC, UGC, New Delhi, Listed Under 2(F) & 12(B), UGC, New Delhi, TEQIP Participated College.

K.KOTTURU, TEKKALI,- 532 201, SRIKAKULAM DIST., AP

VISION OF THE INSTITUTE

To evolve into a premier engineering institute in the country by continuously enhancing the range of our competencies, expanding the gamut of our activities and extending the frontiers of our operations.

MISSION OF THE INSTITUTE

Synergizing knowledge, technology and human resource, we impart the best quality education in Technology and Management. In the process, we make education more objective so that the efficiency for employability increases on a continued basis.

DEPARTMENT OF CIVIL ENGINEERING

Aditya Institute of Technology and Management established the Department of Civil Engineering (CE) in 2011 with an initial intake of 60 students and got approval for additional intake of another 60 seats in 2011-12. Further the UG B.Tech. intake has been enhanced to 120 in the year 2013. A Post Graduate Program (M. Tech) in Structural Engineering was introduced in 2015-16 with an intake of 18 seats. The Department of CE feels proud to announce that this Institution has got accredited by NAAC. The college has got TEQIP funds in phase-II under sub-component 1.1. These two important additions surely enhance the prestige of the institution and in turn help students to improve their academic standards. Both the B. Tech and M. Tech programs were duly approved by the AICTE and Govt. of A.P. and permanently affiliated to JNTUGV, Vizianagaram. The Department has its UG Civil Engineering Program accredited thrice by NBA in 2019 and 2022. The Department has JNTUGV authorized research center for scholars pursuing their Ph.D. The DST-FIST fund has been sanctioned to purchase high end state of art laboratories.

VISION OF THE DEPARTMENT

To become a pioneer in the field of civil engineering by providing high quality education and research to serve the public consistently with competitive spirit professional ethics.

MISSION OF THE DEPARTMENT

1. Provide quality knowledge and advance skills to the students in order to expertise theoretically and practically in the areas of civil engineering.
2. Improve the professional potentiality of the students and staff through educational programs to expand the knowledge in the field of civil engineering
3. Inculcate healthy competitive spirit towards the higher education and successful career in the field of civil engineering to serve the nation ethically.
4. Provide students and faculty with opportunities to create, disseminate and apply knowledge by maintaining a state of the art research.

PROGRAM EDUCATIONAL OBJECTIVES

PEO1. Be employed as a practicing civil engineer in construction, design, testing and allied fields.

PEO2. Engage in self-directed learning research or to undertake higher studies in the rapidly changing civil engineering environment.

PEO3. Create new methods / processes to meet the needs of the society with their civil engineering knowledge.

PEO4. Create themselves as ethical and responsible professionals with good communication skills and demonstrate leadership skills.

PROGRAM OUTCOMES

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. 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.

4. 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.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. 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.

7. 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.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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.

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.

12. Lifelong learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSOs)

On successful completion of B. Tech. Civil Engineering programme graduates will be able to

PSO.1 Specify, design, supervise, test and evaluate civil engineering structures with integrity as per drawings using basic engineering concepts.

PSO.2 Survey, map, plan & layout of infrastructures viz. canals, roads, etc. and apply knowledge of environmental & geotechnical engineering

PSO.3 Acquire knowledge of various techniques, skills and engineering tools required for civil engineering structures including all types of buildings, irrigation structures, highways, railways, docks &harbours etc.

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AR 23 – COURSE STRUCTURE (1st B.Tech.)

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
I B. Tech. (1st Sem)	MC	23MCS101	Induction Program	3 weeks			0
	BH	23BHT102	Linear Algebra and Calculus	2	1	0	3
	BH	23BHT104	Engineering Physics	3	0	0	3
	ES	23EST102	Basic Electrical and Electronics Engineering	3	0	0	3
	ES	23EST105	Introduction to Programming	3	0	0	3
	ES	23EST103	Engineering Graphics	1	0	4	3
	BH	23BHL102	Engineering Physics Lab	0	0	3	1.5
	ES	23ESL102	Basic Electrical and Electronics Engineering Lab	0	0	3	1.5
	ES	23ESL105	Computer Programming Lab	0	0	3	1.5
	MC	23MCS102	NSS/NCC/Scouts & Guides/Community Service	0	0	1	0.5
Total				**12**	**1**	**14**	**20**

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
I B. Tech. (2nd Sem)	BH	23BHT101	Communicative English	3	0	0	3
	BH	23BHT103	Differential Equations and Vector Calculus	2	1	0	3
	BH	23BHT106	Engineering Chemistry	3	0	0	3
	ES	23EST104	Engineering Mechanics	3	0	0	3
	PC	23CET101	Construction Materials and Concrete Technology	3	0	0	3
	ES	23ESL104	Engineering Workshop	0	0	3	1.5
	BH	23BHL101	Communicative English Lab	0	0	3	1.5
	BH	23BHL104	Engineering Chemistry Lab	0	0	3	1.5
	MC	23MCS103	Health and Wellness, Yoga and Sports	0	0	1	0.5
Total				**14**	**1**	**10**	**20**

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AR 23 – COURSE STRUCTURE (2nd B.Tech.)

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
II B.Tech. (1st Sem)	BH	23BHT209	Numerical Methods	3	0	0	3
	ES	23EST206	Python Programming	3	0	0	3
	PC	23CET202	Building Planning and Construction Technology	2	0	0	2
	PC	23CET203	Strength of Materials	3	0	0	3
	PC	23CET204	Fluid Mechanics and Hydraulic Machines	3	0	0	3
	ES	23ESL207	Python Programming Lab	0	0	3	1.5
	PC	23CEL201	Strength of Materials Lab	0	0	3	1.5
	PC	23CEL202	Fluid Mechanics and Hydraulic Machines Lab	0	0	3	1.5
	SC	23CES204	Skill Enhancement course–I	1	0	1	1.5
	MC	23MCT204	Environmental Science	2	0	0	0
Total				**17**	**0**	**10**	**20**

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
II B.Tech. (2nd Sem)	BH	23BHT207	Universal Human Values	2	0	0	2
	PC	23CET205	Surveying	3	0	0	3
	PC	23CET206	Geotechnical Engineering	3	0	0	3
	PC	23CET207	Structural Analysis	3	0	0	3
	PC	23CET208	Engineering Geology	3	0	0	3
	ES	23ESL208	Competitive Programming Lab–I	0	0	3	1.5
	PC	23CEL203	Surveying Lab	0	0	3	1.5
	PC	23CEL204	Geotechnical Engineering Lab	0	0	3	1.5
	SC	23CES205	Skill Enhancement course–II	1	0	1	1.5
	BH	23BHT208	Design Thinking	1	0	2	2
Total				**16**	**0**	**12**	**22**
Mandatory Community Service Project Internship of 02 weeks duration during summer vacation.							

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AR 23 – COURSE STRUCTURE (3rd B.Tech.)

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
III B. Tech. (1st Sem)	BH	23BHT314	Managerial Economics and Management Science	3	0	0	3
	PC	23CET309	Basic Design of Reinforced Concrete Structures	3	0	0	3
	PC	23CET310	Transportation Engineering-I	3	0	0	3
	PC	23CET311	Irrigation and Water Resource Engineering	3	0	0	3
	PE	23CEE31X	Professional Elective– I	3	0	0	3
	BH	23BHL305	Professional Communication Skills Lab	0	0	3	1.5
	PC	23CEL305	Concrete Testing Lab	0	0	3	1.5
	PC	23CEL306	Transportation Engineering Lab	0	0	3	1.5
	ES	23ESL311	Competitive Programming Lab – II	0	0	3	1.5
	IP	23CEP301	Community Service Internship	-	-	-	1
	MC	23MCT305	Constitution of India	2	0	0	0
Total				**17**	**0**	**12**	**22**

Course Code	Professional Elective– I
23CEE311	Advanced StructuralAnalysis
23CEE312	Advanced Surveying
23CEE313	Advanced Solid Mechanics

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
III B. Tech. (2nd Sem)	PC	23CET312	Design of Steel Structures	3	0	0	3
	PC	23CET313	Quantity Survey and Valuation	3	0	0	3
	OE	23OET31X	Open Elective - I	3	0	0	3
	PE	23CEE32X	Professional Elective– II	3	0	0	3
	PE	23CEE33X	Professional Elective– III	3	0	0	3
	SC	23SSS306	Employability Skills	3	0	0	3
	BH	23BHL306	Tinkering Lab	0	0	3	1.5
	PC	23CEL307	Computer Aided Drawing and Design lab	0	0	3	1.5
	MC	23MCT306	Technical Paper Writing and Intellectual Property Rights	2	0	0	0
Total				**20**	**0**	**6**	**21**
Mandatory Industry Internship of 04 weeks duration during summer vacation.							

Course Code	Professional Elective– II
23CEE322	Transportation Engineering II
23CEE323	Earthquake Resistant Design of Structures
23CEE324	Environmental Pollution and Solid waste Management

Course Code	Professional Elective– III
23CEE333	Flood Management and Channel Flow
23CEE334	Repair and Rehabilitation of Structures
23CEE335	Highway Construction Practices

Course Code	Open Elective - I
23OET311	Human Resource Development and Organizational Behaviour
23OET312	Business plan and presentation for Entrepreneurs
23OET313	E-Waste Management
23OET314	Blockchain Technologies
23OET315	Optimization Techniques
23OET316	Ethics in AI

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AR 23 – COURSE STRUCTURE (4th B.Tech. Civil)

Year/Sem.	Category	Code	Theory/Lab	L	T	P	C
IV B. Tech. (1st Sem)	PC	23CET414	Foundation Engineering	3	0	0	3
	PC	23CET415	Environmental Engineering	3	0	0	3
	PC	23CET416	Remote Sensing and Geographic Information System	3	0	0	3
	PE	23CEE44X	**Professional Elective – IV**	3	0	0	3
	PE	23CEE45X	**Professional Elective – V**	3	0	0	3
	OE	23OET42X	**Open Elective - II**	3	0	0	3
	PC	23CEL408	Environmental Engineering Lab	0	0	3	1.5
	PC	23CEL409	Geographic Information System Lab	0	0	3	1.5
	IP	23CEP402	Industry Internship	-	-	-	2
Total				**18**	**0**	**6**	**23**

Course Code	Professional Elective – IV
23CEE441	Advanced Design of Concrete Structures
23CEE442	Ground Improvement Techniques
23CEE443	Watershed Management

Course Code	Professional Elective – V
23CEE451	Prestressed concrete
23CEE452	Bridge Engineering
23CEE453	Finite Element Methods

Course Code	Open Elective - II
23OET421	Entrepreneurial Development
23OET422	Digital Marketing
23OET423	Renewable Energy Sources
23OET424	IT Systems Management
23OET425	Environmental Impact Assessment
23OET426	Cyber Crime and Law Protection

Year/Sem.	Category	Code	Project	L	T	P	C
IV B. Tech. (2nd Sem)	PC	23CEP403	Full semester Internship (or) Project Work	0	0	24	12
	Total			**0**	**0**	**24**	**12**

INDUCTION PROGRAMME

(Common to All Branches of Engineering)

Subject Code: 23MCS101

S.No.	Course Name	Category	L-T-P-C
1	PhysicalActivities-- Sports,YogaandMeditation,Plantation	MC	0-0-6-0
2	CareerCounselling	MC	2-0-2-0
3	Orientationtoallbranches--careeroptions,tools,etc.	MC	3-0-0-0
4	Orientationonadmitted Branch-- correspondinglabs,tools andplatforms	EC	2-0-3-0
5	ProficiencyModules&ProductivityTools	ES	2-1-2-0
6	Assessmentonbasicaptitudeandmathematicalskills	MC	2-0-3-0
7	RemedialTraininginFoundationCourses	MC	2-1-2-0
8	HumanValues&ProfessionalEthics	MC	3-0-0-0
9	CommunicationSkills-- focusonListening,Speaking,Reading,Writingskills	BS	2-1-2-0
10	ConceptsofProgramming	ES	2-0-2-0

LINEAR ALGEBRA AND CALCULUS
(Common to All Branches of Engineering)

Subject Code: 23BHT102

L	T	P	C
2	1	0	3

Course Objectives:

To equip the students with standard concepts and tools of mathematics to handle various real-world problems and their applications as follows.

- Develop proficiency in fundamental algebraic techniques. Apply algebraic concepts to solve engineering problems and practical applications.
- Understand the principles of linear transformations. Explore the concept of orthogonal transformations. Apply these transformations in engineering contexts and problem-solving.
- Gain a deep understanding of calculus concepts. Apply calculus to analyze and solve real-world problems. Explore the applications of calculus in engineering and related fields.
- Understand the concept of functions with multiple variables. Explore optimization techniques using functions of several variables. Apply these concepts in engineering optimization problems
- Learn the concepts of double integrals in two dimensions. Understand triple integrals in three dimensions. Apply integration techniques for calculating areas and volumes in engineering applications.

Course Outcomes:

Student will be able to :

- **CO1:** Apply matrix operations to determine the rank and inverse of matrices using echelon, normal forms, and Gauss-Jordan method; solve systems of linear equations using Gauss elimination and Gauss-Seidel iteration methods. (level 3)
- **CO2:** Compute eigen values, eigen vectors, and analyze their properties; apply Cayley-Hamilton Theorem to find matrix powers and inverses; reduce quadratic form to canonical forms using orthogonal transformations.(level3)
- **CO3:** Apply Rolle's, Lagrange's, Cauchy's mean value theorems, Taylor's and Maclaurin's theorems for function approximations.(level3)
- **CO4:** Apply Taylor/Maclaurin expansions for multivariable functions; compute maxima and minima for two variable functions and constrained maxima/minima using Lagrange multipliers. (level 3)
- **CO5:** Solve double and triple integrals in Cartesian and Polar coordinates, perform change of variables/order, and apply double and triple integrals to calculate areas and volumes. (level 3)

UNIT - I: Matrices:

Rank of a matrix by echelon form, normal form. Inverse of Non- singular matrices by Gauss-Jordan method.

System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations by Gauss elimination method, Gauss Seidel Iteration Method.

UNIT- II: Linear Transformation and Orthogonal Transformation:
Eigen values, Eigen vectors and their properties(without Proof), Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadraticform to canonical forms by Orthogonal Transformation.

UNIT- III : Calculus :
Mean Value Theorems: Rolle's Theorem, Lagrange's mean value theorem with their geometrical interpretation, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof), Problems and applications on the above theorems.

UNIT- IV : Partial differentiation and Applications (Multi variable calculus) :
Partial derivatives, total derivatives, chain rule, change of variables, Taylor's and Maclaurin's series expansion of functions of two variables. Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers.

UNIT – V : Multiple Integrals (Multi variable Calculus):
Duble integrals - change of variables (Cartesian and Polar coordinates), Change of order of integration, cylindrical and spherical coordinates. Finding areas (by double integrals) and volumes (by double integrals and triple integrals).

Text books:

1. B.S.Grewal,HigherEngineeringMathematics,44/e,Khanna Publishers,2017.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e,John Wiley & Sons, 2018.

Reference Books:

1. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, 5/e, Alpha Science International Ltd.,2021 (9th reprint).
2. George B. Thomas, Maurice D.Weir and Joel Hass, Thomas Calculus,14/e, Pearson Publishers, 2018.
3. Glyn James, Advanced Modern Engineering Mathematics, 5/e, Pearson publishers, 2018.
4. Michael Greenberg, Advanced Engineering Mathematics, 9thedition, Pearson edn
5. H. K Das, Er. Rajnish Verma, Higher Engineering Mathematics, S. Chand,2021.

ENGINEERING PHYSICS
(Common to All Branches of Engineering)

Subject Code: 23BHT104

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- Bridging the gap between the Physics in school at 10+2 level and UG level engineering courses.
- To identify the importance of the optical phenomenon. interference, diffraction and polarization related to its Engineering applications
- Enlighten the periodic arrangement of atoms in Crystalline solids by Bragg's law
- To explain the significant concepts of dielectric and magnetic materials that leads to potential applications in the emerging micro devices.
- Enlightenment of the concepts of Quantum Mechanics and to provide fundamentals of deBroglie matter waves, quantum mechanical wave equation and its application, the importance of free electron theory for metals.
- To Understand the Physics of Semiconductors and their working mechanism, Concept utilization of transport phenomenon of charge carriers in semiconductors.

COURSE OUTCOMES

CO 1:Explain the need of coherent sources and the conditions for sustained interference (L2). **Identify** the applications of interference in engineering (L3). **Analyze** the differences between interference and diffraction with applications (L4). **Illustrate** the concept of polarization of light and its applications (L2).

CO 2:Classify various crystal systems (L2). **Identify** different planes in the crystal structure (L3).**Analyze** the crystalline structure by Bragg's X-ray diffracto meter (L4).

CO 3:Explain the concept of dielectric constant and polarization in dielectric materials (L2).**Summarize** various types of polarization of dielectrics (L2). Interpret Lorentz field and Claussius-Mosotti relation in dielectrics (L2). **Classify** the magnetic materials based on susceptibility and their temperature dependence (L2).

CO 4:Describe the dual nature of matter (L1). **Explain** the significance of wave function (L2). **Identify** the role of Schrodinger's time independent wave equation in studying particle in one-dimensional infinite potential well (L3). **Identify** the role of classical and quantum free electron theory in the study of electrical conductivity (L3).

CO5:Classify the crystalline solids (L2).**Outline** the properties of charge carriers in semiconductors (L2).**Identify** the type of semiconductor using Hall effect (L2). **Apply** the concept of effective mass of electron (L3).

UNIT-I: Wave Optics

Interference: Introduction - Principle of superposition –Interference of light - Interference in thin films (Reflection Geometry) & applications - Colors in thin films- Newton's Rings-Determination of wavelength and refractive index.

Diffraction: Introduction - Fresnel and Fraunhofer diffractions - Fraunhofer diffraction due to single slit, double slit & Diffraction Grating (Qualitative).

Polarization: Introduction -Types of polarization - Polarization by reflection, and Double refraction - Nicol's Prism -Half wave and Quarter wave plates.

UNIT II: Crystallography

Crystallography: Space lattice, Basis, Unit Cell and lattice parameters – Bravais Lattices – crystal systems (3D) – coordination number - packing fraction of SC, BCC & FCC - Miller indices – separation between successive (hkl) planes. Bragg's law - X-ray Diffractometer – crystal structure determination by Laue method and Powder method.

UNIT-III: Dielectric And Magnetic Materials

Dielectric Materials: Introduction - Dielectric polarization - Dielectric polarizability, Susceptibility, Dielectric constant and Displacement Vector - Types of polarizations- Electronic (Quantitative), Ionic (Quantitative) and Orientation polarizations (Qualitative) - Lorentz internal field - Clausius-Mossotti equation.

Magnetic Materials: Introduction - Magnetic dipole moment - Magnetization-Magnetic susceptibility and permeability - Classification of magnetic materials: Dia, Para, Ferro, Anti ferro & Ferri magnetic materials - Domain concept for Ferromagnetism (Qualitative) - Hysteresis - soft and hard magnetic materials.

UNIT-IV: Quantum Mechanics and Free electron theory

Quantum Mechanics: Dual nature of matter – Heisenberg's Uncertainty Principle – Significance and properties of wave function – Schrodinger's time independent and dependent wave equations– Particle in a one-dimensional infinite potential well.

Free Electron Theory: Classical free electron theory (Qualitative with discussion of merits and demerits) – Quantum free electron theory – electrical conductivity based on quantum free electron theory - Fermi-Dirac distribution and its temperature dependence.

UNIT – V: Semiconductors

Semiconductors: Formation of energy bands – classification of crystalline solids - Intrinsic semiconductors: Density of charge carriers – Electrical conductivity – Extrinsic semiconductors: density of charge carriers - Drift and diffusion currents – Einstein's equation - Hall effect and its Applications.

Text Books

1. "A Text book of Engineering Physics" - M. N. Avadhanulu, P.G.Kshirsagar& TVS Arun Murthy, S.Chand Publications, 11th Edition 2019.
2. "Engineering Physics"-D.K.Bhatta charya and Poonam Tandon, Oxford press(2015).
3. "Engineering Physics"-P.K.Palanisamy Sci-Tech publications.

Reference Books

1. “Fundamentals of Physics” - Halliday, Resnick and Walker, John Wiley &Sons.
2. “Engineering Physics” - M.R. Srinivasan, New Age international publishers (2009).
3. “Engineering Physics” - Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.
4. “Engineering Physics” - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press.
5. “Semiconductor physics and devices:Basic principle” - A. Donald, Neamen, Mc GrawHill.
6. “Engineering Physics” - B.K. Pandey and S. Chaturvedi, Cengage Learning
7. “Solid state physics” – A.J.Dekker ,Pan Macmillan publishers
8. “Introduction to Solid State Physics” -Charles Kittel ,Wiley

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

(Common for CSE-IT-CSM-CSD-MECH-CE)

L	T	P	C
3	0	0	3

Subject Code: 23EST102

COURSE OBJECTIVES:

- To introduce the basic knowledge of electric circuits
- To analyze AC circuits.
- To provide knowledge on Magnetic circuits.
- To understand the working, characteristics of PN Junction diode, Zener diode
- To explain the working, characteristics of transistor (BJT) in different configurations, JFET and MOSFET.

COURSE OUTCOMES:

CO 1: Able to summarize different electrical circuits.
CO 2: Able to outline the basics of AC circuits.
CO 3: Able to examine DC Generator & DC Motor.
CO 4: Able Describe the working principle of PN Junction diode, Zener diode
CO 5: Able to Describe the working and behavior of transistor (BJT) in different configurations, JFET and MOSFET.

UNIT –I: Introduction to Electric Circuits

Basic definitions, Electrical circuit elements (R, L and C), Voltage and current sources Independent and dependent sources, Ohm's Law, Series & Parallel circuits, Source transformation, Kirchhoff's Laws, Faraday's laws of electromagnetic induction, Lenz's law, simple problems.

UNIT-II: AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series only), real power, reactive power, apparent power, power factor, simple problems.

UNIT-III: DC Machines

DC Generator: Generator-Principle of Operation, Construction, EMF equation, Classification, O.C.C, internal and external characteristics of shunt generator, Applications.

DC Motor: Motor-principle of operation, Torque equation, Classification Speed Control Methods, Operation of 3 point starter, Applications.

UNIT-IV:Diode Characteristics

Formation of PN junction diode, V-I Characteristics of Diode, Diode as a switch, Zener Diode Characteristics, Zener Diode as Voltage Regulator.

UNIT-V: Transistor Characteristics

Bipolar Junction Transistors (BJT) - input & output Characteristics of transistor in CB, CE, CC configurations, Relationship between α, β and γ. Field effect transistors (FET) -Characteristics of JFET, MOSFET (Enhancement and depletion)

TEXT BOOKS

1. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand& Co.
2. Integrated Electronics – Jacob Millman, Chritos C. Halkies, Tata Mc-Graw Hill, 2009.

REFERENCE BOOKS

1. Basic Electrical Engineering Dr.K.B.Madhu Sahu scitech publications (India) pvt.ltd.
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashel sky, Pearson/Prentice Hall, 9thEdition, 2006.
3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill,2010.

INTRODUCTION TO PROGRAMMING
(Common to All Branches of Engineering)

Subject Code: 23EST105

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:
To impart adequate knowledge on the need of programming languages and problem-solving techniques and develop programming skills.

COURSE OUTCOMES
On completion of this course, the student will be able to:

CO 1: Understand the fundamentals of Computers and C programming

CO 2: Develop programs using control structures and Arrays to store and manipulate data

CO 3: Design modular programs using functions and storage classes

CO 4: Use structures and pointers to manipulate record based data

CO 5: Implement and manipulate files on secondary storage media

UNIT–I
IntroductiontoProgramming: Introduction to components of Computer system, Algorithm,Flowchart,Programdevelopmentsteps,CTokens, Data Types, Operatorprecedenceand associativitiy,StructureofC program,simple programs usingBasicI/Ostatements.

UNIT–II
ControlStructures:Decisionstatements:if,if-else,nestedif,if-else-ifladder,andswitch
Iterativestatements:while loop,do-while loop,for loop,nestedloops
Branching: Break,continue
Arrays: Definition,Types:SingleDimensionalarrays,MultiDimensionalarrays,declaration,initialization, accessing elements,Matrixoperations andStringHandling.

UNIT–III
Functions: Definition,Declaration,TypesofFunctions,Parameterpassing,Callbyvalue and call by reference, Passing Arrays to functions, Recursion, Scope andlifetimeofvariables, Command linearguments,Storageclasses.
Pointers:
Definition,Declaration,Initialization,Pointerarithmetic,functionsandpointers,Pointertopointer,Uses of Pointers,arraysandpointers.

UNIT–IV
Structures: Definition, Declaration, Accessing the structure elements, Array of structures, Arrayswith in structures, pointer to structure, Self referential structure, passing structure to function, nested structures and unions, Dynamicmemoryallocation.

UNIT–V

File Handling: Introduction, Types of files, Defining and Opening a File, Closing a File, Input/Output operations on Files, Error Handling during I/O operations, Random Access to Files.

TextBooks

1. B.WKernighan,DennisM.Ritchie.TheC–ProgrammingLanguage.2nd Edition,PHI.
2. BehrouzA.Forouzan,"AStructuredApproachUsingC"RichardF.Gilberg3rd Edition

References

1. YashwantKantikar.2012.LetUsC,8thEd.PBPPublications.
2. E.Balagurusamy.2011. CProgramming.TataMcGrawHills,NewDelhi,India.

Web Links:

1. https://www.tutorialspoint.com›C programming›C–Home
2. https://www.programiz.com/c-programming

ENGINEERING GRAPHICS

(Common for ME/CE)

Subject Code: 23EST103

L	T	P	C
1	0	4	3

COURSE OBJECTIVES:

- Toenablethestudentswith variousconceptslikedimensioning,conventionsand standardsrelatedtoEngineering Drawing
- Toimpartknowledge ontheprojectionofpoints,lines,planes, and solids
- To develop the imaginative skills of the students required to understand the development of surfaces
- To improve the visualization skills for better understanding of conversion of orthographic to isometric views and vice-versa

COURSE OUTCOMES:

On completion of course, students should be able to

CO 1 : Understandthe principles ofengineeringdrawing,includingengineeringcurves, conics, cycloid and Involutes.

CO 2 : Draw projection of points, straight lines and planes in first angle projection.

CO 3 : Understand and draw projection of solids in various positions in first quadrant.

CO 4 : Draw andexplain the principles behind development of surfaces.

CO 5 : Convert orthographic views into isometric projections and vice-versa.

UNIT I

Drawing Instruments and their uses, Types of Lines and Dimensioning, Line bisecting, Angle bisecting, Line divided into equal number of parts, Construction of Regular Polygons (Pentagon and Hexagon).

Construction of Conics: General method**,** Oblong method and Concentric circles method.

Construction of Cycloid and Involutes.

UNIT II

Introduction to Orthographic Projections (First Angle Projection only).

Projections of Points: A point situated in I,II,III & IV quadrants.

Projections of Straight Lines: Line parallel to one or both the planes, Line contained by one or both the planes, Line perpendicular to one of the planes, Line inclined to one plane and parallel to other.

Projections of Planes: Types of planes, Traces of planes, planes parallel to one of the planes, and plane inclined to one reference plane.

UNIT III

Projections of Solids (Polyhedra): Types of Solids, Projections of Solids in simple positions, Projections of Solids axis inclined to the VP and parallel to the HP. Projections of Solids axis inclined to the HP and parallel to the VP.

Projections of Solids (Solids of revolution): Projections of Solids axis inclined to the VP and parallel to the HP. Projections of Solids axis inclined to the HP and parallel to the VP.

UNIT IV

Development of Surfaces:

Parallel line method of development, Developments of lateral surfaces of right Solids i.e., Cube, Prisms, Cylinders.

Radial line method of development, Triangulation method. Development of lateral surfaces of right Solids i.e., Pyramids, Cones.

UNIT V

Orthographic Projections: Conversion of pictorial view (Isometric views) into orthographic views.

Isometric Projections: Isometric axes, lines & planes. Isometric scale, Isometric drawing, Isometric drawing of plane figures, prisms and pyramids. Conversion of orthographic views into Isometric views.

TEXT BOOKS:

1. Engineering Drawing, N. D. Bhatt, V. M. Panchal, Charotar Pub.
2. Engineering Drawing, K. L .Narayana, P.Kanniah, Scitech Pub.

REFERENCE BOOKS:

1. Engineering Drawing and Graphics, 2nd ed., K. Venugopal, New Age International Pub.
2. Fundamentals of Engineering Drawing, 11th ed., Luzadder, J. Warren, D.M. Jon, Prentice Hall India Pub.

ENGINEERING PHYSICS LAB

(Common to All Branches of Engineering)

Subject Code: 23BHL102

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

To study the concepts of optical phenomenon like interference, diffraction etc., recognize the importance of energy gap in the study of conductivity and Hall effect in semiconductors and study the parameters and applications of dielectric and magnetic materials by conducting experiments.

COURSE OUTCOMES: The students will be able to

CO1: Operate optical instruments like travelling microscope and spectrometer.
CO2: Estimate the wave lengths of different colors using diffraction grating.
CO3: Discuss the magnetic, electrical and electronic properties of materials.
CO4: Analyze the mechanical and thermal properties of materials.
CO5: Calculate the band gap of a given semiconductor.

List of Experiments

1. Determination of radius of curvature of a given Plano-convex lens by Newton's rings.
2. Determination of wavelengths of different spectral lines in mercury spectrum using diffraction grating in normal incidence configuration.
3. Determination of width of a slit using diffraction phenomenon.
4. Determination of wavelength of Laser light using diffraction grating.
5. Estimation of Planck's constant using photo cell.
6. To study V-I characteristics of a PN junction diode in forward and reverse biasing conditions.
7. Magnetic field along the axis of a current carrying circular coil by Stewart Gee's Method.
8. Determination of Hall voltage and Hall coefficient of a given semi-conductor using Hall effect.
9. Determination of temperature coefficients of a thermistor.
10. Determination of acceleration due to gravity and radius of Gyration by using a compound pendulum.
11. Determination of rigidity modulus of the material of the given wire using Torsional pendulum.
12. Sonometer: Verification of laws of stretched string.
13. Determination of Frequency of electrically maintained tuning fork by Melde's experiment.
14. Determination of energy band gap of a given semiconductor
15. Determination of thickness of a thin object using wedge shaped film.
16. Determination of crystal structure and lattice parameter of a given crystal using powder diffraction data.
17. Determination of Young's modulus of the given beam by non-uniform bending.
18. Determination of dielectric constant using resonance method.

Note: Any TEN of the listed experiments are to be conducted. Out of which any TWO experiments may be conducted in virtual mode.

References:

- A Textbook of Practical Physics - S. Balasubramanian, .N. Srinivasan, S.Chand Publishers, 2017.

Web Resources

- www.vlab.co.in
- https://phet.colorado.edu/en/simulations/filter?subjects=physics&type=html,prototype

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

(Common for CSE-IT-CSM-CSD-MECH-CE)

Subject Code: 23ESL102

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVE:

Tointroduce the studenttostudy differentelectrical & electronics components andtoverify thebasiclawsrelated toelectrical engineering, analyzetheV-IcharacteristicsofP-Ndiode and transistor characteristics.

COURSE OUTCOMES: Studentswill beableto

CO1: Label various types of electrical & electronics components.
CO2: Demonstrate various basic electrical laws.
CO3: Determine resistance of the series and parallel connected circuits.
CO4: Analyze the V-I characteristics of P-N diode.
CO5: Analyze the Transistor characteristics.

List of Experiments:

1. Studyofelectrical components.
2. ToverifyOhm's law.
3. ToverifyKirchhoff'scurrentlaw
4. Toverify Kirchhoff'svoltagelaw.
5. Toverifythetotalresistanceoftheseriesandparallelconnected circuits.
6. Studyofelectronics components.
7. PNJunctiondiodeforwardandreversebiascharacteristics
8. Zenerdiode characteristics.
9. TransistorCBcharacteristics(Inputand Output)
10. TransistorCEcharacteristics(Input and Output)

Additional Experiments:

11. Half wave rectifier
12. TofindvoltagecurrentrelationshipforseriesRLcircuit anddetermine power &power factor.

COMPUTER PROGRAMMING LAB

(Common to All Branches of Engineering)

Subject Code: 23ESL105

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- Togainexperienceaboutstructuredprogramming
- TohelpstudentstounderstandtheimplementationofClanguage
- TounderstandvariousfeaturesinC

COURSE OUTCOMES: At theend ofthecourse studentswillbeable to

CO 1: Solve the given problem using the syntactical structures of C language.
CO 2: Design programs involving decision structures and loops.
CO 3: Apply programming to solve different operations on arrays and strings.
CO 4: Develop modularity concept using functions and write programs for allocating memory dynamically.
CO 5: Construct C program that uses structures and unions and implement file operations on given application.

ListofExperiments

1. WritetheCprogramstocalculatethefollowing

a) Areaoftrianglewhensidesaregiven.

b) Program for Type Casting.

c) Interchangingvaluesoftwovariables.

2. WritetheCprogramstoperformthefollowing

a) ConversionofFahrenheittoCelsius andviceversa

b) Simpleinterestcalculation

c) Squarerootofagivennumber

3. WritetheCprogramstoperformthefollowing

a) Readlowercasecharacterandconvertintouppercase.

b) Findmaximumof3 valuesusingconditionaloperator.

c) Calculateareaandperimeterofcircle.

4. WriteCprogramsfor thefollowingusingdecisionmakingstatements

a) Find rootsofquadraticequation.

b) Findthemaxandminof three numbersusingif-else.

c) Calculatethegradesofastudent.

d) Findthegivenyearisa leapyearornot.

5. WritetheCprogramstoperformthefollowing

a) Arithmeticaloperationsusingswitch-case.

b) Readanumberanddisplayinreverse.

c) Check forArmstrongnumberproperty

6. WritetheCprogramstoperformthefollowing

a) Find factorial of given number

b) Check a number is palindrome property

c) Generate Fibonacci series.

d) Generate Prime numbers between two numbers.

7. Implementthefollowingusingarrays

a) Largestandsmallestfroma listofelements.

b) ProgramforLinearSearch.

c) ProgramforBubbleSort.

8. Implementthefollowingusingarrays

a) Matrixaddition.

b) MatrixMultiplication.

c) Transpose ofamatrix.

d) Programusingstringhandlingfunctions.

9. WritetheCprogramstoperformthefollowing

a) Factorialusingrecursionandnonrecursion.

b) GCDusingrecursionandnonrecursion.

10. WritetheCprogramstoperformthefollowing

a) FindthesumandaverageoflistofelementsusingDMAFunctions

b) Implementationofcallbyvalueandcallbyreference.

11. WritetheCprogramstoperformthefollowing

a) Implementationofarrayofstructure.

b) DemonstrationofUnion.

12. Write the C programs to perform the following

a) Write a C programtowriteandreadtextintoabinaryfileusingfread()andfwrite()

b) Copythe contentsofonefileinto another.

c) Countthenumber ofcharacters,wordsandlinesinafile.

Text Books:

1. B.WKernighan,DennisM.Ritchie.TheC–ProgrammingLanguage.2ndEdition,PHI.
2. BehrouzA.Forouzan, "AStructuredApproach UsingC"RichardF. Gilberg3rdEdition

References:

1. YashwantKantikar.2012.LetUsC,8thEd.PBPPublications.
2. E.Balagurusamy.2011.CProgramming.TataMcGrawHills,NewDelhi,India.

Web Links:

1. https://www.tutorialspoint.com›Cprogramming›C–Home
2. https://www.programiz.com/c-programming

NSS/NCC/SCOUTS & GUIDES/COMMUNITY SERVICE

(Common to All Branches of Engineering)

Subject Code: 23MCS102

L	T	P	C
0	0	1	0.5

Course Objectives:

The objective of introducing this course is to impart discipline, character, fraternity, teamwork, social consciousness among the students and engaging them in selfless service.

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

CO1: Understand the importance of discipline, character and service motto.

CO2: Solve some societal issues by applying acquired knowledge, facts, and techniques.

CO3: Explore human relationships by analyzing social problems.

CO4: Determine to extend their help for the fellow beings and downtrodden people.

CO5: Develop leadership skills and civic responsibilities.

UNIT I: Orientation

General Orientation on NSS/NCC/ Scouts & Guides/Community Service activities, career guidance.

Activities:

i) Conducting –ice breaking sessions-expectations from the course-knowing personal talents and skills

ii) Conducting orientations programs for the students –future plans-activities-releasing road map etc.

iii) Displaying success stories-motivational biopics- award winning movies on societal issues etc.

iv) Conducting talent show in singing patriotic songs-paintings- any other contribution.

UNIT II: Nature & Care Activities:

i) Best out of waste competition.

ii) Poster and signs making competition to spread environmental awareness.

iii) Recycling and environmental pollution article writing competition.

iv) Organizing Zero-waste day.

v) Digital Environmental awareness activity via various social media platforms.

vi) Virtual demonstration of different eco-friendly approaches for sustainable living.

vii) Write a summary on any book related to environmental issues.

UNIT III: Community Service Activities:

i) Conducting One Day Special Camp in a village contacting village-area leaders- Survey in the village, identification of problems- helping them to solve via media- authorities- experts-etc.

ii) Conducting awareness programs on Health-related issues such as General Health, Mental health, Spiritual Health, HIV/AIDS,

iii) Conducting consumer Awareness. Explaining various legal provisions etc.

iv) Women Empowerment Programmes- Sexual Abuse, Adolescent Health and Population Education.

v) Any other programmes in collaboration with local charities, NGOs etc.

Reference Books:

1. Nirmalya Kumar Sinha & Surajit Majumder, *A Text Book of National Service Scheme* Vol;.I, Vidya Kutir Publication, 2021 (ISBN 978-81-952368-8-6)

2. *Red Book - National Cadet Corps* – Standing Instructions Vol I & II, Directorate General of NCC, Ministry of Defence, New Delhi

3. Davis M. L. and Cornwell D. A., ―Introduction to Environmental Engineering‖, McGraw Hill, New York 4/e 2008

4. Masters G. M., Joseph K. and Nagendran R. ―Introduction to Environmental Engineering and Science‖, Pearson Education, New Delhi. 2/e 2007

5. Ram Ahuja. *Social Problems in India*, Rawat Publications, New Delhi.

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities.
2. Institutes are required to provide instructor to mentor the students.

Evaluation Guidelines:

- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

R23 - B. Tech. - CE **I Year B. Tech. II Semester**

COMMUNICATIVE ENGLISH

(Common to All Branches of Engineering)

Subject Code: 23BHT101

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- To enable students to build vocabulary appropriate to their levels and to make students understand printed texts of different genres
- To enhance basic writing skills of the students in different forms of written communication
- To assist students implicitly synthesize the rules of grammar for the production of accurate sentences
- To aid students to acquire appropriate and adequate letter writing skills
- To get students enhance their essay writing skills and develop reading skills

COURSE OUTCOMES

CO 1: Students will be able to comprehend printed texts of different genres easily and they will be able to make appropriate word choice for writing.
CO 2: Students will be able to write short texts efficiently.
CO 3: Students will be able to construct grammatically correct sentences.
CO 4: Students will be able to communicate through letters effectively.
CO 5: Students will be able to write essays and comprehend unfamiliar passages.

UNIT–I: A Power of a Plate of Rice by Ifeoma Okoye Skimming and Scanning — Capital letters and Punctuation — Spellings — Parts of speech — Root words — Prefixes and Suffixes — Synonyms and Antonyms.
UNIT–II: *Night of the Scorpion* by Nissim Ezekiel Sequencing — Paragraph writing — Cohesive devices — Articles — Prepositions Homonyms, Homographs, homophones

UNIT–III: *Biography of Steve Jobs*Drawing inferences — Paraphrasing, Summarizing, Note-making — Verbs and Tenses, Subject-verb agreement — Compound words — Collocations

UNIT–IV: *The Toys of Peace* by Saki Data interpretation — Official letters and Résumé — Direct and Indirect speech — Academic reporting verbs — Active and passive voice — Words often confused — Jargon

UNIT–V: *The Power of Intrapersonal Communication* (An Essay) Reading comprehension — Essay writing — Correcting errors — Technical Jargon

Textbooks:

1. Pathfinder: Communicative English for Undergraduate Students, 1st Edition, Orient BlackSwan, 2023 (Units 1, 2 & 3)
2. Empowering English by Cengage Publications, 2023 (Units 4 & 5)

Reference Books:

1. Dubey,ShamJi&Co. EnglishforEngineers,VikasPublishers, 2020
2. Bailey, Stephen. Academic writing: A Handbook for International Students. Routledge, 2014.
3. Murphy,Raymond.EnglishGrammarinUse,FourthEdition,CambridgeUniversity Press, 2019.
4. Lewis,Norman.WordPowerMadeEasy-TheCompleteHandbookforBuildinga Superior Vocabulary.Anchor, 2014.

Web Resources:

GRAMMAR

1. www.bbc.co.uk/learningenglish
2. https://dictionary.cambridge.org/grammar/british-grammar/
3. www.eslpod.com/index.html
4. https://www.learngrammar.net/
5. https://english4today.com/english-grammar-online-with-quizzes/
6. https://www.talkenglish.com/grammar/grammar.aspx

VOCABULARY

1. https://www.youtube.com/c/DailyVideoVocabulary/videos
2. https://www.youtube.com/channel/UC4cmBAit8i_NJZE8qK8sfpA

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to All Branches of Engineering)

Subject Code: 23BHT103

L	T	P	C
2	1	0	3

Course Objectives:

To equip the students with standard concepts and tools of mathematics to handle various real-world problems and their applications as follows.

- To furnish the learners in the concept of first order and first degree differential equations and multivariable calculus.
- To enlighten the learners in the concept of higher order differential equations with constant coefficients.
- To furnish the learners with solution methods for partial differential equations that model physical processes
- To equip knowledge with basic concepts and techniques to interpret the physical meaning of different operators such as gradient, curl and divergence by handling various real-world applications
- To furnish the learners with basic concepts and techniques the work done against a field, circulation and flux using vector calculus by handling various real-world applications.

Course Outcomes:

Student will be able to :

- CO-1: Solve the first-order differential equations and apply to real-life concepts such as law of growth(decay), basic electrical circuits.(level 3)
- CO-2: Solve linear differential equations of higher order with constant coefficients using complementary functions and particular integrals, including variation of parameters, and interpret their applications in L-C-R electrical circuits. (level 3)
- CO-3: Apply Lagrange's method to solve first-order linear partial differential equations and solve 2^{nd} and higher order homogeneous partial differential equations. (level 3)
- CO-4: Compute gradient, divergence, and curl of scalar and vector point functions and show the vector identities. (level 3)
- CO-5: Solve line, surface, and volume integrals; verify and apply vector integral theorems-Green's, Stokes', and Divergence theorems. (level 3)

UNIT - I: Differential equations of first order and first degree: Exact equations and equations reducible to exact form. Linear differential equations Bernoulli's Equations. Newton's law of Cooling-Law of natural growth and decay- Electrical circuits

UNIT- II: Linear differential equations of higher order (Constant Coefficients):
Definitions, homogenous and non-homogenous, complimentary function, general particular integral, method of variation of parameters. L-C-R Circuit problems.

UNIT- III : Partial Differential Equations: Introduction and formation of Partial Differential Equations by elimination of arbitrary constants and arbitrary functions, solutions of first order linear equations using Lagrange's method. Homogeneous Linear Partial Differential Equations with constant coefficients

UNIT- IV : Vector differentiation :Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions - Divergence and Curl, Vector identities..

UNIT – V : Vector integration Line integral: circulation- work done, surface integral –flux, Green's Theorem in the plane (without proof), Stokes's Theorem (without proof), Volume Integral, Divergence Theorem (without proof) and problems on these theorems.

Textbooks:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10/e,John Wiley & Sons, 2018.
2. B.S.Grewal,HigherEngineeringMathematics,44/e,Khanna publishers,2017.
Reference

Reference Books:

1. Dennis G.Zill and Warren S.Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2018.
2. Micheael Greenberg, Advanced Engineering Mathematics, 9th edition, Pearson edn
3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 14/e, Pearson Publishers, 2018.
4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 5/e, Alpha Science International Ltd., 2021 (9th reprint).
5. B.V. Ramana, Higher Engineering Mathematics, McGraw Hill Education, 2017

R23 - B. Tech. - CE **I Year B. Tech. II Semester**

ENGINEERING CHEMISTRY

(Common for CE/ME)

Subject Code: 23BHT106

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To familiarize engineering chemistry and its applications
- To impart the concept of soft and hard waters, softening methods of hard water
- To train the students on the principles and applications of electrochemistry, polymers, surface chemistry, and cement

COURSE OUTCOMES: At the end of the course, the students will be able to

CO1: Demonstrate the importance of water for society and industrial needs.

CO2: Summarize the concepts of Instrumental methods and distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.

CO3: Demonstrate the corrosion prevention methods and factors affecting corrosion.

CO4: Demonstrate the preparation, properties, and applications of polymer materials and fuels.

CO5: Demonstrate the importance of modern engineering materials like cement, refractories, composites, and lubricants.

UNIT I: Water Technology

Soft and hard water, Estimation of hardness of water by EDTA Method, Estimation of dissolved Oxygen - Boiler troubles –Priming, foaming, scale and sludge, Caustic embrittlement, Industrial water treatment – Specifications for drinking water, Bureau of Indian Standards (BIS) and World health organization (WHO) standards, Ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electro dialysis.

UNIT II: Instrumental Methods and Applications

Electromagnetic spectrum. Absorption of radiation: Beer-Lambert's law. UV-Visible Spectroscopy, Instrumentation, electronic transition, Definition of Chromophore – Definition of Auxochrome – Absorption and Intensity Shifts, IR spectroscopies, Instrumentation fundamental modes and Fingerprint Region. NMR – Principle - Equivalent and Non-Equivalent Protons - Chemical Shift-Splitting – Coupling Constant.

UNIT III: Electrochemistry and Applications

Electrodes –electrochemical cell, Nernst equation, cell potential calculations(emf formula). Primary cells – Zinc-air battery, Secondary cells – Nickel-Cadmium (NiCad),and lithiumion batteries-working principle of the batteries including cell reactions; Fuel cells-Basic Concepts, the principle and working of hydrogen-oxygen Fuel cell.

Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry and electrochemical corrosion, Pilling

Bedworth ratios and uses, Factors affecting the corrosion, cathodic (sacrificial anodic protection and impressed current cathodic protection) and anodic protection (working principle), electroplating and electro less plating (Nickel and Copper).

UNIT IV: Polymers and Fuel Chemistry

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth polymerization. Thermoplastics and Thermo-setting plastics-: Preparation, properties and applications of poly styrene. PVC, Nylon 6,6 and Bakelite. Elastomers – Preparation, properties and applications of Buna S, Buna N, Thiokol rubbers

Fuels – Types of fuels, calorific value of fuels (HCV, LCV and Theoretical calculations of calorific value), numerical problems based on calorific value;Analysis of coal (Proximate and Ultimate analysis), Liquid Fuels, refining of petroleum, Octaneand Cetane number- alternative fuels-propane, methanol, ethanol and bio fuel-bio diesel.

UNIT V: Modern Engineering Materials

Composites- Definition, Constituents, Classification- Particle, Fibre and Structural reinforced composites, properties and Engineering applications

Refractories- Classification, Properties, Factors affecting the refractory materials and Applications.

Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils – Viscosity, Viscosity Index, Flash point, Fire point, Cloud point, saponification and Applications.

Building materials- Portland Cement, constituents, Setting and Hardening of cement.

Textbooks:

1. Jain and Jain, Engineering Chemistry, 16/e, DhanpatRai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.

Reference Books:

1. H.F.W. Taylor, Cement Chemistry, 2/e, Thomas Telford Publications, 1997.
2. D.J. Shaw, Introduction to Colloids and Surface Chemistry, Butterworth-Heineman, 1992.
3. Textbook of Polymer Science, Fred W. Billmayer Jr, 3rd Edition

ENGINEERING MECHANICS

(Common for CE/ME/EEE)

Subject Code: 23EST104

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Togetfamiliarizedwithdifferenttypesofforcesystems.
- Todrawaccuratefreebodydiagramsrepresentingforcesandmomentsactingona body toanalyzetheequilibriumofsystemofforces.
- Toteachthebasicprinciplesofcenterofgravity,centroidandmomentofinertiaand determine themfordifferentsimple and compositebodies.
- To applytheWork-Energymethodtoparticlemotion.
- Tounderstandthekinematicsandkineticsoftranslationalandrotationalmotionofrigid bodies.

COURSE OUTCOMES: Upon successful completion of the course the students will be able to

CO1: Understand the fundamental concepts in mechanics and determine the frictional forces for bodies in contact.

CO2: Analyze different force systems such as concurrent, coplanar and spatial systems and calculate their resultant forces and moments.

CO3: Calculate the centroids, center of gravity and moment of inertia of different geometrical shapes.

CO4: Apply the principles of work-energy and impulse-momentum to solve the problems of rectilinear and curvilinear motion of a particle.

CO5: Solve the problems involving the translational and rotational motion of rigid bodies.

UNIT -I

Introduction to Engineering Mechanics: Basic Concepts. Scope and Applications

Systems of Forces: Coplanar Concurrent Forces– Components in Space–Resultant– Moment of Force and its Application –Couples and Resultant of Force Systems.

Friction: Introduction, limiting friction and impending motion, Coulomb's laws of dry friction, coefficient of friction, Cone of Static friction.

UNIT -II

Equilibrium of Systems of Forces: Free Body Diagrams, Lami's Theorm, Equations of Equilibrium of Coplanar Systems, Graphical method for the equilibrium, Triangle law of forces, converse of the law of polygon of forces condition of equilibrium, Equations of Equilibrium for Spatial System of concurrent forces, Numerical examples on spatial system of concurrent forces using vector approach, Analysis of plane trusses.

UNIT- III

Centroid: Centroids of simple figures (from basic principles)–Centroids of Composite Figures. **Centre of Gravity:** Centre of gravity of simple body (from basic principles), Pappus theorems.

Area Moments of Inertia: Definition– Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia.

Mass Moment of Inertia: Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia.

UNIT -IV

Rectilinear and Curvilinear motion of a particle: Kinematics and Kinetics – D'Alembert's Principle - Work Energy method and applications to particle motion-Impulse Momentum method.

UNIT -V

Rigid body Motion: Kinematics and Kinetics of translation, Rotation about fixed axis and plane motion, Work Energy method and Impulse Momentum method.

Textbooks:

1. Engineering Mechanics, S. Timoshenko, D. H. Young, J.V. Rao, S. Pati., , McGraw Hill Education 2017. 5th Edition.
2. Engineering Mechanics, P.C.Dumir- S.Sengupta and Srinivas V veeravalli , University press. 2020. First Edition.
3. A Textbook of Engineering Mechanics, S.S Bhavikatti. New age international publications 2018. 4th Edition.

Reference Books:

1. Engineering Mechanics, Statics and Dynamics, Rogers and M A. Nelson., McGraw Hill Education. 2017. First Edition.
2. Engineering Mechanics, Statics and Dynamics, I.H. Shames., PHI, 2002. 4th Edition.
3. Engineering Mechanics, Volume-I: Statics, Volume-II: Dynamics, J. L. Meriam and L.G. Kraige., John Wiley, 2008. 6th Edition.
4. Introduction to Statics and Dynamics, Basudev Battachatia, Oxford University Press, 2014. Second Edition
5. Engineering Mechanics: Statics and Dynamics, Hibbeler R.C., Pearson Education, Inc., New Delhi, 2022, 14th Edition

CONSTRUCTION MATERIALS AND CONCRETE TECHNOLOGY

Course Code: 23CET101

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

Students will have

1. To describe physical properties of construction materials which include, Stones, Bricks , Timber
2. To explain properties of fresh concrete and making concrete.
3. To measure hardened concrete water / cement ratio, space ratio, strength in tension & compression, factors affecting strength, curing.
4. To explain different types of concrete.
5. To Interpret Mix design factors in mix proportions, Statistical methods, Acceptance criteria and BIS method of mix design

COURSE OUTCOMES:

After completion of this course students will be able to

1. Describe physical properties of construction materials which include, Stones, Bricks , Timber.
2. Infer properties of fresh concrete and making concrete.
3. Measure hardened concrete water / cement ratio, space ratio, strength in tension & compression, factors affecting strength.
4. Illustrate different types of concrete Distinguish between different types of concretes.
5. Interpret Mix design factors in mix proportions, Statistical methods, Acceptance criteria and BIS method of mix design

Unit I

Properties of Materials: Classification and characteristics of stones, brick, coarse aggregate, fine aggregate, Timber used in construction.

Composition & Properties of cement, Types of cement. Classification & Uses of Chemical admixtures, Mineral admixtures viz. Fly ash, Silica fume. Ground Granulated Blast Furnace slag (GGBS), Rice Husk Ash (RHA) and Matakoline.

Unit II

Fresh concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Mixing water.

Unit III Hardened concrete: Water / Cement ratio, Abram's Law, Gelspace ratio, Maturity concept – Strength in tension & compression – Factors affecting strength of concrete–Strength, Curing, Creep, Shrinkage and Modulus of Elasticity.

Tests on hardened concrete: Compression test – Split Tensile test – Core test- Non-destructive testing methods like Rebound Hammer & Ultra sonic pulse velocity methods.

Unit IV

Special Concretes: Ready mix concrete, Shotcrete ,Light weight aggregate concrete, cellular concrete, No-fines concrete, High density concrete, Fibre reinforced concrete, Polymer concrete, Geo-polymer Concrete, High strength and High performance concrete, Self compacting concrete, Self healing concrete.

Unit V

Mix design: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method of mix design.

Text Books:

1. S.K.Duggal, "Building Materials", NEW AGE; 4th revised edition, 2012

2. A.M.Neville, Properties of Concrete, Pearson Education India; 5th edition, 2012

3. M.S.Shetty, "Concrete Technology", S.Chand& Co.; 2006

Reference Books:

1. M.L.Gambhir, Concrete Technology, 5th Ed., Tata Mc.Graw Hill Publishers New Delhi, 2017

2. A.R. Santha Kumar, Concrete Technology by, 2nd Ed., Oxford University Press, New Delhi-2018

3. Dr. B.C. Punmia, Ashokkumar Jain, Arun Kumar Jain, "Building Construction", Laxmi Publications; Eleventh edition, 2016

4. IS 2185 Part I & II PWD & CPWD Specifications

5. IS 10262 and IS 456-2000

ENGINEERING WORKSHOP

(Common to ME/CE/ECE/EEE)

Subject Code: 23ESL104

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

To familiarize students with wood working, sheet metal operations, fitting and electrical housewiringskills

COURSE OUTCOMES: Upon the completion of this course, the students will be able to
CO1: Identify workshop tools and their operational capabilities.
CO2: Practice on manufacturing of components using workshop trades including fitting, carpentry,foundry and welding.
CO3: Apply fitting operations in various applications.
CO4: Apply basic electrical engineering knowledge for House Wiring Practice
CO5: Apply the Plumbing tools in plumbing operations

SYLLABUS

1. **Demonstration**:Safety practices and precautions tobe observed in workshop.
2. **Wood Working:**Familiarity with different types of woods and tools used in wood working and make following joints.

a) Half – Lap joint b)Mortise and Tenon joint c) Corner Dovetail or Bridle joint

3. **Sheet Metal Working**: Familiarity with different types of tools used in sheet metal working, Developments of following sheet metal job from GI sheets.

a) Taperedtray b)Conical funnel c)Elbow pipe d) Brazing

4. **Fitting:** Familiarity with different types of tools used in fitting and do the following fitting exercises.

a) V-fit b)Dovetail fit c)Semi-circular fit d) Bicycle tire puncture and change of two-wheeler tyre

5. **Electrical Wiring**: Familiarity with different types of basic electrical circuits and make the following connections.

a) Parallel and series b)Two-way switch c)Godown lighting
d)Tube light e)Three phase motor f)Soldering of wires

6. **Foundry Trade:** Demonstration and practice on Moulding tools and processes, Preparation of Green Sand Moulds for given Patterns.
7. **Welding Shop**: Demonstration and practice on arc welding and gas welding. Preparation of Lap joint and Butt joint.
8. **Plumbing:** Demonstration and practice of Plumbing tools, Preparation of Pipejoints with coupling for same diameter and with reducer for different diameters.

Text books:

1. Basic Workshop Technology: Manufacturing Process, FelixW.; Independently Published, 2019.
2. Workshop Processes, Practices and Materials; BruceJ.Black, Routledge publishers,5thEdn.2015.
3. A Course in Workshop Technology Vol I. & II, B.S. Raghuwanshi, Dhanpath Rai &Co., 2015& 2017.

Reference Books:

1. Elements of Workshop Technology, Vol.I by S. K. Hajra Choudhury & Others, Media Promoter sand Publishers, Mumbai.2007,14thedition
2. Workshop Practice by H. S.Bawa,Tata-McGraw Hill,2004.
3. Wiring Estimating,Costing and Contracting; Soni P.M.& Upadhyay P.A.; Atul Prakashan,2021-22.

R23 - B. Tech. - CE **I Year B. Tech. II Semester**

COMMUNICATIVE ENGLISH LAB

(Common to All Branches of Engineering)

Subject Code: 23BHL101

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES

- To enable students to cultivate proper speech habits
- To enhance the ability of students to make extempore speeches
- To help students master techniques of being successful in debates and group discussions
- To assist students to acquire effective and adequate presentation skills
- To prepare students to face interviews in an assertive manner

COURSE OUTCOMES

CO 1: Students will be able to pronounce words accurately.
CO 2: Students will be able to speak spontaneously.
CO 3: Students will be able to participate in debates and group discussions and contribute proactively.
CO 4: Students will be able to present data on select topics using pre-existing slides.
CO 5: Students will be able to face interviews confidently.

UNIT I: Phonetics— Neutral English Accent
UNIT II: JAM session — Role play
UNIT III: Debate—Group Discussion
UNIT IV: Poster Presentation— PPT Presentations
UNIT V: Cover letter — Résumé — Interview Skills

SuggestedSoftware:

- WaldenInfoTech
- YoungIndiaFilms

ReferenceBooks:

1. MeenakshiRaman,Sangeeta-Sharma. TechnicalCommunication. OxfordPress. 2018.
2. SamsonT: InnovatewithEnglish,Foundations
3. GrantTaylor:EnglishConversationPractice,TataMcGraw-Hill Education India, 2016.
4. Jayashree, M Let's Hear them Speak: Developing Listening-Speaking skills in English. Sage Publications.
5. Hewing's, Martin. Cambridge Academic English (B2). CUP, 2012.
6. T. Balasubramanyam, A Textbook of English Phonetics for Indian Students, (3rd Ed.) Trinity Press.

WebResources:

SpokenEnglish:

1) www.esl-lab.com
2) www.englishmedialab.com
3) www.englishinteractive.net
4) https://www.britishcouncil.in/english/online
5) http://www.letstalkpodcast.com/
6) https://www.youtube.com/c/mmmEnglish_Emma/featured
7) https://www.youtube.com/c/ArnelsEverydayEnglish/featured
8) https://www.youtube.com/c/engvidAdam/featured
9) https://www.youtube.com/c/EnglishClass101/featured
10) https://www.youtube.com/c/SpeakEnglishWithTiffani/playlists
11) https://www.youtube.com/channel/UCV1h_cBE0Drdx19qkTM0WNw
12) https://www.linguahouse.com/en-GB
13) https://www.ted.com/watch/ted-ed

Voice&Accent:

1) https://www.youtube.com/user/letstalkaccent/videos
2) https://www.youtube.com/c/EngLanguageClub/featured
3) https://www.youtube.com/channel/UC_OskgZBoS4dAnVUgJVexc
4) https://www.youtube.com/channel/UCNfm92h83W2i2ijc5Xwp_IA

R23 - B. Tech. - CE **I Year B. Tech. II Semester**

ENGINEERING CHEMISTRY LAB

(Common to ME/CE)

Subject Code: 23BHL104

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- To verify the fundamental concepts with experiments

COURSE OUTCOMES: At the end of the course, the students will be able to
CO1: Determine the cell constant, conductance, potential and pH of solutions.
CO2: Prepare advanced polymer Bakelite materials.
CO3: Determine the molecular/system properties such as kinematic viscosity, Flash and fire point and acid number etc.
CO4: Estimate the Iron (by colurimeter) and Calcium in cement.
CO5: Measure molecular/system properties such as chloride content, hardness of water, dissolved oxygen, of surface tension and viscosity etc

List of Experiments:

1. Determination of Hardness of a groundwater sample.
2. Estimation of Dissolved Oxygen by Winkler's method
3. Determination of Strength of an acid in Pb-Acid battery.(P^{H}METRY)
4. Preparation of a polymer (Bakelite)
5. Determination of percentage of Iron sample by colorimetry
6. Estimation of Calcium in port land Cement
7. Preparation of nanomaterials by precipitation method.
8. Adsorption of acetic acid by charcoal
9. Determination of percentage Moisture content in a coal sample
10. Determination of Viscosity of lubricating oil by Redwood Viscometer 1
11. Determination of Viscosity of lubricating oil by Redwood Viscometer 2
12. Determination of Calorific value of gases by Junker's gas Calorimeter
13. Conductometric titration of strong acid vs. strong base.
14. Potentiometry - determination of redox potentials and emfs.
15. Determination of surface tension and viscosity.
16. Determination of acid number of lubricating oil.
17. Determination of flash and fire point of lubricating oil.

Reference: "Vogel's Quantitative Chemical Analysis 6th Edition 6th Edition" Pearson Publications by J. Mendham, R.C. Denney, J.D. Barnes and B. Sivasankar

HEALTH AND WELLNESS, YOGA AND SPORTS

(Common to All Branches of Engineering)

Subject Code: 23MCS103

L	T	P	C
0	0	1	0.5

Course Objectives:

The main objective of introducing this course is to make the students maintain their mental and physical wellness by balancing emotions in their life. It mainly enhances the essential traits required for the development of the personality.

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

CO1: Understand the importance of yoga and sports for Physical fitness and sound health.

CO2: Demonstrate an understanding of health-related fitness components.

CO3: Compare and contrast various activities that help enhance their health.

CO4: Assess current personal fitness levels.

CO5: Develop Positive Personality

UNIT I

Concept of health and fitness, Nutrition and Balanced diet, basic concept of immunity Relationship between diet and fitness, Globalization and its impact on health, Body Mass Index (BMI) of all age groups.

Activities:

i) Organizing health awareness programmes in community

ii) Preparation of health profile

iii) Preparation of chart for balance diet for all age groups

UNIT II

Concept of yoga, need for and importance of yoga, origin and history of yoga in Indian context, classification of yoga, Physiological effects of Asanas- Pranayama and meditation, stress management and yoga, Mental health and yoga practice.

Activities:

Yoga practices – Asana, Kriya, Mudra, Bandha, Dhyana, Surya Namaskar

UNIT III

Concept of Sports and fitness, importance, fitness components, history of sports, Ancient and Modern Olympics, Asian games and Commonwealth games.

Activities:

i) Participation in one major game and one individual sport viz., Athletics, Volleyball, Basketball, Handball, Football, Badminton, Kabaddi, Kho-kho, Table tennis, Cricket etc.

Practicing general and specific warm up, aerobics

ii) Practicing cardiorespiratory fitness, treadmill, run test, 9 min walk, skipping and running.

Reference Books:

1. Gordon Edlin, Eric Golanty. Health and Wellness, 14th Edn. Jones & Bartlett Learning, 2022
2. T.K.V.Desikachar. The Heart of Yoga: Developing a Personal Practice
3. Archie J.Bahm. Yoga Sutras of Patanjali, Jain Publishing Company, 1993
4. Wiseman, John Lofty, SAS Survival Handbook: The Ultimate Guide to Surviving Anywhere Third Edition, William Morrow Paperbacks, 2014
5. The Sports Rules Book/ Human Kinetics with Thomas Hanlon. -- 3rd ed. Human Kinetics, Inc.2014

General Guidelines:

1. Institutes must assign slots in the Timetable for the activities of Health/Sports/Yoga.
2. Institutes must provide field/facility and offer the minimum of five choices of as many as Games/Sports.
3. Institutes are required to provide sports instructor / yoga teacher to mentor the students.

- **Evaluation Guidelines:**
- Evaluated for a total of 100 marks.
- A student can select 6 activities of his/her choice with a minimum of 01 activity per unit. Each activity shall be evaluated by the concerned teacher for 15 marks, totalling to 90 marks.
- A student shall be evaluated by the concerned teacher for 10 marks by conducting viva voce on the subject.

NUMERICAL METHODS
(Common to ME, CIVIL)

L	T	P	C
3	0	0	3

Subject Code: 23BHT209

COURSE OBJECTIVES

1. Apply various numerical methods to solve algebraic and transcendental equations.
2. Determine the dependent variable at a given point (x) by using numerical techniques to approximate the unknown function y=f(x), considering both evenly and unevenly spaced data points.
3. Use different numerical approaches to estimate derivatives accurately.
4. Utilize numerical methods to compute definite integrals.
5. Implement numerical methods to solve ordinary differential equations effectively

COURSE OUTCOMES

Upon completing this course, students will be able to:

1. Identify appropriate numerical methods to solve algebraic and transcendental equations.
2. Use numerical techniques to approximate the dependent variable at a specific point (x) by estimating the unknown function y = f(x), considering both evenly and unevenly spaced points.
3. Utilize various numerical methods to approximate derivatives
4. Compute definite integrals, as well as solve initial value problems.
5. Calculate the numerical solution for ordinary differential equations using suitable methods.

Unit – I

Algebraic and Transcendental Equations(10 hrs): Solution of Algebraic and Transcendental Equations: Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method.

Unit-II

Interpolation(10 hrs): Interpolation**:** Introduction – Finite differences- Forward Differences – Backward differences – Central differences-Relation between different operators- Newton's Interpolation formulae –Gauss Interpolation Formulae- Interpolation with unevenly spaced points – Lagrange's Interpolation formula.

Unit-III

Numerical Differentiation(8 hrs): Numerical Differentiation– Differentiation using finite differences- Newton's Forward – Backward- Lagranges- Stirling's formula-Lagrange's interpolation formula.

Unit-IV

Numerical Integration(8 hrs): Numerical Integration – Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

Numerical double integration - Trapezoidal rule – Simpson's 1/3 Rule.

Unit-V

Numerical solution of Ordinary Differential equations (10hrs)

Solution by Taylor's series – Picard's Method of successive Approximations – Euler's Method – Runge – Kutta Method(4^{th} order).

Text Books:

1. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, New Delhi, 42^{nd} edition, 2012.
2. A Text Book on Mathematical Methods, Ravindranath, V. and Vijayalaxmi, A.,Himalaya Publishing House, Bombay, 2^{nd} edition, 2012.

Reference Books:

1. Engineering Mathematics Vol.2.-Mathematical Methods(JNTU Kakinada), Dr.T. K.V.Iyengar, Dr.M.V.S.S.N.Prasad, S.Ranganatham, Dr.B.Krishna Gandhi, , S. Chand Publications.
2. Engineering Mathematics, B. V. Ramana, Tata McGraw Hill, New Delhi.

PYTHON PROGRAMMING

L	T	P	C
3	0	0	3

Subject Code: 23EST206

CourseObjectives:

Python programming course aims to empower students with the knowledge, skills, and practical experience essential for becoming proficient Python programmers. By mastering Python fundamentals, exploring its rich ecosystem, and learning software development best practices, students develop problem-solving abilities and gain the confidence to tackle real-world challenges.

CourseOutcomes:

Attheend ofthe course,thestudent willbe ableto:

1. Examine Python syntax and semantics and be fluent in the use of Python flow control andfunctions.
2. Demonstrate proficiency in handling Strings and FileSystems.
3. Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use RegularExpressions.
4. Implement file handling functions and user defined functions in python.
5. Interpret the concepts of Object-Oriented Programming as used inPython and Regular Expressions.

Unit – I

Introduction to Python: History, Features, Installing Python, Running Python, Operators, Statements and Expressions.

Control Structures: Conditional Statements, Loops

Unit – II

Data Types: Mutable vs immutable data type, Numbers - Introduction to Numbers, Integers, Floating Point Real Numbers, Complex Numbers, Operators, Built-in Functions, Related Modules. Sequences - Strings, Lists, and Tuples, Dictionaries and Set Types

Unit – III

Functions: Definitions, Declaration, Parameter passing, calling functions

File Handling: creating a file, opening a file, I/O with file (read, write, append), closing a file

Unit – IV

Modules: Modules and Files, Namespaces, Importing Modules, Importing Module Attributes, Module Built-in Functions, Packages, Other Features of Modules.

Unit – V

Classes in Python: Principles of Object Orientation, Creating Classes, Instance Methods, Special Methods, class Variables and Inheritance, Data base connectivity.

Regular Expressions: Introduction, Special Symbols and Characters, Res and Python

Textbooks:

1. Wesley J .C hun "Core Python Applications Programming", 3rd Edition, 2012, PrenticeHall.
2. Brian jones, David Beazley “Python Cookbook ”, 3rd Edition.

ReferenceBooks:

1. Mark Lutz "Programming Python, 4th Edition" O'ReillyMedia.
2. Think Python, Allen Downey, Green Tea Press

Reference Links:

1. https://docs.python.org/3/tutorial/index.html
2. https://pythonprogramminglanguage.com

BUILDING PLANNING AND CONSTRUCTION TECHNOLOGY

Course Code: 23CET202

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:

1. To explain the principles of building bye-laws and regulations
2. To explain the principles and orientation of residential buildings along with their minimum standards.
3. To explain the basic concepts of construction technology.
4. To explain the construction techniques involved in the different structural elements of building including form work, scaffolding, plastering and proofing.
5. To explain the capacity, feasibility, owning and operating cost and productivity of different construction equipments.

COURSE OUTCOMES:

After completion of the course the student able to:

1. Understand the building bye laws and regulations.
2. Describe the principles of planning and orientation of residential buildings along with their standards.
3. Interpret the various necessary aspects for construction technology.
4. Illustrate various construction techniques adopted for various elements of building.
5. Explore different types of construction equipments.

UNIT - I

Building Bye-laws and Regulations: Introduction-Objectives of building bye-laws -Floor area ratio (FAR)-Floor space Index (FSI)-Principles underlying building bye-laws- classification of buildings-Open space requirements- lighting and ventilation requirement-Building services-Plumbing, Electrical fixtures.

UNTI -II

Principles of Planning and Orientation of the Residential Building: Orientation of the building, Grouping, Privacy, Elegance, Flexibility, Roominess, Circulation, Furniture requirements, Sanitation and economy. Effect of Sun, factors effecting the orientation, to find out the facing of a house. Minimum standards for various parts of buildings and requirements of different rooms. Inroduction to various software tools in building planning.

Planning of Public buildings: Planning of educational institutions and hospitals.Interior Decoration and its principles - Basic Concepts of Interior Design- Balance, Unity, Rhythm, Emphasis, Contrast, Scale and Proportion.

UNIT-III

Construction Technology: Masonry-Classification-Stone masonry -Rubble and Ashlar Masonry, Brick masonry- Flemish and English bonds,Foundation - Shallow and Deep foundations-types, Pointing, Water Proofing, Damp Proofing and Termite Proofing, Plastering, External and Internal finishes, White washing, Distempering.

UNIT-IV

Construction Techniques: Construction Techniques for various elements of building -Scaffolding, Shoring and Under Pinning, Form work- Erection and Fabrication. Introduction to Prefabricated Elements.

UNIT-V

Construction Equipment: Different types of Equipment-Excavators, Pavers, Plastering machines, Pre-stressing jacks and grouting equipment, Cranes and Hoists, Concrete Batching Plants.

TEXT BOOKS:

1. N. Kumara Swamy and. A. Kameswara Rao, "Building Planning and Drawing", 8th Edition, Charotar Publications, 2010 .
2. Dr. B.C. Punmia, "Building Construction", Laxmi publications (p) Ltd New Delhi, 2005.
3. Gurucharan Singh, "Building Planning, Scheduling and Design", 2nd Edition, Khanna Publishers, 2010.
4. R.L. Peurifoyetal, Construction Planning, Equipment and Methods, 7th Edition, Tata Mc. Graw Hill Publications, 2010.

REFERENCES:

1. Building Byelaws by State and Central Governments and Municipal Corporations.
2. 'A' Series & 'B' Series of JNTU Engineering College, Anantapur.
3. Ashokkumar Jain, "Building Construction", Laxmi publications (p)Ltd. Chennai

STRENGTH OF MATERIALS

Course Code: 23CET203

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

Students will have

1. To explain simple stresses and strains and temperature stressess
2. To explain the shear force and bending moments of the simply supported, cantilever and over hanging beams under various loads.
3. To explain the flexural stresses and shear stresses in beams of I section, T section and Circular section.
4. To explain circular shafts subjected to a given torque and find principal stresses and strains
5. To explain the safe load on columns for different end conditions

COURSE OUTCOMES:

After completion of this course students will be able to

1. Compute simple stresses and strains and temperature stresses.
2. Determine the shear force and bending moments of the simply supported, cantilever and over hanging beams under various loads.
3. Find the flexural stresses and shear stresses in beams of I section, T section and Circular section.
4. Design circular shafts subjected to a given torque and find principal stresses and strains
5. Calculate the safe load on columns for different end conditions

UNIT – I

Simple stresses and strains: Types of stresses and strains – Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elasticity and plasticity – Elastic moduli and the relationship between them – Bars of varying section – analysis of composite section– Temperature stresses.

UNIT – II

Shear force and bending moment: Definition of beam –Types of supports - Types of beams – Concept of shear force(S.F.) and bending moment (B.M.) – S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, UDL., and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – III

Flexural stresses: Theory of simple bending – Assumptions – Derivation of bending equation - Neutral axis – Determination bending stresses – section modulus of rectangular, circular sections (Solid and Hollow), I section, T section and Circular section.

Shear stresses: Derivation of formula – shear stress distribution across various beam sections like rectangular, I and T sections.

UNIT – IV

Torsion of circular shafts: Theory of pure torsion – Assumptions made in the theory of pure torsion- Derivation of Torsion equation– Torsion moment of resistance – Polar section modulus – Power transmitted by shafts

Principal stresses and strains: Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – problems on two perpendicular normal stresses accompanied by a state of simple shear – Mohr circle method.

UNIT – V

Columns and Struts: Strutssubjectedtoaxialloads,conceptofbuckling. Classification of based on material, Slenderness ratio. and End conditions. of Assumptions of Euler's theory-Euler'sbucklingtheoryofstrutswithdifferentboundary conditions. Rankine-Gorden buckling theory for columns. Secant formula-IS codal formula.

Text Books:

1. B. C. Punmia," Mechanics of Materials", Laxmi publishers, Delhi, 2017.
2. S. Ramamrutham, "Strength of Materials", DhanpatRai& Sons, Delhi, 2014
3. Strength of Materials by BhaviKatti. Vikas publishing house, 2020

Reference Books:

1. S.B. Junnarkar, "Mechanics of structures (Vol-I &Vol-II)", Charotar Publishing house, 2016
2. Strength of Materials by S. S. Ratan, Tata McGraw Hill, 2016
3. R.K.Rajput, Strength of Materials, 4th Ed, S.Chand & Co, New Delhi, 2007
4. Strength of Materials by A.R.Basu, DhanpatRai& Co, Nai Sarah, New Delhi.
5. Ferdinand P Beer, E. Russell, Johnston, Jr, John T dewolf, Mechanics of Materials, 6th Ed., Tata McGraw-Hill Publications, 2012

FLUID MECHANICS AND HYDRAULIC MACHINES

Course Code: 23CET204

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

Student will have:

1. To explain the importance of fluid properties and their influence on fluid motion
2. To explain concepts of fluid flows and apply equation of continuity, flow net analysis.
3. To explain students with a thorough understanding of fluid dynamics principles and their practical applications in analyzing pipe flow systems.
4. To explain hydrodynamic forces of jets on various vanes and analyze the performance of various turbines under different operating conditions and governing of turbines and surge tanks.
5. To explain the performance of centrifugal pumps under different operating conditions.

COURSE OUTCOMES:

After completion of this course students will be able to:

1. Understand the importance of fluid properties and their influence on fluid motion
2. Summarize concepts of fluid flows and apply equation of continuity, flow net analysis.
3. Proficiency in applying fluid dynamics principles to solve complex engineering problems and design efficient pipe networks, while comprehending lift and drag phenomena on different shapes.
4. Compute hydrodynamic forces of jets on various vanes and analyze the performance of various turbines under different operating conditions and governing of turbines and surge tanks.
5. Determine the performance of centrifugal pumps under different operating conditions.

Unit - I

Fluid statics: Dimensions and units– Physical properties of fluids specific gravity, viscosity, surface tension, capillarity, vapor pressure and their influences on fluid motion, pressure at a point, Pascal's law, Hydrostatic law - atmospheric, gauge and vacuum pressure- measurement of pressure. Manometers: Piezometer, U-tube, inverted and differential manometers.

Unit - II

Buoyancy & Flotation: stability of floating bodies Meta Center, Meta centric height.

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

Unit - III

Fluid dynamics: surface and body forces –Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its applications – Venturimeter and Orifice meter, force on

pipe bend. Closed conduit flow: Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line - pipe networks.

Unit - IV

Basics of turbo machinery: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip, velocity triangles at inlet and outlet, expressions for work done and efficiency, principle of Angular Momentum.

Hydraulic turbines: Layout of a typical Hydropower installation – Heads and efficiencies-classification of turbines Pelton wheel-Francis turbine-Kaplan turbine-working, working proportions, velocity diagram, work done and efficiency.

Unit - V

Centrifugal pumps and Reciprocating pumps: Classification, working, work done – manometric head- losses and efficiencies- specific speed- pumps in series and parallel-performance characteristic curves, cavitation & NPSH. Reciprocating pumps-Working, Discharge, slip, indicator diagrams.

Text Books:

1. P.N Modi and S.M. Seth, "Hydraulics and Fluid Mechanics Including Hydraulic Machines", 21st Edition, Standard BookHouse, 2017.

2. R.K. Bansal, "A textbook of Fluid mechanics and hydraulic machines", 10th Edition, Laxmi Publications (P) Ltd., NewDelhi, 2018.

3. Introduction to Fluid Machines by S.K. Som& G. Biswas, Tata McGraw Hill Pvt. Ltd.3rd edition, 2017

Reference Books:

1. A.K.Jain, "Fluid Mechanics including Hydraulic Machines",12th Edition, Khanna Publishers, New Delhi, 2014

2. D S Kumar, Fluid Mechanics and Fluid Power Engineering, Publisher: S K KATARIA & SONS-NEW DELHI,2013

3. Fluid mechanics and fluid machines by R.K. Rajput,Publisher: S Chand & Company (2016)

PYTHON PROGRAMMING LAB

Subject Code: 23ESL207

L	T	P	C
0	0	3	1.5

CourseObjectives:

This course will enable students with a comprehensive understanding of Python programming language, including its history, features, and fundamental concepts, enabling them to write Python programs proficiently.

CourseOutcomes:

Attheend ofthe course,thestudent willbe ableto:

1. Able to implement conditional statements and loops to control the flow of their Python programs effectively.
2. To manipulate strings, lists, tuples, dictionaries, and sets using appropriate Python syntax and built-in functions.
3. To perform basic file operations such as creating, opening, reading, writing, appending, and closing files using Python.
4. To import specific attributes from modules, utilize built-in functions provided by modules, and organize modules into packages effectively.
5. Apply OOP concepts and regular expressions in Python to search, match, and manipulate textual data effectively.

Exercise Questions: 1

Ex 1: Write the python programs to implement all Number type operations.
Ex 2: Write the python programs to perform all String operations.

Exercise Questions: 2

Ex 3: Write the python programs to calculate the List datatype operations.
Ex 4: Write the python programs to perform the Dictionary operations.

Exercise Questions: 3

Ex 5: Write the python programs to implement the recursive function.
Ex 6: Write the python programs to perform the file operations.

Exercise Questions: 4

Ex 7: Write the python programs to implement modules and packages.

Exercise Questions: 5

Ex 8: Write the python program to create class, object and its concepts of OOP.
Ex 9: Write a Python program that uses regular expressions to find all occurrences of a specific pattern in a given text and validations.

Text Books

1. Wesley J .C hun "Core Python Applications Programming", 3rd Edition, 2012, PrenticeHall.
2. Brian jones, David Beazley “Python Cookbook ”, 3rd Edition.

References Books

1. Mark Lutz "Programming Python, 4th Edition" O'ReillyMedia.
2. Think Python, Allen Downey, Green Tea Press

Web Links

1. https://docs.python.org/3/tutorial/index.html
2. https://pythonprogramminglanguage.com

STRENGTH OF MATERIALS LAB

Course Code: 23CEL201

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

Students will have

1. To perform the experiment on tension test on mild steel, bending test on cantilever beam
2. To perform bending test on simple support beam and torsion test on mild steel
3. To perform hardness test on steel and spring test.
4. To perform compression test on wood/steel/brick, impact test, shear test
5. To perform shear test on wood and verification of Maxwell's Reciprocal theorem on beams
6. To perform experiment to cmeasure deflection of fixed beam and bending test of steel joist, and compression test of brick.

COURSE OUTCOMES:

After completion of this course students will be able to

1. Determine perform the experiment on tension test on mild steel, bending test on cantilever beam.
2. Determine bending test on simple support beam and torsion test on mild steel
3. Examine hardness test on steel and spring test.
4. Calculate compression test on wood/steel/brick, impact test, shear test
5. Compute shear test on wood and verification of Maxwell's Reciprocal theorem on beams
6. Evaluate experiment to cmeasure deflection of fixed beam and bending test of steel joist, and compression test of brick

List of experiments

1. Tension test on MS and HYSD bars
2. Bending test on Cantilever beam (Steel).
3. Determination of Modulus of Elasticity by conducting Bending test on simple support beam (Wood).
4. Torsion test on MS bar.
5. Hardness test on steel
6. Compression test on Close coiled Helical Spring
7. Compression test on wood
8. Impact test on Mild Steel bar
9. Shear test on Wood
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Deflection test on Fixed beam
12. Bending test on RS Joist under UTM
13. Add-on Demonstration Compression Test on Brick

FLUID MECHANICS AND HYDRAULIC MACHINES LAB

L	T	P	C
0	0	3	1.5

Course Code: 23CEL202

COURSE OBJECTIVES:

1. To perform how to calibrate of venturimeter& orifice meter.
2. To perform how to determine of coefficient of discharge for a small orifice and external mouth piece by a constant head method.
3. To perform how to calibrate of Trapezoidal Notch and /or Triangular Notch.
4. To perform how to determine Coefficient of loss of head in a sudden contraction and friction factor and impact of jet on vanes.
5. To perform how to determine efficiency of Pelton wheel turbine, centrifugal pump and reciprocating pump.

COURSE OUTCOMES:

After completion of this course students will be able to

1. Evaluate Coefficient of discharge of Venturimeter and Orifice meter.
2. Examine Coefficient of discharge for a small orifice and external mouth piece by a constant head method.
3. Compute Coefficient of discharge of Trapezoidal Notch and /or Triangular Notch.
4. Determine loss of head in a sudden contraction and friction factor and force exerted by jet onvanes.
5. Measure efficiency of Pelton wheel turbine, efficiency of centrifugal pump and reciprocating pump.

LIST OF EXPERIMENTS

1. Determination of Coefficient of discharge of Venturi meter
2. Determination of Coefficient of discharge of Orifice meter.
3. Determination of Coefficient of discharge for a small orifice by a constant head method.
4. Determination of Coefficient of discharge for an external mouth piece by constant head method.
5. Determination of Coefficient of discharge of Trapezoidal Notch and /or Triangular Notch.
6. Determination of Coefficient of loss of head in a sudden contraction and friction factor.
7. Impact of jet on vanes.
8. Performance test on Pelton wheel turbine
9. Efficiency test on centrifugal pump.
10. Efficiency test on reciprocating pump.

ENVIRONMENTAL SCIENCE

(Common to all Branches)

Course Code: 23MCT204

L	T	P	C
2	0	0	0

Course Objectives:

1. Memorize the knowledge of environment and status of different resources on earth.
2. Identify the significance, arrangement, causes of annihilation and conservation of ecosystems and biodiversity..
3. Discriminate causes, effects of a variety of pollutions and suitable control methods.
4. Identify the hurdles of sustainable development; evaluate the different environmental management and legal issues.
5. Describe the population growths, health problems and evaluate the environmental assets.

Course Outcomes:

By Studying this Course Student will

1. Recognize and speaks well again on the general issues of environment and know how to conserve resources for better usage.
2. Explain and demonstrate the ecosystems setup, assess. Recognize and conserving of diversity to upkeep.
3. Examine a range of pollution problems along with control and their eco-friendly disposal methods.
4. Translate the sustainable development practice through clean development mechanisms.
5. Evaluate the changing trends of world population and compile the information in order to document the environmental assets.

Unit – I (6 Hours)

Importance of Environmental Studies and Natural Resources: Definition of Environment – Importance - Need for Public Awareness

Forest Resources - Use and over exploitation - deforestation – consequences – case study

Water Resources - Use and over utilization - dams - benefits and problems on Tribes and Environment

Food Resources – Food security concept - changes caused by agriculture and overgrazing -effects of modern agriculture – fertilizer - pesticide problems - water logging - salinity – concept of sustainable agricultural methods - case study

Energy Resources - Non-renewable energy resources – coal – crude oil - natural gas - use of renewable and alternate energy sources

Unit – II (6 Hours)

Ecosystems and Biodiversity and its conservation: Definition – Structure of ecosystem: producers - consumers – decomposers. Functions of ecosystem: Food chains - food webs ecological pyramids - Energy flow – Nutrient cycles (Carbon cycle and Nitrogen cycle). Ecological succession.

Definition of Biodiversity - Values of biodiversity - Bio-geographical classification of India - Hot Spots of India - Endangered and endemic species of India –Threats to biodiversity - Conservation of biodiversity

Unit – III (6 Hours)

Environmental Pollution: Definition – causes - effects - control measures of Air pollution -Water pollution - Noise pollution – Marine Pollution - Nuclear hazards.

Solid waste Management: Causes - effects - disposal methods of urban waste – biomedicalwastes - case studies

Disaster management: floods – earthquakes – cyclones

Unit – IV (6 Hours)

Social Issues and the Environment: Concept of Unsustainable and Sustainable development – Water conservation: Rain water harvesting- Watershed management - Globalenvironmental challenges: climate change - global warming – acid rains - ozone layer depletion -World summits on environment: Stockholm conference – Rio-earth summit – Kyoto protocol – Environment (Protection) Act - Air (Prevention and Control ofPollution) Act – Water (Prevention and control of Pollution) Act - Wildlife (Protection) Act -Forest (Conservation) Act

Unit – V (4 Hours)

Human Population and the Environment: Population growth patterns - variation among nations - Population problems - control -Environment and human health - Role of information Technology in Environment and human health

Text Books:

1. Shashi Chawla. 2015, *A Text book of Environmental Studies*, Revised edition, TMH, New Delhi

2. Bharucha, E. 2005, *Text book of Environmental Studies*, First edition, Universities Press (India) Pvt. Ltd., Hyderabad

3. Suresh K. Dhameja. 2006-07, *Environmental Studies*, Third revised edition, S.K. Kataria & Sons (P) Ltd., New Delhi

4. Benny Joseph. 2015, *Environmental Studies*, Revised edition, TMH, New Delhi

Reference Books:

1. Odum, E.P, *Fundamentals of Ecology*, Third edition, W.B. Saunders & Co (P) Ltd., Philadelphia.

2. P. D. Sharma, *Ecology and Environment*, Revised edition, Rastogi Publications (P) Ltd.

3. Cunningham, W.P., Cunningham, M.A., *Principles of Environmental Science*, TMH, New Delhi.

4. Peavy, Rowe and Tchobanoglous, *Environmental Engineering*, Mc Graw – Hill International edition.

5. Graedel, T.E., Allenby, B.R., *Industrial Ecology and Sustainable Engineering*, Pearson Publications.

UNIVERSAL HUMAN VALUES

(Common to all B.Tech Branches)

Subject Code: 23BHT207

L	T	P	C
2	0	0	2

COURSE OBJECTIVES:

1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
2. To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence.
3. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behaviour and mutually enriching interaction with Nature.
4. To Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life

COURSE OUTCOMES:

1. Upon completion of this course students can aware of ethical behavior in the work place
2. To shapes the students by the end of this curriculum being harmony himself
3. To understand the human relationship and values
4. To understand the Nature and its existence of connectivity
5. Learn the importance of Human values and universal order

UNIT-I

Introduction: Understanding the need, basic guidelines, content and process for Value Education- Self Exploration - what is it?- Continuous Happiness and Prosperity Morals, Values and Ethics – Integrity – Work Ethics – Service Learning- Respect for others- Caring – Sharing – Honesty – Courage – Value time – Co-operation – Commitment Self-confidence – Spirituality.

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'- Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)

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- Trust (Vishwas) and Respect (Samman) as the foundational values of relationship- Understanding the meaning of Vishwas; Difference between intention and competence -Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship

UNIT- IV

Understanding Harmony in the Nature and Existence: Whole existence as Co-existence- Understanding the harmony in the Nature- Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature- Holistic perception of harmony at all levels of existence

UNIT-V

Implications of the Holistic Understanding of Harmony: Natural acceptance of human values - Definitiveness of Ethical Human Conduct- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

Reference Books:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics
2. "Professional Ethics and Human Values" by Prof. D.R. Kiran.
3. "Engineering Ethics & Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009.
4. A N Tripathy, 2003, Human Values, New Age International Publishers
5. R. Subramanian, Professional Ethics includes Human Values, Oxford Univ. Press
6. M Govindrajan, S Natrajan& V. S Senthilkumar, Engineering Ethics (including Humna Values), Eastern Economy Edition, Prentice Hall of India Ltd.

SURVEYING

Course Code: 23CET205

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To describe the land area by chaining.
2. To explain the conventional methods of surveying
3. To describe the concept of leveling to prepare the contour maps
4. To explain the concept of tachometer in angular measurement, elevation and distance
5. To describe the applications of drones in various fields and study the relief and tilt displacements from the aerial photographs

COURSE OUTCOMES:

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

1. Measure the land area by plane table and chaining.
2. Synthesize the conventional methods of surveying
3. Apply the concept of levelling to prepare the contour maps
4. Apply the concept of tachometer in angular measurement, elevation and distance between an object
5. Apply the applications of drones in various fields and evaluate the relief and tilt displacements from the aerial photographs

UNIT I

Introduction: Surveying definition & objectives, plane surveying principles and classification, scales, Errors and Mistakes. Chain Surveying: Principles, Equipment, Types of tapes and chains, Tape Variations, Errors and Corrections

UNIT II

Compass Surveying: Types of compass, Measurement of directions and angles, types of compass, meridians and bearings, local attraction, magnetic declination, traversing, plotting of traverse, adjustment of closing error.

UNIT III

Levelling and Contouring: Description of a point (position) on the earth's surface, instruments for levelling, principle and classification of levelling, bench marks, levelling staff, readings and booking of levels, HI method, Raise and fall method, field work, longitudinal section and cross section, plotting the profile, height (level) computations, contours, characteristics of contours, methods of contouring, interpolation, contour gradient, contour maps.

UNIT IV

Theodolite and Tacheometric Surveying: Principle of theodolite survey, Theodolite component parts, observations, Traversing, traverse computations, Trigonometrical Surveying, Tacheometry, principle of tacheometry, methods of tacheometry, tacheometry as applied to subtense measurement, Total station-general commands used- instrument preparation and setting-reading distances and angles.

UNIT IV

Theodolite and Tacheometric Surveying: Principle of theodolite survey, Theodolite component parts, observations, Traversing, traverse computations, Trigonometrical Surveying, Tacheometry, principle of tacheometry, methods of tacheometry, tacheometry as applied to subtense measurement, Total station-general commands used- instrument preparation and setting-reading distances and angles.

Curves: Types of curves, design and setting out – simple curves (one theodolite and two theodolite).

UNIT V

Drones: Introduction to Drones,components of drones, Application of drone for Surveying-Construction, Irrigation and Agricultural, Engineering Land Survey and Transportation.

Photogrammetry Surveying: Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy.

TEXT BOOKS:

1. Duggal S K, "Surveying (Vol – 1, 2 & 3), Tata McGraw Hill Publishing Co. Ltd. New Delhi, 4th edition, 2017.

2. B.C. Punmia, Ashok Kumar Jain, Ashok Kr. Jain, Arun Kr. Jain., Surveying I & II, Laxmi Publications, 17th edition, 2016.

3 Madhu, N, Sathikumar, R and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.

4. Anji Reddy M., Remote sensing and Geographical information system, B.S. Publications, 2001.

5. One Nation Under Drones: Legality, Morality, and Utility of Unmanned Combat Systems by John E. Jackson.

REFERENCES:

1. Chandra A. M., Plane Surveying, New Age International Publ., 2007.

2. Geomatics Engineering by Manoj, K. Arora and Badjatia, Nem Chand & Bros, 2011

3. Drones and Support for the Use of Force by James Igoe Walsh

GEOTECHNICAL ENGINEERING

Course Code: 23CET206

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

1. To explain the soil formation and determine the index properties of these soils and classify them
2. To explain the concept of seepage of water through soils and determine the discharge of water through soils.
3. To explain the principles of compaction and consolidation of soils and determine the magnitude and the rate of consolidation settlement.
4. To explain the stress below the soils under different conditions.
5. To explain the student to understand the concept of shear strength of soils, determine the shear parameters of sands and clays and the areas of their application.

COURSE OUTCOMES:

After completion of this course students will be able to

1. Determine the index properties of soils, classify them and establish their inter-relationships.
2. Illustrate seepage of water through soils and determine the discharge of water through soils
3. Apply the principles of compaction and consolidation and determine the magnitude and the rate of consolidation settlement
4. Analyze the stress below the soils under different conditions
5. Calculate the effective shear stress and shear parameters for different soils.

UNIT I:

Type of Soils, Index Properties: Inter-relationships and Soil Characterization Types of soil and soil formation, Geological cycle, Phase diagrams, Basic terms, Functional relationships based on index properties, Physical characterization of soil-Dry and Wet sieve analysis, Atterberg's Indices, Soil Structures, Soil Water and its types, Standard nomenclature & IS Soil Classification.

UNIT II:

Permeability and Seepage: Darcy's law and its validity, Factors affecting permeability, Laboratory permeability tests, Permeability of stratified soil masses, Seepage pressure, 2-D flow and Laplace's equation, Flow net construction.

UNIT III: Effective Stress and Pore Water Pressure: Introduction to stresses in soil, Effects on stress under Hydrostatic, upward and downward flow conditions,effective stress due to Capillary rise, Quick sand condition, Piping Failure.

Stress Distribution: Causes of stresses in soil, Boussinesque's and Westergard's equation, Pressure Bulb, Stress distribution on horizontal and vertical planes, Stresses due to different shapes of footings, New-mark's influence chart.

UNIT IV: Compaction of soil: Mechanism of compaction, Factors affecting compaction, IS Light and IS Heavy compaction tests, Effect of compaction on soil properties, Field compaction: compaction equipment and Evaluation of field compaction.

Consolidation of soil: Consolidation theory- Initial compression, primary compression, secondary compression, Oedometer test, Spring Analogy model of consolidation, Compression Index, coefficient of compressibility and Volume compressibility coefficient, Terazghi's one dimensional consolidation theory, coefficient of consolidation, Time factor, consolidation settlement.

UNIT V: Shear Strength of Soil: Mohr's strength theory, Mohr- coulomb's strength theory, Modified Mohr coulomb's theory, shears parameters through lab and tests based on drainage conditions like direct shear-Triaxial shear- CU-CD conditions, concepts on liquefaction, and critical void ratio.

Text Books:

1 Basic and Applied Soil Mechanics by Gopal Ranjan &ASR Rao, New age International Pvt . Ltd, New Delhi, Third edition, 2016

2.Soil Mechanics and Foundation Engg. By K.R. Arora, Standard Publishers and Distributors, Delhi, 2009.

3.Soil Mechanics and Foundations by B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi, publications Pvt. Ltd., New Delhi, Sixteenth edition, 2017.

4. Principles of Geo technical Engineering by B. N. Das and K.Sobhan, Cengage India Private Limited; Ninth edition, 2017

References:

1. Geotechnical Engineering by C. Venkataramiah, New age International Pvt . Ltd, (2002).

2. Soil Mechanics – T.W. Lambe and Whitman, Mc-Graw Hill Publishing Company, Newyork.

3. Geotechnical Engineering by Purushotham Raj

4. Fundamentals of soil mechanics by D.W.Taylor

5. Geotechnical Engineering by Manoj Dutta & Gulati S.K – Tata Mc.Grawhill Publishers New Delhi.

STRUCTURAL ANALYSIS

Course Code: 23CET207

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

Students will have

1. To explain deflection of statically determinate structures under various loading and support conditions.
2. To explain the structural elements through strain energy methods to find out workdone and deflections.
3. To explain the shear force and bending moments caused by rolling loads.
4. To explain the shear force and bending moment of propped cantilever and fixed beam
5. To explain the analysis of three hinged and two hinged arches

COURSE OUTCOMES:

After completion of this course, students will be able to,

1. Determine deflection of statically determinate structures under various loading and support conditions.
2. Analyze the structural elements through strain energy methods to find out work done and deflections
3. Analyze the the shear force and bending moments caused by rolling loads.
4. Analyze the shear force and bending moment of propped cantilever and fixed beam.
5. Analyze the analysis of three hinged and two hinged arches.

Unit-I

Deflection of beams: Bending into a circular arc – slope, deflection and radius of curvature – Differential equation for the elastic line of a beam – Double integration, Macaulay's method, Moment area method (Mohr's theorems),– Determination of slope and deflection for cantilever and simply supported beams subjected to point loads and U.D.L.

Unit-II

Strain Energy methods: Concept of Strain Energy-Resilience-Modulus of Resilience, Strain energy stored in a bar due to axial load, Shear force and Bending moments and its applications on Statically determined beams. Castigliano's Theorem I and II. Applications of Castigliano's theorems in Statically determined structures. (Cantilever and SSB with point load and Udl with constant and Variable Flexural rigidity). Maxwell's reciprocal theorem.

Unit-III

Rolling loads and Influence line Diagrams: Concept of Rolling loads and Influence line Diagrams. Applications of ILD's in Design of bridges. Determination of Support reactions, Shear force, bending moment and absolute bending moments for Rolling load (Concentrated load, Group of Concentrated loads and UDL) on Simply supported bridge girders by using ILD.

Unit-IV

Propped Cantilever Beams: Analysis of Propped cantilever beams with concentrated load, UDL – Shear force and Bending moment Diagrams.

Fixed Beams: Advantages for Fixed beams, Analysis of Fixed beams with concentrated load, UDL – Shear force and Bending moment Diagrams.

Unit-V

Analysis of Three Hinged Parabolic Arches: Elastic theory of arches-Eddys Theorem-Determination of Horizontal Thrust-Support Reactions-Shear force- Bending Moment-Normal thrust and Radial Shear for arches subjected to concentrated loads and UDL for parabolic arches supports at same level

Analysis of Two hinged Parabolic Arches: Determination of Horizontal Thrust-Support Reactions-Shear force- Bending Moment-Normal thrust and Radial Shear for arches subjected to concentrated loads and UDL for parabolic arches supports at same level.

Text Books:

1. S.S.Bhavikatti, Structural Analysis Volume–I, Vikas Publishers, 3rdedition,2011. (ISBN:9788125942696/8125942696).
2. D.Menon, Structural Analysis Volume–IandIINarosa Publication, 2010.(ISBN-978-842653371/1842653377).
3. C.S.Reddy, Basic Structural Analysis, Publisher: Tata McGrawHill, 2010.(ISBN-1283187140/978-1283187145).
4. Structural Analysis by R.C. Hibbler, Pearson Education India, 6th edition, 2006.

Recommended Reading

1. C.K.Wang, Intermediate Structural Analysis, Mc GrawHill,1984.(ISBN-10:0070666237/978-0070666238).
2. B.G.Neal, Structural theorems andtheir application, Pergaman Press,1972.(ISBN:978-1483139029).
3. S.Timoshenko and Young, Theory of Structures, Publisher: TataMcGrawHill,1965.(ISBN-9780070648685/978-0070648685).
4. NorriesandWilbur,ElementaryStructuralAnalysis,Publisher:McGrawHill,1990.(ISBN-
5. 0071008365/978-0071008365).

ENGINEERING GEOLOGY

Course Code: 23CET208

L	T	P	C
3	0	0	3

Course Objectives:-

The Students Will able

1. To explain the various properties of minerals
2. To explain features of rocks
3. To explain the geological structures, processes of weathering and classification of soils.
4. To explain the knowledge of geological studies for dams and tunnels.
5. To explain the causes and effects and mitigating measures of earth quakes and landslides

Course Outcomes:

After completion of this course students will be able to

1. Identify different minerals.
2. Distinguish features exhibited by the rocks.
3. Identify the geological structures like folds, faults, joints and unconformities present in rock and describe the processes of weathering.
4. Evaluate the suitability of site for the dams and tunnels.
5. Illustrate the causes, effects and mitigating measures of earthquakes and landslides

UNIT I

Engineering Geology: Introduction, Scope and Significance of Engineering Geology in various civil engineering projects.

Mineralogy: Definition of Mineral and crystal. Physical properties used in the identification of minerals. Physical properties of Feldspar Group, Olivine, Calcite, Bauxite, Kyanite and Gypsum.

UNIT II

Petrology: Geological classification of Rocks, Dykes and Sills , Structures and textures, Geological description of Granite, Basalt, Dolerite, Gabbro, Sand stone, Shale, Limestone slate, Gneiss, Schist, Quartzite, Marble, and Khondalite.

UNIT III

Geological Structures: Strike and Dip, Classification mode of origin and engineering consideration of Folds, Faults, Joints and unconformities.

Rock Weathering: Definition of Rock weathering, classification of weathering Engineering consideration of Rock Weathering.

Geology of Soils: Formation of soil, Soil profile, important clay minerals, Geological classification of soils, Types of Indian Soils.

UNIT IV

Geology of Dams and Tunnels: Types and purpose of Dams, Geological considerations in the selection of a Dam site, Analysis of Dam failures in the past, Purpose, effects and lining of tunnels, Influence of Geology for successful Tunnelling.

UNIT V

Geological Hazards: Earthquakes-Causes and effects, Richter scale, Seismic belts, Seismic zones of India, precautions while constructing engineering structures- Land Slides-Causes, effects and methods of mitigating measures.

Geophysical Investigation: Introduction, Surface methods of Investigations Electrical Methods and Seismic Methods.

Text Books:

1. Parbin Singh, "*Engineering and general Geology*", S. K. Kataria & sons, New Delhi 2013.
2. N. Chenna Kesavulu, "*Text book of Engineering Geology*", Laxmi Publications Pvt Ltd; third edition, 2018.
3. P.C. Varghese, "*Engineering Geology for Civil Engineers*", PHI learning private Ltd., 2013.

References:

1. F. G. Bell, "*Fundamentals of Engineering Geology*", Aditya Books Pvt. Ltd., New Delhi, 2016
2. D. P. Krynine and W. R. Judd, "*Principles of Engineering Geology and Geotechnics",* CBS publishers and Distribution Pvt. Ltd, 2018.
3. Subinoy Gangopadhyay, "*Engineering Geology*", Oxford University press, 2013.
4. Geological Survey of India, "*Seismo Tectonic Map of India*" 2005.

COMPETITIVE PROGRAMMING LAB-I

(Common to ECE, EEE, MECH and CIVIL)

L	T	P	C
0	0	3	1.5

Course Code: 23ESL208

Course Objectives:

- This course aim to enhance student proficiency in a particular programming language C++.
- Acknowledge in the value of mathematics and problem solving techniques in programming
- Learning about the optimized solution in solving problems.

Course outcomes:

After completion of the course, the students will be able to

- Use programming to find solution of the problems.
- create solution based on OOPS concept
- Choose the right container to arrange data in order to solve problems.
- Provide problem Solving strategies employing Recursion.
- Apply mathematics to the problem Analysis.
- write data retrieval queries and evaluate the result set

LAB MODULE I:

CPP Essentials: Basic Syntax, Variables, Data types, Operators, Input and output, Conditional Statements ,loops.

Data Type,Conditions:

https://codeforces.com/group/MWSDmqGsZm/contest/219158

Loops: https://codeforces.com/group/MWSDmqGsZm/contest/219432

LAB MODULE II:

Arrays, Functions and Strings

Arrays : https://codeforces.com/group/MWSDmqGsZm/contest/219774

Functions : https://codeforces.com/group/MWSDmqGsZm/contest/223205

Strings: https://codeforces.com/group/MWSDmqGsZm/contest/219856

LAB MODULE III:

OOPS

Class: https://www.hackerrank.com/challenges/c-tutorial-class/problem

Classes and Objects:

https://www.hackerrank.com/challenges/classes-objects/problem

https://www.hackerrank.com/challenges/box-it/problem

LAB MODULE IV:

Inheritance:

https://www.hackerrank.com/domains/cpp?filters%5Bsubdomains%5D%5B%5D=inheritance

Virtual Functions:

https://www.hackerrank.com/challenges/virtual-functions/problem

Abstract Classes – **Polymorphism:**

https://www.hackerrank.com/challenges/abstract-classes-polymorphism/problem

LAB MODULE V:

STL - 1: Containers, Container Classes, Vectors, Lists, Iterators,set

Vector: https://www.geeksforgeeks.org/problems/c-stl-set-1-vector/1

https://www.hackerrank.com/challenges/vector-erase/problem?isFullScreen=true

Intersection of Two Arrays:

https://leetcode.com/problems/intersection-of-two-arrays/description

Set:https://www.hackerrank.com/challenges/cpp- ets/problem?isFullScreen=true

Stack: Next Greater Element I: https://leetcode.com/problems/next-greater-element-i/description/

Valid Parentheses:

https://leetcode.com/problems/valid- parentheses/description/

Largest Rectangle in Histogram:

https://leetcode.com/problems/largest-rectangle-in-histogram/description/

LAB MODULE VI:

STL -2: Maps, Bit set, Stack, Queue, De queue, Priority queue

https://www.hackerrank.com/challenges/cpp-maps/problem?isFullScreen=true

Twice counter:https://www.geeksforgeeks.org/problems/twice-counter4236/1

Frequency Game: https://www.geeksforgeeks.org/problems/frequency-game/1

Check if a string is repetition of its substring of k-length:

https://www.geeksforgeeks.org/problems/check-if-a-string-is-repetition-of-its-substring-of-k-length3302/1

Dequeue:https://www.hackerrank.com/challenges/deque-stl/problem?isFullScreen=true

LAB MODULE VII:

Problem solving approaches : precomputation, Two pointer

Two Sum II :

https://leetcode.com/problems/two-sum-ii-input-array-is-sorted/description/

Rotate Array: https://leetcode.com/problems/rotate-array/description/

Container With Most Water: https://leetcode.com/problems/container-with-most-water/description/

Remove Duplicates from Sorted Array:

https://leetcode.com/problems/remove-duplicates-from-sorted-array/description/

Product of Array Except Self:

https://leetcode.com/problems/product-of-array-except-self/description/

Reverse Words in a String II:

https://leetcode.com/problems/reverse-words-in-a-string-ii/description/

LAB MODULE VIII:

Problem solving approaches:

Sliding Window approach, fixed window approach and varying window approaches

Max Consecutive Ones I:

https://leetcode.com/problems/max-consecutive-ones/description/

Max Consecutive Ones II:

https://leetcode.com/problems/max-consecutive-ones-ii/description/

Longest Substring with At Most Two Distinct Characters:

https://leetcode.com/problems/longest-substring-with-at-most-two-distinct-characters/description/

Longest Substring Without Repeating Characters:

https://leetcode.com/problems/longest-substring-without-repeating-characters/description/

Find All Anagrams in a String:

https://leetcode.com/problems/find-all-anagrams-in-a-string/description/

SQL Part1:

SQL Command, Data Types, Operators and Expressions, DDL statements, DML statements, Functions, Sorting Data, Grouping Data

Practise problems:-

https://www.hackerrank.com/domains/sql?filters%5Bsubdomains%5D%5B%5D=select

https://www.hackerrank.com/domains/sql?filters%5Bsubdomains%5D%5B%5D=aggregation

https://www.sqlzoo.net/wiki/SQL_Tutorial

SQL Part2: Cartesian Product and Inner Join, Self Join, Outer Join, Subquery, Independent Subquery, Correlated Subquery

Practice problems:-

https://www.hackerrank.com/domains/sql?filters%5Bsubdomains%5D%5B%5D=join

https://www.hackerrank.com/domains/sql?filters%5Bsubdomains%5D%5B%5D=advanced-join

https://www.sqlzoo.net/wiki/SQL_Tutorial

Text Books:

1. The Complete Reference C++ by Herbert Schildt ,4th Edition
2. E. Horowitz. et.al., Fundamentals of computer Algorithms, Universities Press, 2008, 2nd Edition.

Reference Books:

1. Competitive Programming 3: The New Lower Bound of Programming Contests Book by Felix Halim and Steven Halim, 423 pages
2. Programming Pearls Book by Jon Bentley, 258 pages.T.H. Cormen et.al. – Introduction to Algorithms – PHI, New Delhi, 2005
3. S.Dasgupta et.al. – Algorithms, TMH, New Delhi – 2007.
4. SQL Quickstart Guide: The Simplified Beginner's Guide to SQL by Clydebank Technology

Resources:

1. https://leetcode.com/problems/
2. https://nptel.ac.in/courses/106106145/
3. https://www.spoj.com/problem

SURVEYING LAB

Course Code:23CEL203

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

1. To demonstrate calculation of area by chaining across obstacles and prepare outline of residential building using chain survey
2. To demonstrate the calculation of distance between two inaccessible points and area of closed traverse by using prismatic compass
3. To demonstrate computation and measurement of horizontal and vertical angle by Theodolite
4. To demonstrate determination of reduced levels for L.S and C.S of road profiles using dumpy or auto level
5. To demonstrate determination and drafting of area of the selected field by contouring and total station.

COURSE OUTCOMES:

On completion of the course, the students will get ability to:

1. Determine the area by chaining across obstacles and prepare outline of residential building using chain survey
2. Determine distance between two inaccessible points and area of closed traverse by using prismatic compass
3. Compute the measurement of horizontal and vertical angle by Theodolite
4. Determine reduced levels for L.S and C.S of road profiles using dumpy or auto level
5. Determine and draw the area of the selected field by contouring and total station.

EXCERCISES:

1. Survey of an area by chain survey (closed traverse) & Plotting
2. Chaining across obstacles
3. Determination of distance between two inaccessible points with compass.
4. Surveying of a given area by prismatic compass (closed traverse) and plotting after adjustment.
5. a) Measurement of horizontal and vertical angle by Theodolite

b) Distance between inaccessible points by Theodolite

c). Setting out of simple curve.

6. Introduction to levelling instrument, leveling staff. Reading of level staff, temporary adjustments of level1ing instrument.
7. Fly leveling (differential leveling)
9. Check leveling - L.S. & C.S. of a road profile.
10. One exercise on contouring.
11. Determination of areas of field (enclosed three or more points) by total station

GEOTECHNICAL ENGINEERING LAB

Course Code: 23CEL204

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

1. To demonstrate the calculation of Atterberg's limits and specific gravity of the soils
2. To demonstrate the calculation of relative density, dry density & moisture contents by core cutter, sand replacement and compaction tests. To perform permeability of soils
3. To demonstrate the grain size and permeability of soils
4. To demonstrate the Optimum Moisture Content and dry density by CBR test and consolidation factors.
5. To demonstrate the shear strength parameters by direct shear, vane shear, tri-axial shear tests.

COURSE OUTCOMES:

On completion of the course, the students will get ability to:

1. Evaluate Atterberg's limits and specific gravity of the soils.
2. Evaluate relative density, dry density & moisture contents by core cutter, sand replacement and compaction tests.
3. Determine the grain size and permeability of soils
4. Determine the Optimum Moisture Content and dry density by CBR test and consolidation factors.
6. Determine shear strength parameters by direct shear, vane shear, tri-axial shear tests.

LIST OF EXPERIMENTS

1. Specific Gravity test on soil
2. Atterberg's Limits
3. Field Density-Core cutter and Sand replacement methods
4. Relative Density of Sand
5. Grain size analysis - Sieve Analysis and Hydrometer analysis
6. Permeability of soil - Constant and Variable head tests
7. Compaction test
8. Consolidation Test
9. CBR test
10. Unconfined Compression test
11. Direct Shear test
12. Vane Shear test
13. Triaxial test

At least **Ten** experiments shall be conducted.

LIST OF EQUIPMENT:

1. Casagrande's liquid limit apparatus.
2. Apparatus for plastic and shrinkage limits
3. Field density apparatus for

a) Core cutter method

b) Sand replacement method

4. Set of sieves: 4.75mm, 2mm, 1mm, 0.6mm, 0.42mm, 0.3mm, 0.15mm, and 0.075mm.
5. Hydrometer

6. Permeability apparatus for
    Constant head test
    Variable head test
7. Universal auto compactor for I.S light and heavy compaction tests
8. Oedometer Test

Reference

AR-18 Lab Manual of AITAM.

DESIGN THINKING

(Common to all B.Tech Branches)

Subject Code: 23BHT208

L	T	P	C
1	0	2	2

Course Objectives:

1. Understand the significance of Design Thinking in engineering disciplines and develop empathy-building skills.
2. Explore various ideation techniques to generate innovative design solutions.
3. Learn to incorporate user feedback into design iterations for continuous improvement.
4. Apply Design Thinking principles to real-world engineering problems.
5. Collaborate in teams to solve complex engineering problems using Design Thinking principles.

Course Outcomes:

1. Students will be able to explain the importance of Design Thinking in engineering contexts and use empathy-building techniques
2. Students will be able to generate a diverse range of design ideas using creative ideation techniques.
3. Students will demonstrate the ability to iteratively refine design solutions based on user feedback.
4. Students will be able to apply Design Thinking methodologies to solve engineering challenges effectively.
5. Students will effectively collaborate in teams to develop innovative solutions to engineering challenges during workshop activities.

Unit 1: Introduction to Design Thinking

Entrepreneurship Challenges and prospects, Design Thinking- definition and Importance, Core principles of Design Thinking, Techniques for empathy building, User research methods,

Unit 2: Ideate and Prototype

Creative ideation techniques (Brainstorming, Mind Mapping, SCAMPER, etc.), Prototyping fundamentals and materials, Rapid Prototyping Methods, Iterative Design Processes

Unit 3: Test and Iterate

User testing principles and methodologies, Iterative design cycles, Evaluation criteria for design solutions

Unit 4: Design Thinking in Engineering Applications

Case studies of Design Thinking in engineering projects, Applying Design Thinking to product design, process improvement, and problem-solving, Challenges and opportunities in integrating Design Thinking into engineering practice

Unit 5: Workshop: Application of Design Thinking

Hands-on workshop sessions to practice empathy building, ideation, prototyping, and iteration, Presentation of workshop outcomes and reflections on the Design Thinking process

Reference:

1. Lockwood, T. (2010). *Design Thinking: Integrating Innovation, Customer Experience, and Brand Value*. Allworth Press.
2. Brown, T. (2009). *Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation*. HarperBusiness.
3. Norman, D. (2013). *The Design of Everyday Things* (Revised and Expanded Edition). Basic Books.
4. Knapp, J., Zeratsky, J., &Kowitz, B. (2016). *Sprint: How to Solve Big Problems and Test New Ideas in Just Five Days*. Simon & Schuster.
5. Cross, B. (2018). *Design Thinking for Engineers and Technologists.* Wiley.
6. Kumar, V. (2012). 101 *Design Methods: A Structured Approach for Driving Innovation in Your Organization.* Wiley.
7. Kelley, T., & Kelley, D. (2013). *Creative Confidence: Unleashing the Creative Potential Within Us All.* Crown Business.
8. Mootee, I. (2013). *Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School*. Wiley.
9. Ries, E. (2011). *The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses*. Crown Business.
10. Polaine, A., Løvlie, L., & Reason, B. (2013). *Service Design: From Insight to Implementation.* Rosenfeld Media.

MANAGERIAL ECONOMICS AND MANAGEMENT SCIENCE

(Common to all Branches)

Course Code: 23BHT314

L	T	P	C
3	0	0	3

Course Objectives:

1. To understand Managerial Economics, Law of demand, Elasticity of demand and Demand forecasting techniques
2. To understand theory of production cost analysis and its application in business
3. To understand market structure different types of competition and pricing strategies
4. To understand Principles of management. Leadership styles and social responsibility of an organization
5. To understand the concept of marketing and human resources management.

Course Outcomes:

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

1. Recognize managerial Economics skills to the solution of engineering problems\
2. Explain the cost and production theories in engineering problems
3. Explore and develop the management qualities
4. Enhance the problem solving skills in various business areas
5. Evaluate the future threats and application theories.

Unit- I

Introduction to Managerial Economics: Definition, Nature and Scope of Managerial Economics, Demand Analysis: Demand Determinants, Law of Demand and its Exceptions, Elasticity of Demand, Demand Forecasting, Significance of Demand Forecasting, Factors Governing Demand Forecasting. Demand Forecasting for Established and new Product.

Unit-II

Theory of Production and Cost Analysis: Production Function in Isoquants and Iso-costs, MRTS, least cost Combination of Inputs, Production Function Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost Concepts, Opportunity cost, Fixed &Variable costs explicit costs &Implicit costs, out of pocket costs & Book costs, Break-Even Analysis (BEA), Determination of Break-Even Point, Managerial Significance and Limitations of BEA.

Unit-III

Introduction to Markets and Pricing Strategies: Market Structure, Types of competition, Features of Perfect competition, Monopoly and Monopolistic Competition, Price-Output Determination in Case of Perfect Competition and Monopoly, Concept of Pricing Strategies.

Unit-IV

Introduction to Management: Concept of Management and Organization: Nature, Importance and Functions of Management, Taylor ‘s Scientific Management Theory, Fayal ‘s Principles of Management, Mayo ‘s Hawthorne Experiments, Maslow ‘s Theory of Human Needs, Douglas McGregor ‘s Theory X and Y, Hertzberg ‘s Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Business.

Unit-V

Introduction to Marketing and Human Resources Management (HRM): Functions of Marketing, Marketing Mix, Marketing Strategies based on Product Lifecycle, Channels of Distribution. Human Resources Management (HRM): Concept of HRM, HRD and Personnel Management and Industrial Relations (PMIR), HRM vs. PMIR, Basic Functions of HR Manager; Manpower Planning, Recruitment, Selection, Training and Development, Placement, Wage and Salary Administration, Promotion, Transfer, Separation, Performance Appraisal, Grievance Handling and Welfare Administration, Job Evaluation and Merit Rating

.**Text Books:**

1. Varshney, S., & Maheswari, S. (2014). Managerial Economics. Sultan and Chand Publishers.

2. Das & Saibabu, N. (2024). Business Economics. Digital Publishing House.

3. Ramaswamy, T. (2017). Principles of Management. Himalaya Publishing House.

4. Rao, P. S. (2015). Personnel and Human Resource Management: Text and Cases (5th ed.). Himalaya Publishing House.

5. Kotler, P., & Keller, K. L. (2014). Marketing Management (15th ed.). PHI Learning Private Limited.

6. Nageswararao, S. B. (2021). Marketing Management. Walnet Publication.

Reference Books:

1. Dwivedi, V. (2021). *Managerial economics* (9th ed.). Vikas Publications.

2. Koontz, H., Weihrich, H., & Aryasri, M. (2015). *Principles of management* (10th ed.). Tata McGraw Hill.

3. Panda, T. K. (2009). *Marketing management: Texts and cases* (3rd ed.). Excel Books.

4. Saxena, R. (2009). *Marketing management* (6th ed.). Tata McGraw Hill.

5. Aswathappa, K. (2012). *Human resource management* (2nd ed.). McGraw Hill.

6. Flippo, E. B. (2008). *Personnel management* (6th ed.). McGraw Hill.

BASIC DESIGN OF REINFORCED CONCRETE STRUCTURES

Course Code: 23CET309

L	T	P	C
3	0	0	3

Course Objectives:
The objective of the course is to

- Explain the basics concepts of limit state method (LSM) design.
- Explain the analysis of T-beam and doubly reinforced section for flexure and reinforcement for shear and torsion.
- Explain the different types of simply supported slabs by limit state method.
- Explain the short and long columns by limit state method.
- Explain the different types of isolated footings by limit state method.

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

1. Illustrate the concepts of limit state method design.
2. Design of T-beam and doubly reinforced section for flexure and reinforcement for shear and torsion
3. Design different types of simply supported slabs by limit state method.
4. Design short and long columns by limit state method.
5. Design different types of isolated footings by limit state method.

UNIT-I
Introduction of Limit State method Design (LSM): Working Stress Method (WSM) (concepts). Limit state design statistical principles- characteristic loads – characteristic strength – partial load and safety factors – representative stress-strain curves for cold worked deformed bars and mild steel bars. Based on IS Code: 456-2000. Comparison of the Limit state method with working stress and ultimate load method. Assumptions in limit state design – stress–block parameters.
Analysis of singly reinforced beams by the LSM method. Under- and over-reinforced sections. Calculation of the area of required steel.

UNIT-II
Design for Flexure: Limiting moment of Resistance of doubly reinforced rectangular beams and T-beam sections with examples.

Shear, Torsion and Bond: Limit state analysis and design of section for shear and torsion – concept of bond, anchorage and development length, I.S. code provisions.

UNIT – III
Slabs: Classification, design, and detailing of one-way slabs, two-way slabs, and continuous one-way slabs using IS code Coefficients (conventional)—all concerning simply supported only.

UNIT-IV
Design of Compression Members: Slenderness ratio, effective length of a column, design of short - under axial loads, uniaxial and biaxial bending (Use of SP 16), Design of slender column, P-M interaction (Only for Demonstration) – I S Code provisions.

UNIT-V

Footings: types of footings. Distribution of base pressure. General Design considerations for footings. Design of Isolated rectangular, square and combined rectangular footing.

NOTE: All the designs to be taught in Limit State Method (IS456-2000)

Text Books:

1. Design of Reinforced Concrete Structures by N. KrishnaRaju, CBS Publication, 4th Edition, 2019
2. Reinforced concrete design by S.Unnikrishnan Pillai & Devdas Menon, Tata Mc.GrawHill, New Delhi, 2016.

References:

1. Reinforced Concrete Structures by Park and Pauley, John Wiley and Sons, 1975.
2. Limit state designed of reinforced concrete – P.C.Varghese, Printice Hall of India, New Delhi, 2019.
3. Fundamentals of Reinforced concrete design by M.L. Gambhir,Printice Hall of India Private Ltd., New Delhi, 2020.

TRANSPORTATION ENGINEERING - I

Course Code:23CET310

L	T	P	C
3	0	0	3

COURSEOBJECTIVES:

The objective of the course is to

1. Explain the importance of highway development and different road classifications
2. Explain the Geometric design elements of the highway.
3. Explain the highway materials used in highway construction.
4. Explain the basic parameters of traffic, parking studies, road accident analysis and identifying grade and grade separated intersections.
5. Explain about Highway Capacity, parking studies, road accidents.

COURSE OUTCOMES:

On completion of the course, the students able to:

1. Understand the importance of highway development and different road classifications.
2. Evaluate the Geometric design elements of the highway.
3. Illustrate about highway materials used in highway construction.
4. Analyze basic parameters of traffic, parking studies, road accident analysis and identifying grade and grade separated intersections
5. Analyze Highway Capacity, parking studies, road accidents.

UNIT I :

Highway development and planning: Invention of wheel - Different modes of transportation, role of highway transportation in India, Necessity for Highway Planning - Different Road Development Plans -Classification of Roads, Road Network Patterns.

Highway Alignment: Alignment - Factors controlling Alignment, Engineering Surveys for Highways - Drawings and Reports.

UNIT II :

Geometric design: Importance of Geometric Design, Highway Cross Section Elements – Pavement Surface Characteristics, Sight Distance - Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance.

Design of Horizontal Alignment - Design of Super elevation and Extra widening, Design of Transition Curves, Design of Vertical Alignment, Grade Compensation.

UNIT III :

Highway materials: Soil, Aggregate, Bitumen and Tar, Tests on construction materials- Differentiation between Tar and Bitumen- Bituminous Concrete, requirements of Design Mix - Marshalls Method of Bituminous Mix design.

Highway Construction: Construction of Roads -Earthen roads, W.B.M. Roads, Bituminous Roads - distresses; Cement Concrete roads -Tie bars and Dowel bars, distresses. Highway Maintenance.

UNIT IV:

Traffic engineering: Elements of Traffic Engineering - Vehicle & Road User Characteristics, Accessibility & Mobility concept, Traffic Volume studies & methods, Speed Studies – Time Mean Speed, Space Mean Speed, Travel time and Delay studies, Origin - Destination studies.

UNIT V:

Highway capacity: Highway capacity and level of service (LOS) - capacity of urban and rural roads, PCU concept and its limitations.

Parking: Parking Studies – Problems of parking, types of parking facilities – on street & off street, Accidents -Causes and Mitigative measures- Accident Data Recording – Condition Diagram and Collision Diagrams

TEXTBOOKS:

1.S.K.Khanna, C.E.G.Justo& A. Veeraragavan “Highway Engineering”, Nemchand& Bros., 10th Edition, 2017.

2. Dr.L.R.Kadiyali and Lal “ Traffic Engineering & Transport Planning” Khanna Publications, 7th Edition, 2012.

REFERENCES:

1. S.P.Bindra, “Highway Engineering” Dhanpat Rai & Sons. – 4th Edition (1981)

2. ITE Hand Book, Highway Engineering Hand Book, Mc Graw - Hill

3. Indian Road Congress, Ministry of Road Transport and Highways, and Special Publications

4. V.N.Vazirani and S.P.Chandra, “Transportation Engineering- Vol. I”, Khanna Publications, 4th Edition, 1994.

IRRIGATION AND WATER RESOURCES ENGINEERING

Subject Code: 23CET311

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

Students will have

1. To provide an understanding of the hydrologic cycle, precipitation characteristics, and abstractions from precipitation for effective water resource management.
2. To study the hydrographs and their components for analyzing runoff and rainfall relationships in hydrology.
3. To understand groundwater dynamics, aquifer properties, and well hydraulics for sustainable groundwater management.
4. To impart knowledge on irrigation fundamentals, water distribution techniques, crop water requirements, and management of issues like water logging.
5. To understand the principles of canal design, river training methods, and cross-drainage systems for efficient water conveyance and flood management.

COURSE OUTCOMES:

Students will get ability

1. To analyze precipitation data, estimate abstractions like evaporation and infiltration, and apply hydrological principles in engineering applications.
2. To construct and interpret hydrographs, apply unit hydrograph theory, and assess runoff characteristics for effective water resource planning.
3. To analyze aquifer characteristics, evaluate well hydraulics, and perform aquifer tests for groundwater resource assessment.
4. To evaluate irrigation methods, calculate crop water needs, and propose solutions for efficient water management and prevention of water logging.
5. To design irrigation canals, recommend river training methods, and select suitable cross-drainage structures for integrated water resource management.

UNIT – I

Introduction- Hydrologic Cycle, Water-Budget Equation, World Water Balance, Applications in Engineering. Precipitation- Forms of Precipitation, Measurement of Precipitation, Rain Gauge Network, Mean Precipitation over an Area, Depth-Area-Duration Relationships, Maximum Intensity/ Depth- Duration-Frequency Relationship, Probable Maximum Precipitation (PMP).

Abstractions from Precipitation- Evaporation Process, Evaporimeters, Analytical Methods of Evaporation Estimation, Reservoir Evaporation and Methods for its Reduction, Interception, Depression Storage, Infiltration, Infiltration Capacity, Measurement of Infiltration, Classification of Infiltration Capacities, Infiltration Indices.

UNIT – II

Hydrograph: Hydrograph, Factors affecting Runoff Hydrograph, Components of Hydrograph, Base Flow Separation, Effective Rainfall, Unit Hydrograph, S-Hydrograph, IUH.

UNIT – III

Groundwater and Well Hydrology- Forms of Subsurface Water, Saturated Formation, Aquifer Properties, Geologic Formations of Aquifers, Well Hydraulics: Steady State Flow in Wells, Equilibrium Equations for Confined and Unconfined Aquifers, Aquifer Tests.

UNIT – IV

Fundamentals of Irrigation and Water Management – Necessity, Advantages and Disadvantages Of Irrigation, Types of Irrigation, Techniques of Water Distribution in Firms: Free Flooding, Boarder Flooding, Check Flooding, Basin Flooding, Furrow Irrigation Method, Sprinkler Irrigation Method and Drip Irrigation Method, Water Requirement of Crops, Duty and Delta, Soil-Moisture Irrigation Relationship, Infiltration, Consumptive Use, Estimation of Evapo-Transpiration, Water Logging: Causes, Effects and Remedial Measures.

UNIT – V

Canal Design, River Training, and Cross-Drainage Systems: Classification of Canals, Alignment of Canals: Watershed Canal and Contour Canal, Losses of Water in Canal, Kennedy's Theory, Lacey's Theory, Cross Section of an Irrigation Canal, Lining of Irrigation Canals: Advantages of Lining, Types of Lining, Design of Lined Canals. Classification of Rivers, River Training and its Objectives, Classification of River Training Works, Methods for River Training, Necessity of Cross Drainage Work, Types of Cross Drainage Works.

Text Books:

1. Engineering Hydrology, K Subramanya, Mc-Graw Hill., 5th Edition, 2020.
2. Irrigation Engineering and Hydraulic Structures, S.K. Garg, Khanna Publishers, 28th Edition, 2017.

Reference Books:

1. Irrigation and Water Resources & Water Power, P.N.Modi, Standard Book House, 11th Edition, 2019.
2. Irrigation and Water Power Engineering, B.C. Punmia, Pande B.B. Lal, Ashok Kumar Jain

ADVANCED STRUCTURAL ANALYSIS

(Professional Elective– I)

L	T	P	C
3	0	0	3

Course Code: 23CEE311

Course Objectives:

The objective of the course is

- To study slope deflection methods.
- To study moment distribution method
- To learn problems on continuous beams and single bay portal frames by Kani's method.
- To study stiffness method applied to continuous beams.
- To study flexibility method applied to continuous beams portal frames

.Course Outcomes:

Students will get ability to:

1. Analyze the moments of the members by slope deflection methods.
2. Analyze the moments of the members by distribution method
3. Analyze problems on continuous beams and single bay portal frames by Kani's method.
4. Analyze continuous beams by stiffness method
5. Analyze continuous beams and portal frames by flexibility method

UNIT – I

Slope deflection method: Assumptions in slope deflection method -application to the analysis of statically indeterminate beams with and without settlement of supports – rigid jointed plane frames with and without side sway.

UNIT – II

Moment Distribution method – Stiffness and carry over factors – Distribution factors – Analysis of continuous beams with and without sinking of supports – story portal frames – including Sway.

UNIT – III

Kani's method- Analysis of continuous beams – including without sinking and with sinking- analysis of single bay portal frames with and without sway.

UNIT – IV

Stiffness Method-Introduction- Analysis of continuous beams- portal frame non sway analysis. (Maximum of two unknowns). Simple space structures.

UNIT – V

Flexibility Method-Introduction- Analysis of continuous beams- Simple rigid frame non sway analysis. (Maximum of two unknowns).

TEXT BOOKS:

1. Structural Analysis by C.S. Reddy, Tata McGraw-Hill, New Delhi, 3rd edition 2010.
2. Structural Analysis (Matrix Approach) by Pundit and Gupta – Tata Mc.Graw Hill publishers, 2nd edition, 2008.

REFERENCES:

1. Theory of Structures by S.P. Timoshenko and D. H. Young, Tata Mc.Graw Hill publishers 2002.
2. Analysis of structures by Vazrani&Ratwani – Khanna Publications, 1994.
3. Structural analysis by T.S ThandavaMoorthy, Oxford University Press, 2011.

ADVANCED SURVEYING

(Professional Elective– I)

Subject Code: 23CEE312

L	T	P	C
3	0	0	3

Course Objectives:

1. To explain the Total Station equipment, working and conduct of surveying
2. To explain modern surveying techniques in a variety of civil engineering disciplines
3. To explain photogrammetric interpretation
4. To explain the remote sensing satellite data Interpretation techniques
5. To explain the surveying methods with GPS

Course Outcomes:

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

1. Comprehend Total Station equipment, working and conduct of surveying
2. Apply modern surveying techniques in a variety of civil engineering disciplines
3. Synthesize photogrammetric interpretation
4. Interpret remote sensing satellite data
5. Synthesize the surveying methods with GPS.

UNIT I -Fundamentals of Total Station and Electromagnetic Waves: Methods of Measuring Distance, Basic Principles of Total Station, Historical Development, Classifications, applications and comparison with conventional surveying. Classification - applications of Electromagnetic waves, Propagation properties, wave propagation at lower and higher frequencies- Refractive index (RI) - factors affecting RI-Computation of group for light and near infrared waves at standard and ambient conditions-Computation of RI for microwaves at ambient condition - Reference refractive index- Real time application of first velocity correction. Measurement of atmospheric parameters- Mean refractive index- Second velocity correction -Total atmospheric correction- Use of temperature - pressure transducers.

UNIT-II- Electromagnetic distance measurement (EDM) – Principle of EDM Carrier waves – Types of EDM instruments – Distomat – Total Station – Principle – procedure & surveying using Total Station – precise leveling - micro-optic theodolite.

UNIT-III- Photogrammetry – Terrestrial and Aerial Photogrammetry – Horizontal position of a point from photographic measurement – elevation of a point – Determination of focal length of camera - Geometry and scale of vertical photographs – Ground co-ordinates from vertical photographs - Relief displacement – Planimetric mapping from vertical photos – Stereoscopy– Photo interpretation.

UNIT-IV-Remote sensing – concepts – Idealized remote sensing system – characteristics – Types of remote sensing system – Remote sensing from space – Data interpretation – application of remote sensing – LIDAR – RADAR.

UNIT-V-GPS Basics – system overview – working principle of GPS – Satellite ranging – calculating position – Ranging errors and its correction – GPS surveying Methods – static, Rapid static, DGPS and Kinematic methods – Real time and post processing DGPS – visibility diagram – GAGAN.

Textbooks:

1. Punmia, B.C. Surveying Vol.III, Standard Publishers, 2005.
2. Duggal, S.K. Surveying Vol. II, Tata McGraw Hill, 2004

References :

1. R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.
2. Satheesh Gopi. Advanced Surveying, Pearson Education, 2007.
3. Alfred Leick, GPS satellite surveying, John Wiley & Sons Inc., 3rd Edition, 2004.
3. Guocheng Xu, GPS Theory, Algorithms and Applications, Springer - Verlag, Berlin, 2003.
4. Seeber G, Satellite Geodesy, Walter De Gruyter, Berlin, 1998
5. Arora, K. R. Surveying Vol. III, Standard Book House, 1996.

ADVANCED SOLID MECHANICS

(Professional Elective– I)

COURSE CODE: 23CEE313

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1: To explain Elasticity, Displacement, stress and strain fields, components of stress and strain, Equations of elasticity.
2: To explain stress strain concepts.
3: To explain equations of equilibrium for different boundary conditions.
4: To explain two dimensional problems of elasticity.
5: To explain two dimensional problems of plasticity.

COURSE OUTCOMES:

After successful completion of this course, students will be able to

CO 1: Evaluate Elasticity, Displacement, stress and strain fields, components of stress and strain, Equations of elasticity.
CO 2: Analyze stress strain concepts.
CO 3: Evaluate equations of equilibrium for different boundary conditions.
CO 4: Analyze two dimensional problems of elasticity.
CO 5: Analyze two dimensional problems of plasticity.

UNIT-I

Introduction to Elasticity – Notation for Forces and Stresses – Components of Stresses – Components of Strain, Stress – Strain Fields, Displacements, Cartesian Tensors and Equations of Elasticity.

UNIT-II

Stress – Strain Fields – Elementary Concept of Stress and Strain, Principle Stress, Strain and Principle Axes, Compatibility Conditions, Stress at a Point, Strain at a point, Stress components on an Arbitrary Plane, Differential Equations of Equilibrium.

UNIT-III

Equations of Elasticity – Equations of Equilibrium, Stress – Strain Relations, Strain – Displacement Relations and Compatibility relations, Boundary Conditions and boundary value problems and Homogeneous Deformations.

UNIT-IV

Two - Dimensional Problems of Elasticity – Plane Stress and Plane Strain Problems, Airy's Stress Function, Two Dimensional Problems in Rectangular and Polar Coordinates.

UNIT-V

Plastic Deformation – Theory of plasticity – concepts and assumption - yield criterions, Strain hardening, Idealized Stress – Strain Curve, Plastic Stress – Strain relations, Principle of Normality and Plastic Potential.

TEXT BOOKS:

1. Theory of Elasticity – Sadhu Singh, Khanna Publishers, 2003.
2. Advance Mechanics of Solids – L S Srinath., McGraw Hill, 3rd Edition, 2000.
3. Theory of Elasticity- Timoshenko S & Goodier J.N., McGraw Hill,3rd Edition,2010.

REFERENCES:

1. Theory of Elasticity and Plasticity – H. Jane Helena., PHI Learning private Limited,2017.
2. Theory of Elasticity and Plasticity – E.M.Lifshitz, A.M.Kosevich, L.P.Pitaevskii., Science Direct, 3rd Edition,1986.

PROFESSIONAL COMMUNICATION SKILLS LAB

EEE, ECE, ME, CE — III B.Tech. SEM-I
CSE, IT, CSM, CSD — III B.Tech. SEM-II

Subject Code: 23BHL305

L	T	P	C
0	0	3	1.5

Course Objectives

1. Equip students with a diverse vocabulary to excel in language tests for academic and professional pursuits.
2. Enhance active listening, comprehension, and recall by engaging with various audio materials and practicing structured retelling exercises.
3. Cultivate effective writing techniques through structured essay composition, refine email communication skills, and develop the ability to assess personality.
4. Improve presentation skills through professional slides and to develop negotiation and collaboration skills in group settings.
5. Prepare students with tailored resume-building skills for specific job roles and the confidence to perform well injobinterviews.

Course Outcomes

1. Students will be able to use synonyms, antonyms, analogies, idioms, phrases, one-word substitutes, word roots, prefixes and suffixes appropriately
2. Students will enhance their auditory processing skills, including active listening, comprehension, and recall, through exposure to varied audio content and targeted retelling exercises.
3. Students will cultivate effective writing techniques through practice structured essay composition, refine their email communication skills, and acquire a practical understanding of personality traits through personality assessments.
4. Students will refine their presentation skills by creating professional-grade slides and cultivate effective negotiation and collaboration strategies in team-based activities.
5. Students will develop job-specific resume-building skills and buildconfidence to perform well in interviews.

Course Syllabus

The modules comprise a combination of mandatory and optional activities.
Lab Module 1: Vocabulary

Activities:

- Online vocabulary development activities, including quizzes and vocabulary-building exercises.
- Language assessment exercises, comprising word classification exercises and Word Association Test (WAT).

Lab Module 2: Effective Listening Comprehension and Retelling Stories

Activities:

- Engagein activities such as listening to podcasts and TED talks, followed by answering comprehension questions
- Listen to short stories, read articles, and retell themfollowed by peer evaluation using rubrics designed for the purpose.

Lab Module 3: Effective Written Communication

Activities:

- Composeessays on given topics, improving grammar and sentence structure through writing exercises, and practicing time-bound essay writing.
- Understand the importance of email etiquette and compose emails for different occasions, such as job inquiries, follow-ups, and professional correspondence.
- Engagein activities like career-related self-assessment, and Thematic Association Test
- Picture perception and description test (optional)

Lab Module 4: Developing PowerPoint Presentation and Group DiscussionStrategies
Activities:

- Prepare and deliver PowerPoint presentations on current topics, followed by peer and teacher feedbackon content, design, and delivery
- Participate in formal group discussions on current topics, followed by peer and teacher feedback on group behavior and decision-making.

Lab Module 5: ResuméWriting and Preparation for Interviews

Activities:

- Learn to draft a resumé.
- Participate in one-on-one mock interviews, both in-person and virtual, followed by feedback on body language and response structure
- Role-play as interviewer and interviewee (optional)

References:

Advanced Communication Skills Lab. Version 1.0 (Software). K-VAN Solutions Pvt. Ltd.
Communication Skills. Sanjay Kumar and Pushpa Lata. Oxford University Press. 2018.
Speak Well. K. Nirupa Rani. Orient Blackswan, Hyderabad. 2012.
Strengthen Your Communication Skills. M. Hari Prasad. Maruthi Publications, Hyd. 2014.
Strengthen Your Steps. M. Hari Prasad. Maruthi Publications, Hyderabad. 2012.
Technical Communication. Meenakshi and Sangeetha. OUP. New Delhi. 2013
uolingo Language Learning Application
*Instacks*E Learning Platform for LSRW practice
https://www.cambridgeenglish.org/learning-english/activities-for-learners/

CONCRETE TESTING LAB

Course Code: 23CEL305

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

Students will have

- To tests on cement which include determination of fineness of cement, specific gravity of cement, normal consistency of cement, soundness of cement, compressive strength of cement
- To tests on aggregate which include determination of fineness modulus of fine and course aggregate, bulk density of fine and course aggregate, Specific Gravity of Fine and coarse aggregate, bulking of sand
- To tests on fresh concrete which include determination of workability of concrete by slump cone test, compaction factor test and vee-bee consistometer test.
- To tests on hardened concrete which include, determination of compressive Strength of concrete cube and concrete cylinder, determination of split tensile strength of concrete cylinder.
- To demonstrate the non-destructive testing of concrete (rebound hammer),

COURSE OUTCOMES:

After completion of this course students will be able to

1. Determine Compressive Strength and physical properties of cement viz. fineness, Specific Gravity, Normal Consistency, Initial and Final Setting time, Soundness .
2. Determine physical properties of aggregates viz.Fineness Modulus, Bulk Density, Specific Gravity, Bulking of Sand and Water absorption.
3. Determine Workability of fresh Concrete by Slump Cone, Compaction factor, Vee-bee Consistometer and Flow table test
4. Determine Compressive Strength of concrete cube &cylinder &Split tensile strength of Concrete cylinder
5. Demonstrate Rebound hammer test.

LIST OF EXPERIMENTS

TESTS ON CEMENT

1. (a) Determination of Fineness of Cement.

   (b) Determination of Specific Gravity of Cement by Lechatlier Flask.

2. (a) Determination of Normal Consistency of Cement.

   (b) Determination of Initial and Final Setting time of Cement.

3. (a) Determination of Soundness of Cement.

   (b) Determination of Compressive Strength of Cement.

TESTS ON AGGREGATE

4. (a) Determination of Fineness Modulus of Fine Aggregate
   (b) Determination of Fineness Modulus of Coarse Aggregate.
5. (a) Determination of Bulk Density of Fine aggregate.
   (b) Determination of Bulk density of Coarse aggregate.
6. (a) Determination of Specific Gravity of Fine aggregate.
   (b) Determination of Specific Gravity of Coarse Aggregate.
7. Determination of Bulking of Sand.

TESTS ON FRESH CONCRETE

8. (a) Determination of Workability of Concrete by Slump Cone test.
   (b) Determination of Workability of Concrete by Compaction Factor test.
   (c) Determination of Workability of Concrete by Vee-bee Consistometer test.

TESTS ON HARDENED CONCRETE

9. (a) Determination of Compressive Strength of Concrete cube.
   (b) Determination of Compressive Strength of Concrete cylinder.
10. Determination of Split tensile strength of Concrete cylinder.

BUILDING MATERIALS

1. Compressive strength of bricks, and Water absorption of bricks.

DEMONSTRATION

1. Non-destructive testing of Concrete (Rebound hammer).

TRANSPORTATION ENGINEERING LAB

Subject Code: 23CEL306

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:
Students will have

1. To perform the coarse aggregate crushing value impact coefficient, specific gravity and water absorption.
2. To perform attrition, abrasion and shape tests on aggregates.
3. To perform viscosity and ductility test on bitumen materials.
4. To perform flash and fire point and penetration tests.
5. To perform Marshal stability test and stripping test.

COURSE OUTCOMES:

Students will get ability to:

1. Demonstrate coarse aggregate crushing value impact coefficient, specific gravity and water absorption.
2. Demonstrate attrition, abrasion and shape tests on aggregates.
3. Demonstrate viscosity and ductility test on bitumen materials.
4. Evaluate flash and fire point and penetration tests.
5. Demonstrate Marshal stability test and stripping test.

LIST OF EXPERIMENTS:

A) TESTS ON ROAD AGGREGATES:

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

B) TESTS ON BITUMINOUS MATERIALS:

1. Viscosity Test.
2. Ductility Test.
3. Softening Point Test.
4. Flash and fire point tests.
5. Penetration test

C) TESTS ON BITUMINOUS CONCRETE

1. Marshal Stability test
2. Stripping test

COMPETITIVE PROGRAMMING LAB – II

(Common to ECE, EEE, MECH and CIVIL)

Subject Code: 23ESL311

L	T	P	C
0	0	3	1.5

Course Objectives:

- Understanding importance of Mathematics and Problem solving approaches for Programming
- Understanding importance of optimized solution for problem solving

Course Outcomes:

After completion of the course, the students will be able to

1. Analyze the problem using Mathematics
2. Select appropriate Sorting /Searching technique to solve the Problem
3. Develop solutions using stack and queue
4. Develop solutions using Non-Linear Data Structures
5. Develop Solution to problems using Dynamic Programming.

Lab Module – I

Number Theory

Class Test:	https://www.geeksforgeeks.org/batch/cp-mathematics/track/cp-mathprimeFactorization/problem/class-test
Largest prime factor:	https://www.geeksforgeeks.org/problems/largest-prime-factor2601/1
Integer to Roman:	https://leetcode.com/problems/integer-to-roman/description/
Total Chocolates II:	https://www.geeksforgeeks.org/batch/cp-mathematics/track/cp-math-primeFactorization/problem/total-chocolates-ii
Count Primes:	https://leetcode.com/problems/count-primes/description/
Make them Co-prime:	https://www.geeksforgeeks.org/batch/cp-mathematics/track/cp-math-primeFactorization/problem/make-them-co-prime

Lab Module – II

Number Theory

Number of 1 Bits:	https://www.geeksforgeeks.org/problems/set-bits0143/1
Bit Difference:	https://www.geeksforgeeks.org/problems/bit-difference-1587115620/1
Power of 2:	https://www.geeksforgeeks.org/problems/power-of-2-1587115620/1
Find position of set bit:	https://www.geeksforgeeks.org/problems/find-position-of-set-bit3706/1
Missing Number:	https://leetcode.com/problems/missing-number/description/
Non Repeating Numbers:	https://www.geeksforgeeks.org/problems/finding-the-numbers0215/1

Lab Module – III

Searching: Linear and Binary Search

Find First and Last Position of Element in Sorted Array:	https://leetcode.com/problems/find-first-and-last-position-of-element-in-sorted-array/description/
Search in Rotated Sorted Array:	https://leetcode.com/problems/search-in-rotated-sorted-array/description/
Find Peak Element:	https://leetcode.com/problems/find-peak-element/description/
Single Element in a Sorted Array:	https://leetcode.com/problems/single-element-in-a-sorted-array/description/
Search a 2D Matrix:	https://leetcode.com/problems/search-a-2d-matrix/description/
Capacity to Ship Packages Within D Days:	https://leetcode.com/problems/capacity-to-ship-packages-within-d-days/description/

Lab Module – IV

Sorting: Bubble Sort, insertion Sort, Quick Sort, Merge Sort, Counting Sort

Minimum Moves to Equal Array Elements:	https://leetcode.com/problems/minimum-moves-to-equal-array-elements/description/
Minimum Absolute Difference:	https://leetcode.com/problems/minimum-absolute-difference/description/
Sort Array By Parity:	https://leetcode.com/problems/sort-array-by-parity/description/
Max Chunks To Make Sorted:	https://leetcode.com/problems/max-chunks-to-make-sorted/description/
K^{th} Largest Element in an Array:	https://leetcode.com/problems/kth-largest-element-in-an-array/description/
Boats to Save People:	https://leetcode.com/problems/boats-to-save-people/description/?envType=problem-list-v2&envId=sorting

Lab Module – V

Recursion and Backtracking

Subsets	https://leetcode.com/problems/subsets/description/
Permutations	https://leetcode.com/problems/permutations/description/
Permutations II	https://leetcode.com/problems/permutations-ii/description/
Subsets II	https://leetcode.com/problems/subsets-ii/description/
Palindrome Partitioning	https://leetcode.com/problems/palindrome-partitioning/description/
N-Queens	https://leetcode.com/problems/n-queens/description/

Lab Module – VI

Linked List part1: Singly Liked List, Doubly Linked List, Circular Linked List

Middle of the Linked List	https://leetcode.com/problems/middle-of-the-linked-list/description/

Delete Node in a Linked List	https://leetcode.com/problems/delete-node-in-a-linked-list/description/
Reverse Linked List:	https://leetcode.com/problems/reverse-linked-list/description/
Convert Binary Number in a Linked List to Integer:	https://leetcode.com/problems/convert-binary-number-in-a-linked-list-to-integer/description/
Palindrome Linked List	https://leetcode.com/problems/palindrome-linked-list/description/
Remove Linked List Elements	https://leetcode.com/problems/remove-linked-list-elements/description/

Lab Module – VII

Linked List part2:

Sort List:	https://leetcode.com/problems/sort-list/description/
Remove Duplicates from Sorted List:	https://leetcode.com/problems/remove-duplicates-from-sorted-list/description/
Merge Two Sorted Lists:	https://leetcode.com/problems/merge-two-sorted-lists/description/
Intersection of Two Linked Lists:	https://leetcode.com/problems/intersection-of-two-linked-lists/description/
Linked List Cycle:	https://leetcode.com/problems/linked-list-cycle/description/
Linked List Cycle II:	https://leetcode.com/problems/linked-list-cycle-ii/description/

Lab Module – VIII

Stack & Queue

Evaluate Reverse Polish Notation:	https://leetcode.com/problems/evaluate-reverse-polish-notation/description/
Min Stack:	https://leetcode.com/problems/min-stack/description/
Daily Temperatures:	https://leetcode.com/problems/daily-temperatures/description/
Largest Rectangle in Histogram:	https://leetcode.com/problems/largest-rectangle-in-histogram/description/
Implement Stack using Queues:	https://leetcode.com/problems/implement-stack-using-queues/description/
Implement Queue using Stacks:	https://leetcode.com/problems/implement-queue-using-stacks/description/
Gas Station:	https://leetcode.com/problems/gas-station/description/
Sliding Window Maximum:	https://leetcode.com/problems/sliding-window-maximum/description/

Lab Module – IX

Hashing

Find Common Elements Between Two Arrays	https://leetcode.com/problems/find-common-elements-between-two-arrays/description/
Contains Duplicate	https://leetcode.com/problems/contains-duplicate/description/

Find All Duplicates in an Array	https://leetcode.com/problems/find-all-duplicates-in-an-array/description/
Sort Characters By Frequency	https://leetcode.com/problems/sort-characters-by-frequency/description/
Group Anagrams	https://leetcode.com/problems/group-anagrams/description/
Isomorphic Strings	https://leetcode.com/problems/isomorphic-strings/description/

Lab Module – X

DP: Linear DP,2 Dimensional DP, DP on Grids,

Climbing Stairs:	https://leetcode.com/problems/climbing-stairs/description/
Decode Ways:	https://leetcode.com/problems/decode-ways/description/
House Robber:	https://leetcode.com/problems/house-robber/description/
Partition Equal Subset Sum:	https://leetcode.com/problems/partition-equal-subset-sum/description/
Frog Jump:	https://leetcode.com/problems/frog-jump/description/
Unique Paths:	https://leetcode.com/problems/unique-paths/description/
Minimum Path Sum:	https://leetcode.com/problems/minimum-path-sum/description/
Knapsack 1:	https://atcoder.jp/contests/dp/tasks/dp_d
Longest Increasing Subsequence:	https://leetcode.com/problems/longest-increasing-subsequence/description/
Largest Divisible Subset:	https://leetcode.com/problems/largest-divisible-subset/description/

Lab Module – XI

Tree:

Binary Tree Preorder Traversal:	https://leetcode.com/problems/binary-tree-preorder-traversal/description/
Binary Tree Inorder Traversal	https://leetcode.com/problems/binary-tree-inorder-traversal/description/
Binary Tree Postorder Traversal	https://leetcode.com/problems/binary-tree-postorder-traversal/description/
Maximum Depth of Binary Tree	https://leetcode.com/problems/maximum-depth-of-binary-tree/description/
Diameter of Binary Tree	https://leetcode.com/problems/diameter-of-binary-tree/description/
Binary Tree Right Side View	https://leetcode.com/problems/binary-tree-right-side-view/description/
Path Sum	https://leetcode.com/problems/path-sum/description/

Lab Module – XII

Graph:DFS and BFS on Graphs,Topological Sort,Flood Fill

DFS Traversal:	https://www.naukri.com/code360/problems/dfs-traversal_630462
Find if Path Exists in Graph:	https://leetcode.com/problems/find-if-path-exists-in-graph/description/

Keys and Rooms:	https://leetcode.com/problems/keys-and-rooms/description/
Open the Lock:	https://leetcode.com/problems/open-the-lock/description/
Jump Game III:	https://leetcode.com/problems/jump-game-iii/description/
Course Schedule:	https://leetcode.com/problems/course-schedule/description/

Text Books:

1. T.H. Cormen et.al. – Introduction to Algorithms – PHI, New Delhi, 2005.
2. E. Horowitz. et.al., Fundamentals of computer Algorithms, Universities Press, 2008, 2nd Edition.

Reference Books:

1. G.Brassard & P. Bratley – Fundamentals of Algorithms, PHI, New Delhi, 2005.
2. S.Dasgupta et.al. – Algorithms, TMH, New Delhi – 2007.
3. Silberschatz, Korth :Database System Concepts. McGraw hill,5th Edition.
4. Elmasri, Navrate:Fundamentals of Database Systems. Pearson Education,6th Edition

Reference Links

1. https://leetcode.com/problems/
2. https://nptel.ac.in/courses/106106131/
3. https://www.spoj.com/problems

CONSTITUTION OF INDIA

(Common to all Branches)

Subject Code: 23MCT305

L	T	P	C
2	0	0	0

Objectives:

1. To help Students regulate their behavior in a social environment as Engineering Professionals.
2. To make students aware of the impact of taking social, legal and Administrative decisions about their profession.
3. To understand the political and constitutional parameters in work environment.
4. To understand the need and strengths of our nation and adopt their knowledge for future career.
5. To create awareness about Indian Constitution and its overarching goals.

Course Outcomes:

By the end of this course the student will be able to:

CO 1: Realize the rigidness of our Indian Politics and Administrative aspects.
CO 2: A Student can understand our nation federalism.
CO 3: Can assess different types of risk involved in misadministration.
CO 4: Summarizes the legal and Administrative establishments.
CO 5: A student can infer financial aspects for betterment of the National Building.

Unit – I

INTRODUCTION:

Historical perspective of the constitution of India - Salient features of The Indian Constitution - Amendment Procedure of The Indian Constitution.42nd amendment (Mini Constitution) - 44th amendment (1978 – Janatha Govt.)

Unit – II

IMPORTANT FEATURES OF CONSTITUTION:

Fundamental Rights(Article 12 to 35), Duties (51 A – 1976 emergency) and Directive principles (Article 36 to 51) of State Policy - Articles 14 to 18 - Articles 19 - Article 21

Unit – III

PARLIMENTARY FORM OF GOVT. IN INDIA:

PresidentofIndia-Emergencyprovisions-NationalEmergency–Article352PresidentRules–Article356- Financial Emergency – Article 360Prime Minister and Cabinet - Supreme Court of India (Indian Judiciary)

Unit – IV

INDIAN FEDERALISM:

Union – State relations; - Legislative, Administrative and Financial relations.Local self Govt. – Constitutional Schemes in India (73 & 74 Constitutional amendments)

Unit – V

PARLIMENTARY COMMITTEES:

Public Accounts Committee - Estimates Committee - Committee on Public. Undertakings. - Election commission of India (Article -324) - Comptrollar and Auditor General (CAG) of India (Article – 148 to 150)Finance Commission(Article – 280) - Neethi Aayog(Planning Commission) and – Political Parties.

Text Books:

1) Introduction to Indian Constitution by D.D Basu,Lexis Nexis Butterworth wadhwa Nagapur, 2008.

2)Poicits in India by Rajini Kothari, Orient LongMan,2005.

3)The IndianConstitution by Madhav Khosla by Oxford University Press India, 2012.

DESIGN OF STEEL STRUCTURES

Course Code: 23CET312

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

The objective of the course is to

1. Understand the basics concepts of bolted connections and design of welded connections
2. Design supported, unsupported and plated simply supported beams
3. Understand IS code provisions for designing tension and compression members
4. Understand the design procedure of gantry girder
5. Design welded plate girder

COURSEOUTCOMES:

Students will get ability to

1. Design IS code bolted connections and designs welded connections.
2. Design beams including detailing.
3. Design tension members and compression members including detailing.
4. Design gantry girder including detailing.
5. Design plate girder including detailing.

UNIT– I

Basics of bolted/rivetted connections: Bolted/rivetted connections, Types of bolts, Types of bolted joints, Failure of bolted joints, Strength of bolted joints

Welded connections: Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds. IS Code specifications? Design strength of fillet welds subjected to moment acting in the plane and at right angles to the plane of the joints.

UNIT – II

Beams: Allowable stresses, design requirements as per IS Code-design of laterally supported and unsupported beams. Design of plated beams.

UNIT –III

Tension members: Introduction, Types of tension members, Net sectional Area, Effective net area, Types of failures, Design strength of tension members

Design of Compression members: Introduction, Effective length of columns, Slenderness ratio, Design of compression members, Built-up sections- Design of lacings and battens. Design Principles of Eccentrically loaded columns and splicing of columns.

UNIT–IV

Gantry Girder: Introduction, Loads, Design of Gantry girders, roof elements–Design of Purlin’s

UNIT – V

Plate Girder: Introduction, Elements of plate girder, Design consideration – I S Code recommendations, Design of plate welded plate girder- post-critical method, stiffeners.

NOTE- All Designs should be in LIMIT STATE Method

Text Books:

1. Limit state design of steel structures by S.K. Duggal, Tata Mcgraw Hill, New Delhi, 2nd edition, 2017.
2. Design of Steel Structures by Ramachandra. Vol – 1, Scientific Publishers, 2016.

Reference Books:

1. Comprehensive Design of Steel structures, by B.C. Punmia, Ashok Kumar Jain and Arun Kumar Jain, Laxmi Publications, New Delhi, 2nd edition, 2015.
2. Structural design in steel by SarwarAlamRaz, New Age International Publishers, New Delhi, 2018.
3. Design of Steel Structures by Arya and Azmani, Nem Chand Publisher, 2011.

IS Codes:

1) IS-800 – 2007, 2) IS – 875 – Part I, II & III, and 3) Steel Tables.

*These codes and steel tables are permitted in the examination.

AR-23 B. Tech Civil **III year II Sem.**

QUANTITY SURVEYING AND VALUATION

Subject Code: 23CET313

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To identify standard specifications for detailed estimation of building.
2. To estimate earthwork excavation for roads and canals.
3. To determine the rates of various aspects of buildings.
4. To determine the bar requirement schedules of the various elements of building.
5. To recognize preparation of the tenders and Valuation of buildings.

COURSE OUTCOMES:

After the completion of the course, students will be able to

1. Prepare detailed and abstract estimate of buildings.
2. Compute earthwork excavation for roads and canals.
3. Estimate the cost of the various items of civil works.
4. Estimate reinforcement for bar bending and prepare bar bending schedules.
5. Prepare tenders and Valuation of buildings.

UNIT – I

General items of work in Building: Standard Units, Principles of working out quantities for detailed and abstract estimates - Detailed Estimates of Residential Buildings for load bearing and framed structures.

UNIT – II

Earthwork for roads and canals: Lead and Lift – Types of different methods – Mid Sectional area method – Mean sectional area method – trapezoidal method and Prismoidal method.

UNIT – III

Rate Analysis: Standard specifications for different items of building construction. Working out data for Plain Concrete, Brick Masonry, R.R. Masonry, R.C.C, Plastering, White washing and distempering.

UNIT-IV

Reinforcement bar bending schedule: Footing, Pedestal, Rectangular/square column, plinth beam, slab beam & slab and bar requirement schedules.

UNIT – V

Contracts –Types of contracts- tenders – types of tenders –.BIM - Basics of BIM – Advantages and Dis advantages of BIM – Objects of BIM, Valuation of buildings.

TEXT BOOKS

1. B.N. Dutta (2016), Estimating and Costing, 28th Revised Edition, UBS publishers

2. G.S. Birdie (2014) Estimating and Costing, Sixth edition, Dhanpat Rai Publishing Company Private Limited

REFERENCES:

1. Standard Schedule of rates and standard data book by public works department.

2. I. S. 1200 (Parts I to XXV – 1974/ method of measurement of building and Civil Engineering works.

3. M. Chakraborthi (2010), Estimation, Costing and Specifications, 24th Edition, M.K. Publishers

4. National Building Code, 2016

REFERENCE CODE BOOKS:

1. ISO 19650-1:2018
2. ISO 19650-2:2

HUMAN RESOURCE DEVELOPMENT AND ORGANIZATIONAL BEHAVIOUR

(Open Elective - I)

Subject Code: 23OET311

L	T	P	C
3	0	0	3

Course Objectives:

1. To Gain insights into the fundamental concepts, processes, and significance of HRD.
2. To Learn the importance and methodologies of performance appraisal, both traditional and modern.
3. To Comprehend the principles, concepts, and influencing factors of compensation management.
4. To understand the meaning, scope, challenges, and opportunities in organizational behaviour.
5. To learn theories of motivation and also deals with individual behaviour, their personality and perception of individuals.

Course Outcomes

1. To familiarize the various aspects of HR, to deal effectively with people resourcing and talent management and HR functions in an organization.
2. To understand the concepts of HRD, its role and importance in the success of organization.
3. To develop an understanding towards compensation management and industrial relations. course outcomes
4. To define and explain the basic concepts of organizational behaviour and motivation.
5. To explain the essential concepts of organisational conflicts, resolution of conflicts through negotiation, change management and organisational development.

Unit–I

Human Resource Development

Introduction to Human Resource Development: Concepts - Training and Development - methods of training -Concept and Importance -Assessing Training Needs- Designing and Evaluating T&D Programmes - Role, Responsibilities and challenges to Training Managers

Unit–II

Performance Appraisal

Importance of Performance Appraisal, Traditional and Modern methods of performance appraisal, Job Evaluation - Methods of Job Evaluation.

Unit–III

Compensation Management, Industrial Relations and Emerging HR Practices Compensation – Concepts and Principles, Influencing Factors, Emerging Trends in Compensation – Methods of Payment – Incentives and Rewards, Managing Industrial Relations – Emerging trends and practices in human resource management

Unit-IV

Introduction to Organizational Behavior

Meaning and scope of organizational behavior - Challenges and Opportunities – Foundations of Individual behavior, Motivation - Theories (Maslow, ERG, Douglas McGregor two-factor theory), Group dynamics, Leaderships styles

Unit-V

Organizational Conflict and Change

Organizational Conflict - causes and consequences - conflict and negotiation, Organizational change, change management process, resistance to change, flexibility and crisis management Organizational Development – concept and significance

Text Books

1. Rocco, T. S., Morris, M. L., & Poell, R. F. (Eds.). (2024). The Sage handbook of human resource development. SAGE Publications Ltd.Available at SAGE Publications
2. Bierema, L. L., Callahan, J. L., Elliott, C. J., Greer, T. W., & Collins, J. C. (2023). Human resource development: Critical perspectives and practices. Routledge. Available at Taylor & Francis
3. Noe, R. A., Hollenbeck, J. R., Gerhart, B., & Wright, P. M. (2024). Fundamentals of human resource management. McGraw Hill. Available at McGraw Hill

References

1. K. Aswathappa(2016), Organizational Behaviour, 12th edition, Himalaya
2. Edwin B. Flippo(2013), Personnel Management, TMH, 6th edition
3. Robbins, S. P., & Judge, T. A. (2021). *Organizational behaviour* (18th ed.). Pearson.
4. P. Subba Rao(2014), Management & Organizational Behaviour, 2nd edition, Himalaya
5. C.B. Mamoria& VSP Rao (2015), Personnel Management, Himalaya, 20th edition
6. Stephen P. Robins, Organisational Behaviour, PHI Learning / Pearson Education, 11th edition
7. Rustum S. Davar(2009), Personnel Management & Industrial Relations, Vikas Publishers, 10th edition,
8. K.Venkataratnam(2011), Human Resource Management, Seven hills Book Publications, 1st edition

BUSINESS PLAN AND PRESENTATION FOR ENTREPRENEURS
(Open Elective - I)

Subject Code: 23OET312

L	T	P	C
3	0	0	3

Course Objectives:

1. Understand the essential components of a business plan and how to structure it.
2. Develop a clear and concise elevator pitch for a business idea.
3. Learn to create a persuasive, visually engaging presentation that captures the interest of the audience.
4. Master public speaking and storytelling techniques tailored for business pitches.
5. Gain practical experience through pitching and receiving feedback.

Course Outcomes

Upon completing the course, students will be able to

1. Demonstrate the ability to identify and structure the essential components of a business plan, including problem identification, market analysis, solution development, and financial planning.
2. Develop concise and impactful elevator pitches that effectively communicate business ideas, ensuring clarity, relevance, and engagement.
3. Create visually engaging and persuasive business presentations that utilize appropriate tools, techniques, and strategies to capture audience attention and interest.
4. Master storytelling and public speaking techniques tailored to business contexts, effectively using tone, pace, and gestures to enhance communication.
5. Gain hands-on experience in delivering business pitches, integrating feedback to refine ideas and improve presentation skills for real-world application.

Unit 1: Introduction to Business Planning and Audience Analysis: Overview of business planning and the purpose of business pitches, Types of pitches: elevator, investor, and product, Understanding target audiences and stakeholders, Basics of market research and competitor analysis.

Unit 2: Building the Business Model and Value Proposition: Crafting a clear business model (Business Model Canvas), Defining a unique value proposition, Outlining the essential elements of a business plan: executive summary, market analysis, and key sections.

Unit 3: Financial Planning and Pitch Deck Design: Basics of financial projections- income statement, cash flow, and balance sheet. Understanding key metrics for startups, Creating an effective pitch deck- structure, essential slides, and visual design principles.

Unit 4: Presentation Skills and Storytelling: Public speaking fundamentals: managing anxiety, body language, voice modulation, and eye contact. Storytelling techniques for business pitches: narrative structure and emotional appeal. Visual storytelling and design elements (color, typography, layout).

Unit 5: Pitch Rehearsal, Q&A, and Final Presentation: Rehearsing for the final pitch: timing, delivery, and handling anxiety. Preparing for questions and objections from potential investors. Conducting a Q&A session with confidence.

Recommended Books:

1. Klaff, O. (2011). *Pitch anything: An innovative method for presenting, persuading, and winning the deal*. McGraw-Hill Education.
2. Osterwalder, A., &Pigneur, Y. (2010). *Business model generation: A handbook for visionaries, game changers, and challengers*. Wiley.
3. Duarte, N. (2012). *HBR guide to persuasive presentations*. Harvard Business Review Press.
4. Berry, T. (2022). *Hurdle: The Book on Business Planning.* Palo Alto Software.
5. Budhale, P. (2021). *The Golden Book of Business Presentation Skills: Quick and Easy Tips to Make Powerful Presentations*. Bloomsbury Prime.

E–WASTE MANAGEMENT

(Open Elective – I)

(Common to All Branches)

Subject Code: 23OET313

L	T	P	C
3	0	0	3

COURSE OBJECTIVES

- Understand the concept, generation, and environmental impacts of e-waste in India and globally.
- Analyze global trade practices, e-waste recycling, and its economy in India's organized and unorganized sectors.
- Learn e-waste control measures, including health safeguards, EPR, and effective regulatory mechanisms.
- Examine the salient features and implications of India's e-waste management rules of 2011 and 2016.
- Explore international conventions and directives for managing e-waste and restricting hazardous substances.

COURSE OUTCOMES

CO 1. Explain the concept of e-waste, its composition, and environmental and health impacts at national and global levels.
CO 2. Identify and compare factors influencing e-waste trade and recycling practices in India and globally.
CO 3. Apply principles of e-waste management, including EPR and reduction at source, to develop effective control measures.
CO 4. Evaluate the implications of India's E-Waste (Management) Rules of 2011 and 2016 for sustainable e-waste management.
CO 5. Assess the effectiveness of international conventions and directives in addressing e-waste hazards and restrictions on hazardous substances.

UNIT-I

Introduction: What is E-Waste, Indian and global scenario of e-Waste, Growth of Electrical and Electronics industry in India, E-waste generation in India, Composition of e-waste, Possible hazardous substances present in e-waste, Environmental and Health implications.

UNIT-II

E-Waste Hazardous On Global Trade: Essential factors in global waste trade economy, Waste trading as a quint essential part of electronic recycling, Free trade agreements as a means of waste trading. Import of hazardous e-waste in India; India's stand on liberalizing import rules, E-waste economy in the organized and unorganized sector. Estimation and recycling of e-waste in metro cities of India.

UNIT-III

E-Waste Control Measures: Need for stringent health safeguards and environmental protection laws in India, Extended Producers Responsibility (EPR), Import of e-waste permissions, Producer-Public-Government cooperation, Administrative Controls & Engineering controls, monitoring of compliance of Rules, Effective regulatory mechanism strengthened by manpower and technical expertise, Reduction of waste at source.

UNIT-IV

E-waste (Management and Handling) Rules, 2011; and E-Waste (Management) Rules, 2016 - Salient Features and its likely implication. Government assistance for TSDFs.

UNIT-V

The international legislation: The Basel Convention; The Bamako Convention. The Rotterdam Convention. Waste Electrical and Electronic Equipment (WEEE) Directive in the European Union, Restrictions of Hazardous Substances (RoHS) Directive

TEXT BOOKS

1. E-waste: implications, regulations, and management in India and current global best practices",Johri R., TERI Press, New Delhi

REFERENCE BOOKS

1. Electronic Waste – 1st Edition (Toxicology and Public Health Issues), Fowler B. 2017, Elsevier

2. Electronic Waste Management. Science,HesterR.E., and Harrison R.M. 2009

WEB LINKS

1. https://ewastemonitor.info/
2. https://www.nea.gov.sg/our-services/waste-management/3r-programmes-and-resources/e-waste-management
3. https://www.who.int/news-room/fact-sheets/detail/electronic-waste-%28e-waste%29

BLOCKCHAIN TECHNOLOGIES

(Open Elective - I)

Subject Code: 23OET314

L	T	P	C
3	0	0	3

Course Objectives:

- To give students the understanding of emerging abstract models for Blockchain Technology and to familiarize with the functional/operational aspects of crypto currency eco-system, this course covers the technological underpinning of block Chain operations in both theoretical and practical implementation of solutions using Ethereum.

Course Outcomes:

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

1. Understand the basics of block chain and its applications.
2. Analyze the Consensus agreement methods & Mining .
3. Understand the Cryptocurrency and Bitcoin.
4. Deploy Ethereum and Open source Hyper ledger Architecture.
5. Apply various technologies to Integrate Block Chain.

Unit – I

Basics of Block chain: Introduction, History, Definition of Block chain, Fundamentals of Block chain, Characteristics, Public, Private, and Hybrid Block chains, Distributed Ledger Technologies, Architecture of Block chain**.**

Block chain Applications: Smart Contracts, Wallet, Digital Currency, Digital Ledgers.

Unit – II

Consensus: Introduction, Consensus Approach, Consensus Algorithms, Byzantine Agreement Methods, Consensus in Trust-Building Exercise.

Mining: Introduction, Mining Nodes, Mining the block, Validating a New Block, Blockchain Forks, Mining Hardware and Software

Unit – III

Crypto currency and Wallet: Introduction to cryptocurrency,Types of Wallet-Desktop Wallet, App based Wallet, Browser based wallet, Metamask, Creating a account in Metamask, Use of faucet to fund wallet, transfer of cryptocurrency in metamask.

Bitcoin basics: Introduction to Bitcoin block chain, Challenges and solutions, Bitcoin scripting language and their use.

Unit – IV

Understanding Ethereum: Introduction, Ethereum, History, Ethereum Virtual Machine, Working of Ethereum, Ethereum Clients, Key Pairs, Addresses, Wallets, Transactions, Development Tools.

Understanding Hyperledger Fabric: Overview of Open source Hyperledger project, Hyperledger Fabric- Architecture, Identities and Policies, Membership and Access Control, Channels, Transaction Validation, Writing smart contract using Hyperledger Fabric.

Unit –V

Blok chain Allied Technologies: Cloud Computing, Artificial Intelligence, IoT, Machine Learning, Robotic Process Automation.

Challenges: Technical challenges, Business model challenges, Scandals and Public perception, Government Regulations.

TEXT BOOKS

1. A. Sourabh, A. Sexena,"Blockhain Technology: Concepts and Applications", Wiley, 2019.
2. Melanie Swan, "Blockhain", O'Reilly, 2nd Ed, 2018

REFERENCE BOOKS

1. Andreas M. Antonopoulos, "Mastering Bitcoin", O'Reilly, 2nd Ed, 2017.
2. Manav Gupta, "Blockchain for Dummies", John Wiley & Sons, 2nd Ed, 2018
3. Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks by Imran Bashier.

Reference Links

1. https://www.cybrary.it/blog/blockchain-technology-in-information-security/ - Accessed on 17-11-2022
2. Prof. Sandeep Chakraborty, IIT Kharagpur
   https://archive.nptel.ac.in/courses/106/105/106105184/ - Accessed on 17-11- 2022

OPTIMIZATION TECHNIQUES

(OpenElective - I)

Subject Code: 23OET315

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- Develop the ability to formulate and solve linear programming problems
- Equip students with the skills to solve transportation and assignment problems
- Provide students with a deep understanding of nonlinear programming problems,

COURSE OUTCOMES:

Upon the completion of this course, the students will be able to

CO1: Formulate, solvelinear programming problem using graphical and simplexmethod along with its Big-M and 2-Phasevariations

CO2: Solve both balanced andunbalanced transportation and assignment problems

CO3: Students should able to apply the concept of non-linear programming

CO4: Computequeueperformance characteristics for various queuing models

CO5: Solve problems of decision making under certainty, uncertainty and risk

UNIT - I

LinearProgramming: Introductiontolinearprogrammingproblemformulation,Graphicalsolution, Simplex method, Artificial variables techniques.

UNIT - II

Transportation Problem: Formulation, Optimal solution, unbalanced transportation problems,

Assignment Problem: Formulation, Optimal solution, Traveling salesmanproblem.

UNIT - III

NonlinearProgrammingProblems:Nonlinearprogrammingproblem-Kuhn-Tuckerconditionsmin cost flow problem.

UNIT - IV

Queuing Theory: Characteristics of Queuing models, Classification, (M/M/1):(FCFS/∞/∞), (M/M/1):(FCFS/N/∞), (M/M/C) : (FCFS/∞/∞)models.

UNIT - V

Decision Theory: Introduction, Classification of decisions, decision making under certainty, decision making under risk, decision making under uncertainty.

Text Books

1. Operations Research by P. Rama Murthy
2. Operations Research
3. Operations Research by D.S. Hira and Prem Kumar gupta

Reference Books

1. Operations Research, J.K. Sharma, MacMilan Pub.
2. Introduction to Operations Research by V. K. Kapoor, S. Chand Publishers
3. Optimization theory & Applications / S.S .Rao / New Age International

ETHICS in AI
(Open Elective – I)

L	T	P	C
3	0	0	3

Subject Code: 23OET316

Course Objectives:

- Understand the ethical considerations and moral implications in the development and deployment of AI systems.
- Explore the impact of AI on society, privacy, autonomy, and fairness.
- Evaluate ethical frameworks, principles, and regulations relevant to AI development and usage.
- Analyze ethical dilemmas in AI systems, including bias, transparency, accountability, and AI's impact on employment.
- Discuss global perspectives and the role of policymakers, developers, and the public in shaping ethical AI governance.

Course Outcomes:

1. Demonstrate an understanding of key ethical challenges related to artificial intelligence.
2. Apply ethical theories and principles to real-world AI applications and dilemmas.
3. Critically assess AI systems in terms of fairness, transparency, accountability, and privacy.
4. Communicate ethical concerns effectively and propose strategies to mitigate negative AI impacts.
5. Advocate for the responsible design and implementation of AI systems through ethical practices and regulations.

Unit - I: Introduction to Ethics in AI

Overview of AI: History and current landscape**,** Introduction to ethics and its significance in AI**,** Moral reasoning, ethical theories (utilitarianism, deontology, virtue ethics)**,** Case studies of AI-related ethical issues

Unit - II: Bias and Fairness in AI Systems

Types of bias in AI: Data, algorithmic, and human biases**,** Approaches to reducing bias in AI systems**,** Ethical implications of biased AI decisions**,** Case studies: Discrimination in facial recognition, biased predictive algorithms

Unit - III: Privacy, Surveillance, and Data Ethics

Importance of data privacy in AI**,** Ethical issues in data collection, storage, and use**,** Surveillance technologies and their social implications**,** Privacy-preserving AI techniques

Unit - IV: Accountability, Transparency, and Explainability

Defining accountability and transparency in AI systems**,** Challenges of "black-box" AI models**,** Methods for explainable AI (XAI)**,** Regulatory and industry efforts for transparency

Unit - V: Ethical AI Governance and Regulation

Role of governments, industry standards, and international bodies in AI regulation**,** Human-centered AI principles, Ethical challenges in autonomous systems (e.g., self-driving cars, military AI)**,** Future trends and challenges in AI ethics

Textbooks:

1. Boddington, Paula. Towards a Code of Ethics for Artificial Intelligence. Springer, 2017.
2. Russell, Stuart. Human Compatible: Artificial Intelligence and the Problem of Control. Viking, 2019.
3. Floridi, Luciano. The Ethics of Artificial Intelligence. Oxford University Press, 2021.

Reference Books:

1. O'Neil, Cathy. Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy. Crown Publishing, 2016.
2. Muller, Vincent C. Ethics of Artificial Intelligence and Robotics. Routledge, 2020.
3. Dignum, Virginia. Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way. Springer, 2019.

TRANSPORTATION ENGINEERING – II

(Professional Elective-II)

Course Code: 23CEE322

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

The objective of the course is to

• Explain various functionalities of permanent way components

• Describe various geometric elements of a railway track system

• Explain the components of points and crossings in a railway track

• Describe various components of Airport installation and runway design factors

• Explain the planning, construction and maintenance of Docks and Harbours

COURSE OUTCOMES:

After the completion of the course, students will be able to

1. Interpret the functions of various permanent way components
2. Design various geometric elements of railway track system
3. Analyze the components of points and crossings in a railway track
4. Organize various components of Airport installation and runway design
5. Illustrate the construction and maintenance activities of Docks and Harbours

UNIT I

Introduction to Railway Engineering: Permanent way components -Cross Section of Permanent Way - Railway track gauge - Functions of various Components like Rails, Sleepers and Ballast - Rail Fastenings - Creep of Rails - Theories related to creep - Sleeper density.

UNIT II

Geometric design of Railway track: Gradients-Grade Compensation – Cant and Negative super elevation - Cant deficiency- degree of curve- safe speed on curve -Rail joints and welding of joints, Railway stations and yards

UNIT III

Points and Crossings: track layout- switches & crossings. Turnouts- layout of turnouts- double turnouts and different types of crossings Signals and Interlocking: Objectives - classification - fixed signals, stop signals. Signalling systems- mechanical signalling, Interlocking - modern signalling installations. Urban rail transit -metro rails, mono rail.

UNIT IV

Airport Engineering: Airport site Selection, Airport Installation components - Runway geometric design - Factors controlling Taxiway Layout, Terminal Area, Apron, Hanger, Blast considerations. Aircraft characteristics - zoning laws - classification of airports. Correction for Runway Length - Orientation of Runway - Wind Rose Diagram - Runway Lighting system. Airport navigational aids - Airport Surveillance Radar, Visual Flight Rules (VFR) & Instrumental Flight Rules (IFR).

UNIT V

Harbours: Definition of Terms; planning and layout of docks and harbours. Classification of ports-requirements of good port maintenance of ports.

Docks: Dry and Wet Docks- transition sheds and workhouses, construction and maintenance of docks and harbours

Text Books:

1. Rangwala S.C & K.S. (2016), Railway Engineering, 26th Edition, Charotar Publications.
2. S.K.Khanna and M.G.Arora (1999), Airport Planning and Design, 6th edition, Nemchand& Bros

Reference Books:

1.J. S. Mundrey (2010), Railway Track Engineering, 4th Edition, McGraw Hill Publications.
2. Saxena S.C and Arora S.P (2004), Railway Engineering, 6th Edition, Dhanapat Rai
    1. Publications
3. Virendhra Kumar &StatishChandhra (1999), Air Transportation Planning & design, Gal Gotia Publishers.
4. Robert M. Horonjeff (2008), Planning and Design of Airports, McGraw Hill Publications.

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

(Professional Elective– II)

Subject Code: 23CEE323

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

Students will have

1. Explain the knowledge on types of Earthquakes, Factors effecting earthquake, terminology related to earthquake, Effects of earthquake and IS codes related to earthquake engineering.
2. Explain the concepts of free and forced vibrations
3. Explain between SDOF and MDOF systems with damped and undamped vibrations and response spectrum.
4. Explain the provisions of IS code for earthquake design.
5. Explain the provisions related to ductility as per IS codes.

COURSE OUTCOMES:

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

1. Apply the knowledge on types of Earthquakes, Factors effecting earthquake, terminology related to earthquake, Effects of earthquake and IS codes related to earthquake engineering.
2. Distinguish the concepts of free and forced vibrations
3. Distinguish between SDOF and MDOF systems with damped and undamped vibrations and response spectrum.
4. Synthesize the provisions of IS code for earthquake design.
5. Synthesize the provisions related to ductility as per IS codes.

UNIT – I Introduction to Earthquake Engineering: - Engineering Seismology – Earthquake phenomenon – Causes and effects of earthquakes – Structure of earth – Plate Tectonics – Elastic Rebound Theory – Earthquake Terminology – Source, Focus, Epicentre etc - Earthquake size – Magnitude and intensity of earthquakes – Classification of earthquakes – Seismic waves – Seismic zones – Seismic Zoning Map of India as per IS1893:2016 – Seismograms and Accelerometer.

UNIT – II Introduction to Structural Dynamics (Part 1): – Theory of vibrations – Lumped mass and continuous mass systems –- Determination of natural frequencies of vibration and mode shapes – Orthogonal properties of modes – Mode superposition method of obtaining response - Free vibration – Forced vibration.

UNIT – III Introduction to Structural Dynamics (Part 2):– Degrees of freedom - Single Degree of Freedom (SDOF) Systems – Formulation of equations of motion – Damping - Undamped and damped vibration — Response to harmonic excitation – Concept of response spectrum. Multi-Degree of Freedom (MDOF) Systems - Formulation of equations of motion.

UNIT – IV-Provisions related to Earthquake Analysis of Buildings: Review of the latest Indian seismic code IS:1893 – 2016 (Part-I) provisions for buildings – Earthquake design philosophy – Assumptions – Design by seismic coefficient and response spectrum methods –Displacements and drift requirements – Provisions for torsion.

UNIT – V Provisions related to Ductile design: - Review of the latest Indian Seismic codes IS:4326 and IS:13920 provisions for ductile detailing of R.C buildings – Beam, column and Beam to column joints.

Text Books:

1. Dynamics of Structures – Clough & Penzien, McGraw Hill – International Edition.
2. Earthquake Resistant Design of Structures – Pankaj Agarwal & Manish Shrikhande – Printice Hall of India, New Delhi

Reference Books:

1. Dynamics of Structures by A.K.Chopra – Pearson Education, Indian Branch, Delhi.
2. Earthquake Tips by C.V.R.Murty, I.I.T. Kanpur.
3. Structural Dynamics by Mario Paaz. IS Codes: IS:1893-2002, IS:4326 -1993 and IS:13920-1993 etc.

ENVIRONMENTAL POLLUTION AND SOLID WASTE MANAGEMENT

(Professional Elective– II)

Subject Code: 23CEE324

L	T	P	C
3	0	0	3

Course Objectives:

This course enables the students:

1. To analyze, how the environment is getting contaminated and probable control mechanisms for them.
2. To learn the processes for conversion of wastes into resources
3. To evaluate the management principles of hazardous waste
4. To understand the components of solid waste management system, study and understand collection, transfer and transport options of a municipal solid waste system.
5. To examine the processing options, study operations of various resource recovery and energy recovery facility, study the operation of municipal solid waste landfill.

Course Outcomes:

After completion of this course, students will be able to:

1. Distinguish and analyze the types of air pollution in the environment and understand about their dispersal mechanisms.
2. Analyze the types of water pollution happening in the environment and understand about their effects and potential control mechanisms.
3. Define and examine the treatment and management of radioactive and biomedical wastes
4. Review the components of a solid waste management system, identify the various collection and transport mechanisms of municipal solid waste.
5. Operate processing, material and energy recovery facilities, operate solid waste landfills.

Unit-I:

Air Pollution: Definition, Sources of air pollution. Air pollutants (CO, CO2, SO2, NOx, Hydrocarbons & Aerosols). Green House Effect, Global warming, Acid rain, Ozone layer depletion and Smog. Meteorological aspects of air pollution dispersion; temperature lapse rate and stability, wind velocity and turbulence, plume behavior, dispersion of air pollutants, the Gaussian Plume Model, stack height and dispersion. Air pollutants in indoor environments-private residences-offices-schools-public buildings-ventilation. Ambient air quality and emission standards.

Unit-II:

Water Pollution: Definition and Sources of water pollution. Specific phenomena related with water pollution- Algal bloom, Eutrophication, Biomagnifications/ Bioaccumulation. Water Quality-Physical, chemical and biological parameters of water- Water Quality requirement-Potable water standards, Primary, Secondary and tertiary treatment-Unit operations-unit processes. Membrane process, classification, Materials, membrane configurations, membrane operation, Reverse osmosis, Ultrafiltration, Microfiltration, Nanofiltration, Electrodialysis.

Unit-III:
Radioactive and Biomedical Waste Management: Sources, classification, health and safety aspects, management of radioactive wastes, Radioactive wastes generated during mining, processing of atomic minerals and in atomic reactors, Disposal of radioactive waste. Biomedical wastes: Sources and categories of biomedical wastes, segregation and color coding, treatment and disposal of biomedical wastes, biomedical wastes management and handling rules.

Unit-IV:
Solid Waste Management Fundamentals, Collection and Transportation: Sources and types of Municipal Solid Waste, waste generation rates, factors affecting generation, composition, characteristics, effects of improper disposal of solid waste, Municipal Solid Waste Rules; concept of ISWM system, source reduction of waste — reduction, reuse, recycling, onsite storage methods, handling and segregation of wastes at source. Methods of collection of municipal solid wastes, collection vehicles, primary and secondary collection, collection routes, vehicle routing, transfer station – location and operation.

Unit-V:
Waste Processing Techniques and Landfill Operation: Objectives of waste processing, component separation and volume reduction, processing technologies — biological and chemical conversion methods, resource and energy recovery from composting, biomethanation, thermal processing methods. Disposal methods, landfills — site selection, essential components of landfill; types of land filling methods, landfill planning – phased operation, leachate management and gas control.

Text Books:

1. Boubel, R. W., Vallero, D., Fox, D. L., Turner, B., & Stern, A. C. Fundamentals of air pollution 4th edition Elsevier, 2008
2. *Peavy, H.S., Rowe, D.R., Tchobanoglous, G. Environmental Engineering, McGraw Hills, New York 1985.*
3. Murphy, E., King,E., Environmental Noise Pollution, Elsevier, 2014
4. Tchobanoglous G., Theisen H., Vigil S.: Integrated Solid Waste Management Engineering Principles and Management Issues. Mc-Graw Hill
5. CPHEEO, Ministry of Urban Development: Manual on Municipal Solid Waste Management 2016

Reference Books:

1. Wark and Warner: Air Pollution: Its Origin and Control.
2. Khan Iqbal H., Ahsan, N.: Testbook of Solid Waste Management. CBS Publisher and Distributors (P) Ltd.

AR-23 B. Tech Civil **III year II Sem**

FLOOD MANAGEMENT AND CHANNEL FLOW

(Professional Elective– III)

Subject Code: 23CEE333

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

Students will have

1. To study the methods of stream flow measurement and develop skills for analyzing stage-discharge relationships and rating curves.
2. To equip students with knowledge of flood estimation techniques, flood routing methods, and strategies for flood control.
3. To understand the behavior of different types of flows in open channels and develop the ability to analyze flow profiles and energy dissipation mechanisms.
4. To study the necessity, types, and design of canal falls for effective water level management in irrigation systems.
5. To understand the design and components of diversion head works, their types, and the impact of weirs on river regimes for efficient water diversion.

COURSE OUTCOMES:

Students will get ability

1. To measure streamflow using various techniques, establish stage-discharge relationships, and evaluate hydrometry data for water resource management.
2. To estimate flood peaks, apply hydrologic routing methods, and design effective flood mitigation and management measures.
3. To classify flow regimes, apply uniform and non-uniform flow equations, compute critical depths, and design systems for energy dissipation in open channel flows.
4. To classify different types of canal falls and design a Sarda Type Fall based on hydraulic and site-specific requirements.
5. To analyze and design diversion headworks, including weirs and barrages, apply theories like Bligh's and Lane's, and propose solutions for silt control and seepage issues.

UNIT – I

Stream flow Measurements: Measurement of Stage and Velocity, Area Velocity Method, Dilution Technique of Stream flow Measurement, Electromagnetic Method, Ultrasonic Method, Indirect Method, Stage-Discharge Relationship, Rating Curve, Hydrometry Stations.

UNIT – II

Flood and Flood Routing: Introduction, Estimation of Flood Peaks: Rational Method, Gumbel's Method and Log-Pearson Type-III Distribution. Flood Routing – Basin Equations, Hydrologic Storage Routing: Modified Pul's Method and Goodrich Method, Hydrologic Channel Routing: Muskingum Method, Flood Control Measures.

UNIT – III

Open Channel Flow: Types of Flows, Type of Channels, Velocity Distribution, Energy and Momentum Correction Factors, Chezy's and Manning's Formulae for Uniform Flow, Most Economical Sections,Critical, Sub-Critical and Super Critical Flows, Specific Energy, Critical Depth, Computation of Critical Depth, Non Uniform Flow, Differential Equation of GVF, Classification and Analysis of FlowProfiles, Rapidly Varied Flow, Hydraulic Jump, Energy Dissipation.

UNIT – IV

Canal Fall and Design of Sarda Type Fall:Introduction, Necessity of Canal Falls, Types of Canal Falls: Ogee Fall, Rapid Fall, Stepped Fall, Trapezoidal Notch Fall, Vertical Drop Fall, Glacis Fall and Inglish Type Fall, Design of a Sarda Type Fall.

UNIT – V

Diversion Headworks: Types of Diversion Headworks, Location of Canal Headworks, Components of Diversion Headworks, Weir and Barrage differences, Effect of Construction of a Weir on the River Regime, Cause of Failure of Weirs on Permeable Foundation and Their Remedies, Bligh's Creep Theory, Lane's Weighted Creep Theory, Theory of Seepage Flow, Khosla's Theory, Concept of Under sluices or Scouring Sluices, Divide Wall or Divide Groyne and Canal Head Regulator, Silt Control Devices.

Text Books:

- Engineering Hydrology, K Subramanya, Mc-Graw Hill., 5thEdition, 2020.
- Irrigation Engineering and Hydraulic Structures, S.K. Garg, Khanna Publishers, 28th Edition, 2017.
- Irrigation Water Resources and Water Power Engineering, P.N. Modi, Rajsons Publications Pvt. Ltd, 10thEdition, 2019.
- Flow in Open Channels, K. Subramanya, Tata Mc. Graw Hill, 3rd Edition, 2009.

Reference Books:

- Irrigation and Water Power Engineering, B.C. Punmia,Pande B.B. Lal, Ashok Kumar Jain and ArunKUmar Jain, Laxmi Publication, 16th Edition, 2009.

AR-23 B. Tech Civil **III year II Sem**

REPAIR AND REHABILITATION OF STRUCTURES

(Professional Elective– III)

Subject Code: 23CEE334

L	T	P	C
3	0	0	3

OBJECTIVES:

The objective of this course is to enable the students to

- Understand different maintenance and repair strategies and their importance.
- Understand different repair materials, grouting materials.
- Know the factors effecting durability and strength of structures.
- Understand various repair protection & retrofitting of structure.
- Conductfieldmonitoringandnon-destructiveevaluationofconcretestructures.

Outcomes:

At the end of the course the students are expected to

1. Apply the different strategies of repair and maintenance of structures
2. Apply the strength and durability of concrete
3. Evaluate various repair and rehabilitation methods
4. Evaluate and explain various non-destructive methods
5. Evaluate the methods for strengthening the components of a structure

UNIT-I

Maintenance and Repair Strategies: Maintenance, Repair and Rehabilitation, facets of maintenance, importance of maintenance, various aspects of inspection, assessment procedure for evaluating a damaged structure, causes of deterioration.

UNIT-II

Repair materials Various repair materials, Criteria for material selection, Methodology of selection, Health and safety precautions for handling and applications of repair materials

Special mortars and concretes Polymer Concrete and Mortar, Quick setting compounds.

Grouting materials: Gas forming grouts, Salfoalumate grouts, Polymer grouts, Acrylate and Urethane grouts.

Bonding agents: Latex emulsions, Epoxy bonding agents.

Protective coatings Protective coatings for Concrete and Steel. FRP sheets.

UNIT-III

Strength and Durability of Concrete:

Quality assurance and quality control on concrete, Strength, durability, thermal properties of concrete. Cracks different type, causes, effects due to climate, temperature, corrosion, effects of cover thickness.

UNIT-IV

Techniques for Repair and Protection Methods: Non-Destructive testing techniques, Epoxy injection, Shoring, Underpinning, Corrosion protection techniques, corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.

UNIT-V

Repair, Rehabilitation and Retrofitting of Structures: Strengthening of beams, strengthening of columns, Repair of structures distressed due to corrosion, fire, Leakage, earthquake, Demolition techniques, Engineered demolition methods, Jacketing and fiber raping, Case studies.

Text Books:

1. AllenR.T.& EdwardsS.C,RepairofConcreteStructures,BlakieandSons,UK,1987
2. Denison Campbell, Allenand HaroldRoper, "Concrete Structures, Materials, Maintenance and Repair", Longman Scientific and Technical UK, 1991

Reference Books:

1. Shetty M.S., "Concrete Technology, Theory andPractice",S.ChandandCompany,2008
2. DovKominetzky.M.S.,"Designandconstructionfailures,GalgotiapublicationsPvtLtd., 2001
3. "Deterioration, Maintenance and Repair of Structures" by Johnson, McGraw Hill.

Web References:

1. https://easyengineering.net/ce6021-repair-and-rehabilitation-of/
2. https://www.academia.edu/4519837/MaintenanceandRehabilitationof Structures

E-TextBooks:

1. https://books.google.co.in/books?isbn=0784470294
2. https://books.google.co.in/books?isbn=0128111844

HIGHWAY CONSTRUCTION PRACTICES
(Professional Elective– III)

Course Code: 23CEE335

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

1. To explain highway construction and management with quality assurance
2. To explain the construction of different layers of highways
3. To explain various functions of asphalt plan, placing, transporting of asphalt mix.
4. To explain various operations involved in asphalt pavements.
5. To explain various operations involved in concrete pavements.

COURSE OUTCOMES:

After the completion of the course, students will be able to

1. Synthesize highway construction and management with quality assurance
2. Apply the construction of different layers of highways
3. Synthesize various functions of asphalt plan, placing, transporting of asphalt mix.
4. Illustrate various operations involved in asphalt pavements.
5. Illustrate various operations involved in concrete pavements.

UNIT I

Highway Construction and Management: Phases of highway construction projects; Pre-construction activities; construction supervision; field inspection and quality assurance.

UNIT II

Construction of Unbound and Bound Granular Layers: Gradation and material quality requirement for granular subbase and base layers; blending and proportioning; compaction requirements; field quality control; stabilised subbase and base layers: mix design, placing, laying, and compaction requirements; crack relief and SAMI layer; geosynthetic application reinforced granular layers; construction of subsurface drainage for highways and airfield pavements.

UNIT III

Asphalt Plant Operations, Transport, and Delivery: Asphalt plant functions, batch, drum, and continuous mix plants, emission controls, mix storage, and asphalt mix transport: planning, haul trucks, dressing segregation; material transfer vehicle; visual inspection of the mix, and troubleshooting.

UNIT IV

Asphalt Paving Operation: Preparing for paving: new construction/overlay, prime coat, tack coats: recommended, applications, distribution, verifying the application rates; asphalt pavers and compaction; screed operations and control; joints; compaction mechanics; cold weather paving; roller types; sequence of rolling: breakdown, intermediate, and finishing; tender mixes and component troubleshooting; quality assurance: sampling methods for asphalt mixtures, laboratory design versus field production; quality control tests; volumetric adjustments, density specifications.

UNIT V

Construction of Concrete Pavements: Concrete production; preparation of subgrade and base; reinforcement presetting for JPCP and CRCP; establishing string line; PCC slab constructions: slip form paving, fixed form paving; curing process; quantification of curing effectiveness; quality control tests; rehabilitation of concrete pavements.

Text Books:

1.Prithvi Singh Kandhal, A.Veeraragavan, Rajan Choudhary; Bituminous Road Construction in India, PHI Learning Pvt. Ltd., New Delhi, India, 2023, Second Edition.

2.Ministry of Road Transport and Highways, Specifications for Road and Bridge Works, Indian Roads Congress, New Delhi, India, 2013, Fifth Edition.

Reference Books:

1. Norbert J. Delatte, Concrete Pavement Design, Construction and Performance, CRC Press, 2014, Second Edition.
2. MS-22, Construction of Quality Asphalt Pavements, Asphalt Institute, 2020, Third Edition.
3. Sanford E.B., Concrete in Highway Construction: A Textbook for Highway Engineers and Supervisors, Thompson, 2022.

EMPLOYABILITY SKILLS

(Common to all Branches)

Subject Code: **23SSS306**

L	T	P	C
3	0	0	3

Course Objectives:

1. To perform a wide range of mathematical and aptitude problems commonly encountered in diverse disciplines, including science, engineering, and banking management.
2. To enhance students' understanding of data problems through the effective interpretation of data presented in various formats, including tables, bar graphs, pie charts, and line graphs.
3. To empower students with logical and critical thinking skills, enabling them to objectively analyze data, form evidence-based conclusions, and distinguish facts from assumptions and personal biases.
4. To develop the ability to effectively analyze and interpret diverse types of data, including numerical, verbal, and visual information.
5. To equip learners with a comprehensive command of the English language, focusing on vocabulary enhancement, grammatical accuracy, and effective reading and comprehension skills.

Course Outcomes:

1. Students apply mathematical proficiency by effectively communicating ideas, solving quantitative problems, and mastering financial calculations, including interest and taxes.
2. Students know how to use various data visualization tools, such as charts, graphs, and tables, to represent data effectively.
3. Students understand various reasoning techniques, including Logical and Critical reasoning, Analogical reasoning, and Causal reasoning.
4. Students learn various non-verbal reasoning techniques, including Diagrammatic reasoning, Spatial reasoning, and Visual logic.
5. Students develop the English language competencies necessary for success in academic, professional, and personal endeavors through effective application of vocabulary, grammar, and reading comprehension skills.

Unit 1: General Mathematical Structures, Quantitative Aptitude and Business Computations:

Coordinate Geometry, Time, Work, Speed, and Distance, Allegation and Mixtures, Mensuration, Geometry, Permutations and Combinations, Probability and Statistics.

Unit 2: Data Interpretation:

Interpretation of Data Tables, Bar Diagrams, Pie Charts, and Graphs.

Unit 3: **Logical Reasoning and Critical Reasoning:**

Series, Analogy and Classification, Alphabet, Ranking and Direction Tests, Discrete, Mathematical, and Logical Puzzles.

Unit 4: Analytical Reasoning and Non-Verbal Reasoning:

Syllogisms, Statements and Assumptions, Conclusions, Arguments, Cause and Effect, Analytical Decision Making, Coded Relations and Coded Inequalities, Cubes and Dice, Mirror and Water Images, Paper Folding and Cutting.

Unit 5: **English Language Essentials:**

Synonyms & Antonyms, One Word Substitutions, Idioms & Phrases, Spotting Errors, Sentence Completion, Sentence Improvement, Reading Comprehension, Para jumbles, Cloze Test, Inferred Meaning

Reference Books:

1.“Modern Approach to Verbal and Non-verbal Reasoning”, R. S. Aggarwal, S. Chand & Company LTD, New Delhi.

2.“Test of Reasoning (Verbal and Non-verbal)” S. L. Gulati, Cosmos Bookhive’s (P) LTD, Delhi.

3.“Quantitative Aptitude for the CAT”, Arun Sharma, Tata Mc Graw-Hill Publishing Company New Delhi.

4. “BARRON’S GRE The leader in Test Preparation”, Sharon Weiner Green, Ira K. Wolf

5. “How to Prepare for VERBAL ABILITY & READING COMPREHENSION for CAT”, Arun Sharma, Meenakshi Upadyay.

6. Arihant’s Objective General English, SP Bakshi.

TINKERING LAB

Subject Code: 23BHL306

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

- The Tinkering Lab course aims to foster an environment where students can explore, experiment, and innovate through hands-on learning.
- The lab encourages creativity, problem-solving, prototyping, and teamwork.
- It provides interdisciplinary exposure to mechanical, electronic, and digital fabrication tools, sensors, IoT, coding, and product design.

COURSE OUTCOMES:

Upon the completion of this course, the students will be able to

CO1: Apply knowledge from various engineering disciplines to build and test prototypes
CO2: Use tools, equipment, and software for basic mechanical, electronic, and digital fabrication.
CO3: Understand the basics of product design, prototyping, and iteration
CO4: Work collaboratively on real-world problem statements and interdisciplinary projects
CO5: Develop problem-solving skills through tinkering and experimentation

MODULE - I

Introduction to Tinkering: The principles of creativity, innovation, and tinkering. What is tinkering? Importance of creativity and experimentation in engineering, Overview of Tinkering Labs: Spaces, tools, and possibilities, Safety and best practices in the lab.

Lab Work:

- Simple individual projects using hand tools (e.g., wood/metal cutting, joining, etc.).
- Demonstrations of sample projects from different engineering streams.

MODULE - II

Introduction to Mechanical Prototyping : Basic mechanical fabrication tools and techniques: 3D modeling and CAD tools (Introduction to software like Solid Works, AutoCAD), Introduction to 3D printing and laser cutting, Using hand tools, drills, and mechanical prototyping kits.

Lab Work:

- Create simple mechanical prototypes using 3D printing and basic fabrication tools.
- Build and test basic structural models using wood, plastic, and metal materials.

Introduction to Electronics Prototyping: Basic electronics and circuit design. Introduction to bread boarding, resistors, capacitors, transistors, and ICs., Use of Arduino/Raspberry Pi or similar microcontrollers, Working with sensors and actuators, Introduction to simple programming for hardware integration.

Lab Work:

- Build a simple electronic project like an automatic light sensor or basic robot.
- Implement hands-on projects using Arduino, basic wiring, and circuit design.

Digital Fabrication and IoT: Digital tools for fabrication and integrate IoT-based systems, Introduction to IoT: Sensors, communication protocols (Bluetooth, Wi-Fi, etc.), Working with embedded systems, IoT platforms, and cloud-based services, Introduction to digital fabrication techniques (Laser cutting, CNC machines).

Lab Work:

- Build a basic IoT project (e.g., smart home device or weather station using sensors).
- Fabricate components of IoT projects using 3D printers or laser cutters.

MODULE - III

Design Thinking and Ideation: Process of design thinking for problem-solving, Steps of design thinking: Empathize, Define, Ideate, Prototype, and Test, Case studies of successful product design and innovation, Understanding user needs and translating them into tangible solutions.

Lab Work:

- Brainstorm ideas for final projects.
- Work in teams to develop multiple solutions to a given challenge.

MODULE - IV

Rapid Prototyping and Iteration: Prototype and test ideas iteratively, Concepts of rapid prototyping: fail-fast, iterate often, Tools for prototyping across disciplines (CAD, electronics simulation, 3D printing), Testing and evaluating prototypes for functionality, usability, and cost.

Lab Work:

- Create initial prototypes for the final project.
- Conduct iterative testing and modifications.

MODULE - V

Collaborative Final Project: Application of interdisciplinary knowledge to solve real-world problems, Work in interdisciplinary teams (mix of mechanical, electronics, computer science, etc.), Solving real-world problems by building a functional prototype, Document project progress, design decisions, and iterations.

Lab Work:

- Develop and finalize a working prototype that addresses a selected challenge.
- Present the project to peers and faculty for evaluation.

Text Books

1. *Designing for Growth: A Design Thinking Tool Kit for Managers* by Jeanne Liedtka and Tim Ogilvie.
2. *The Art of Tinkering* by Karen Wilkinson and Mike Petrich.
3. *Make: Electronics: Learning by Discovery* by Charles Platt.

Online Resources:

1. Arduino, Raspberry Pi, and IoT tutorial platforms.
2. 3D modeling and CAD tutorials on platforms like Tinkercad or Fusion360.
3. MIT's Fab Lab and Fab Academy resources.

Tools and Equipment:

1. 3D printers, laser cutters, CNC machines.
2. Arduino and Raspberry Pi kits.
3. Basic electronic components: sensors, LEDs, motors, breadboards.
4. Mechanical tools: drills, saws, hand tools, etc.

AR-23 B. Tech Civil **III year II Sem**

COMPUTER AIDED DRAWING AND DESIGN LAB

Course Code: 23CEL307

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

Students will have

1. To practice introduction to computer aided drafting which include points, lines, curves, polygons and dimensioning
2. To practice types modeling which include object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling,.
3. To practice building drawings which include Plan, Front Elevation and Sectional Elevation of buildings
4. To design 2-D frame analysis and design
5. To design 3-D building frame analysis and design

COURSE OUTCOMES:

Students will get ability

1. To do computer aided drafting which include points, lines, curves, polygons and dimensioning
2. To do types modeling which include object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling,.
3. To do building drawings which include Plan, Front Elevation and Sectional Elevation of buildings
4. Design 2-D frame analysis and design
5. Design3-D building frame analysis and design

Lab Practice – I
INTRODUCTION TO COMPUTER AIDED DRAFTING: Generation of points, lines, curves, polygons, Dimensioning.

Lab Practice – II
TYPES OF MODELING: object selection commands – edit, zoom, cross hatching, pattern filling, utility commands, 2D wire frame modeling, 3D wire frame modeling,.

Lab Practice -III
BUILDING DRAWINGS: Plan, Front Elevation and Sectional Elevation of buildings

Lab Practice -IV
2-D Frame Analysis, Design and Detailing by STAAD Pro Software

Lab Practice -V
3-D Frame Building Analysis, Design and Detailing by STAAD Pro Software

SOFTWARE:
1. AUTOCAD SOFTWARE
2. STAAD Pro. or EQUIVALENT SOFTWARE

AR-23 B. Tech Civil **III year II Sem**

TECHNICAL PAPER WRITING AND INTELLECTUAL PROPERTY RIGHTS (IPR)

Subject Code: 23MCT306

L	T	P	C
2	0	0	0

Course Objectives:

1. Introduce students to research fundamentals, including topic selection, literature review, and the structured components of a technical paper.
2. Familiarize students with research design, data collection methods, and statistical analysis, alongside proper citation and referencing styles.
3. Develop students' skills in writing clear and concise technical papers and delivering professional presentations of research findings.
4. Provide a comprehensive overview of intellectual property rights, covering patents, copyrights, trademarks, and trade secrets.
5. Raise awareness of ethical considerations in research, emerging issues in IPR (such as digital rights and open access), and the importance of protecting intellectual property in collaborative settings.

Course Outcomes:

1. Ability to identify a research topic, conduct a literature review, and organize a paper into sections like introduction, methodology, and conclusion.
2. Proficiency in designing research, choosing appropriate data collection methods, analyzing data, and applying accurate citation styles.
3. Competence in writing a complete technical paper with clarity and delivering a professional oral presentation on research findings.
4. Understanding of various types of intellectual property, their protection processes, and relevance in engineering contexts.
5. Ability to recognize and address ethical issues in research, understand open-access licensing, and discuss recent developments in IPR related to digital technologies.

SYLLABUS

UNIT 1: Introduction to Research and Technical Writing: Fundamentals of Research: Definition, objectives, types (basic and applied), and research methodology.Types of Technical Documents: Research papers, theses, and technical reports.Literature Review: Importance, methods for conducting surveys, and reviewing scholarly articles.Research Topic Selection: Identifying research gaps and formulating research questions.

UNIT 2: Research Design and Data Collection: Research Design: Types (exploratory and descriptive) and planning research.Data Collection: Primary vs. secondary data, qualitative and quantitative methods.Visual Data Representation: Graphs, tables, and charts.Citation Styles: Overview of APA and IEEE formats.

UNIT 3: Writing and Presenting Technical Papers: Writing Skills: Clarity, conciseness, and coherence in technical writing.Abstract and Conclusion: Techniques for writing effectively.Presentation Skills: Preparing presentations and using visual aids.

UNIT 4: Intellectual Property Rights (IPR): Fundamentals of IPR: Introduction to patents, copyrights, and trademarks.Patents: Basic criteria for patentability.Case Studies: Real-world applications of IPR in engineering.

UNIT 5: Ethical Considerations in Research: Ethical Issues: Plagiarism avoidance, responsible authorship, and ethical use of data.Open Access: Introduction to Creative Commons and open-source research.

Reference Books

1. Alred, G. J., Brusaw, C. T., &Oliu, W. E. (2020). *The Handbook of Technical Writing* (12th ed.). Bedford/St. Martin's.
2. Day, R. A., &Gastel, B. (2016). *How to write and publish a scientific paper* (8th ed.). Cambridge University Press.
3. Kothari, C. R., &Garg, G. (2019). *Research methodology: Methods and techniques* (4th ed.). New Age International Publishers.
4. Menell, P. S., Lemley, M. A., Merges, R. P., &Balganesh, S. (2020*). Intellectual Property in the New Technological Age 2020*: Vol. II Copyrights, Trademarks, and State IP Protections.
5. Singh, A. K. (2018). *Intellectual property rights: Unleashing the knowledge economy*. Springer.

Textbooks

1) Kumar, R. (2018). *Research methodology: A step-by-step guide for beginners* (5th ed.). SAGE Publications.
2) Goold, P. R. (2022). *A Critical Introduction to Intellectual Property Law*. Cambridge University Press.
3) Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). SAGE Publications.
4) Glasman-Deal, H. (2020). *Science Research Writing: For Native and Non-Native Speakers of English* (2nd ed.). World Scientific Publishing Company.

AR-23 B. Tech Civil **IV year I Sem**

FOUNDATION ENGINEERING

Subject Code: 23CET414

L	T	P	C
3	0	0	3

COURSEOBJECTIVES:
The objective of the course is to

- Explain the soil exploration and field tests
- Explain the earth slope stability using various methods
- Explain and the earth pressure by various theories
- Explain study safe bearing capacity and settlement of soils
- Explain the load carrying capacity of piles and well by various methods

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

1. Enumerate soil exploration and field tests
2. Analyze earth slope stability using various methods
3. Evaluate earth pressure by various theories
4. Evaluate safe bearing capacity and settlement of soils
5. Evaluate load carrying capacity of piles, well foundations by various methods

UNIT I
Soil Exploration: Introduction, methods of site exploration, soil samplers, sampling procedures, trail pits, borings, Penetration tests - SPT and CPT, Plate load test, Analysis of borehole logs, geophysical investigation methods, Preparation of soil investigation report.

UNIT II
Stability of Slopes: Introduction, types of slopes, types of failures and their failure mechanisms, factor of safety, analysis of finite and infinite slopes, wedge failure, Swedish circle method, friction circle method, Taylor's stability number , Bishop's Simplified method, and Stability of slopes of earth dams under different conditions.

UNIT III
Earth pressure theories: Introduction, Rankine's theory of earth pressure – earth pressures in layered soils – Coulomb's earth pressure theory – Culmann's graphical method.

UNIT IV
Shallow foundations: Types - choice of foundation – Location of depth – Factors effecting bearing capacity – gross, net, Safe Bearing Capacity – Terzaghi, Meyerhof's and IS Methods, effect of water table – Safe bearing pressure based on N-value – allowable bearing pressure, safe bearing capacity and settlement from plate load test – allowable settlements of structures.

UNIT V
Pile foundation: Types of piles – Load carrying capacity of piles based on static pile formulae – Dynamic pile formulae – Pile load tests – Load carrying capacity of individual pile and pile groups in sands and clays – Settlement of individual pile and pile groups.
Well Foundations: Types – Different shapes of wells – Components of wells – Sinking of wells – Tilts and shifts.

TEXTBOOKS:

1. Principles of Geotechnical Engineering, by Braja M. Das, Cengage Learning India Private Limited; 8 edition, 2015
2. Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering (Civil and Environmental Engineering) by V.N.S. Murthy, CRC Press; 1 edition 2002

REFERENCE BOOKS:

1. Fundamentals of Soil Engineering by Taylor, John Wiley & Sons
2. Soil Mechanics and Foundation Engineering by Dr K R Arora , A. K. Jain For Standard Publishers Distributors , 6^{th} Edition, 2002
3. Basic and Applied Soil Mechanics by Gopal Ranjan & ASR Rao, New age International Pvt . Ltd, New Delhi
4. Soil Mechanics by Craig R.F., Chapman & Hall, CRC Press; 8 edition, 2012.

ENVIRONMENTAL ENGINEERING

Course Code: 23CET415

L	T	P	C
3	0	0	3

Course Objectives:
This course enables the students:

1. To describe the importance of water quality and quantity and interpret the design of water supply systems.
2. To apply the appropriate technologies for water treatment.
3. To interpret the concepts of water supply systems designing and management.
4. To explain the impacts of sewage and select conveyance systems for sewage and storm water.
5. To identify and apply suitable process for the sewage treatment and sludge management.

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

1. Examine and explain various sources of water, water quality and quantity estimation.
2. Analyze the appropriate water treatment technology.
3. Interpret the concepts of water supply systems designing and management.
4. Understand and determine the fundamentals of wastewater generation, conveyance system, wastewater quality and different discharge standards.
5. Explain and illustrate various methods of wastewater and sewage sludge treatment.

Unit-I:
Introduction: Sources of Water - Comparison from quality and quantity – intakes, infiltration galleries. Waterborne diseases - protected water supply - population forecasting methods, design period - types of water demand - factors affecting – fluctuations - fire demand - storage capacity, drinking water quality standards: IS 10500.

Unit-II:
Water Treatment Process, Filtration and Disinfection: Layout and general outline of water treatment units – Aeration, sedimentation – principles – design factors – coagulation - jar test, flocculation, clarifier design – coagulants – feeding arrangements. Filtration – theory – working of slow and rapid gravity filters – multimedia filters – design of filters – troubles in operation – disinfection – theory of chlorination, chlorine demand – other disinfection practices.

Unit-III:
Water Supply Systems: Requirements - methods and layouts - Design of distribution systems - Hardy Cross and equivalent pipe methods - Service reservoirs - Capacity by Mass Curve Method. Joints, sluice valves, air valves, Scour valves and check valves, water meters.

Unit-IV:
Conservancy and Water Carriage Systems: Sewage and storm water estimation- characteristics of sewage – decomposition of sewage, examination of sewage – B.O.D. Equation. C.O.D. Design of sewers – shapes and materials – sewer appurtenances, manholes – inverted siphon – catch basins – flushing tanks – ejectors, pumps and pump houses.

Unit-V:

Layout and General Outline of Waste Water Treatment Plants and Disposal of Sewage: Waste water treatment plant – Flow diagram – primary treatment - design of screens – grit chambers – skimming tanks – sedimentation tanks – biological treatment – trickling filters – Activated sludge processes (ASP). Sludge digestion – factors effecting – design of Digestion tank – Sludge disposal by drying - septic tanks working principles and design – soak pits.

Air Pollution:Definition and classification of air pollutants – Sources and effects – air pollution meteorology – Control of particulates, Gravity settlers – cyclone filters ESPs – Control of gaseous pollutants – Adsorption – Absorption – Combustion – Condensation, Air quality standards and limits – Definition and impacts of noise pollution – Permissible limits of noise – Measurement of noise and control of noise pollution.

Text Books:

1. Water Supply Engineering: Environmental Engineering - Vol. I, by S.K. Garg, Khanna Publishers, New Delhi
2. Sewage Disposal and Air Pollution Engineering: Environmental Engineering - Vol. II, S.K. Garg, Khanna Publishers, New Delhi.

Reference Books:

1. Water supply: Don D. Ratnayaka Malcolm, J. Brandt, Michael Johnson, 6th edition, 2009
2. Metcalfe and Eddy. Wastewater Engineering, Treatment, Disposal and Reuse, Tata McGraw-Hill, New Delhi.
3. Water and Wastewater Engineering – designs, principle and practice, Mackenzie L. Davis. McGraw-Hill Education
4. Water supply and sanitary Engineering by G.S. Birdi, Birdie J. S Dhanpat Rai & Sons Publishers, 2010.
5. Environmental Engineering, Peavy, H., Rowe, D.R, Tchobanoglous, G. Mc-Graw - Hill International

REMOTE SENSING AND GEOGRAPHIC INFORMATION SYSTEM

Subject Code: 23CET416

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

The Students will have

1. To demonstrate the basic concepts of spatial data acquisition techniques
2. To illustrate the different data acquisition platforms and digital image data formats of spatial data
3. To utilize different visual interpretation and digital image processing techniques to extract meaningful information from spatial data
4. To explain the geographic information system and its related concepts
5. To apply and analyze the spatial data techniques for different applications

COURSE OUTCOMES:

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

1. Demonstrate the basic concepts of spatial data acquisition techniques
2. Illustrate the different data acquisition platforms and digital image data formats of spatial data
3. Utilize different visual interpretation and digital image processing techniques to extract meaningful information from spatial data
4. Explain the geographic information system and its related concepts
5. Apply and analyze the spatial data techniques for different applications

UNIT I

Basics of Remote Sensing: Components of remote sensing - Electromagnetic radiation, electromagnetic spectrum - EMR interaction with atmosphere - EMR interaction with Earth Surface Materials - Atmospheric Windows and its Significance.

UNIT II

Platforms Sensors and Resolutions : Types of platforms- ground, airborne, and space born platforms, Types and classification of sensors - Sensor resolution-spectral, radiometric and temporal - Image data characteristics - Digital image data formats- band interleaved by pixel, band interleaved by line, band sequential.

UNIT III

Image Analysis: Introduction, elements of visual interpretations, digital image processing, image enhancement, image classification, supervised classification, unsupervised classification

UNIT IV

Geographic Information System: Introduction, key components, map projections, Data – Spatial and Non-Spatial, spatial data input, raster data models, vector data models, raster versus vector.

UNIT V

Spatial data analysis: Introduction overlay function-vector overlay operations, arithmetic operators, comparison and logical operators, conditional expressions, overlay using a decision table

RS and GIS Applications: Land use and Land cover, agriculture, geology, urban applications, flood zone delineation mapping, GIS for Transportation Engineering

TEXT BOOKS:

1. Remote Sensing and its Applications by LRA Narayan, Universities Press (India) Private Limited, 2018
2. Principles of Geographical Information Systems – Peter A Burrough, Rachael A. Mc Donnell and Christopher D. Lloyd, Oxford University Press, 2016.

REFERENCES:

1. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications, 2016.
2. Concepts & Techniques of GIS by Chor Pang Lo and Albert K.W. Yeung, Pearson Education, 2016
3. GIS by Kang – Tsung Chang, McGraw-Hill Education, 2006
4. Text Book of Remote Sensing and Geographical Information systems by M.Anji Reddy,

ADVANCED DESIGN OF REINFORCED CONCRETE STRUCTURES

(Professional Elective– IV)

Subject Code: 23CEE441

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

The student will able to

- Explain the cantilever and counter fort of retaining walls.
- Explain circular and rectangular types of RCC water tanks
- Explain the circular slabs which include simply supported and fixed end conditions and flat slabs.
- Explain the piles and pile caps
- Explain and Design earthquake forces for multi-storey structures

COURSE OUTCOMES:

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

1. Analyze and design of Retaining walls, cantilever and counter fort
2. Analyze and design of RCC water tanks on ground, Circular, square and rectangular types.
3. Analyze and design of circular slabs and Flat slabs.
4. Analyze and design of bored cast-in-situ piles, under reamed piles and Pile cap for three and four piles using bending method.
5. Analyze and design of earthquake forces and detailing for ductility.

UNIT I

Design of Retaining walls: types, behavior, earth pressure and stability requirements, design of cantilever and Design counter fort retaining wall.

UNIT II

Design of RCC water tanks on ground and underground: Circular, and rectangular types.

UNIT III

Slabs: Yield line theory of slabs- circular slab design, circular slab – Simply supported and Fixed end conditions with Uniformly Distributed Loads, Flat slabs.

UNIT IV

Piles and pile caps: Types of of piles, Design of Pile foundation, Design of pile cap for three and four piles using bending method.

UNIT V

Multi-storey building system: Detailing for Ductility, Design for wind forces, Different types of loadings on bridges according to IRC, Design of RCC Culvert-deck slab.

Text Books:

1. Advanced Reinforced concrete structures by Vargheesh, Pranties Hall of India Pvt. Ltd, 2nd edition 2005.
2. Design drawing of concrete and steel structures by N.Krishna Raju University Press 2005.

References:

1. Reinforced concrete design by S.U,Pillai and D.Menon, Tata Mc.Ghrawhill Publishing company,3rd edition, 2011.
2. Reinforced Concrete Design byWang John Wiley & Sons; 7th Edition edition, 2006.
3. Codes: Relevant IS: codes.

AR-23 B. Tech Civil **IV year I Sem**

GROUND IMPROVEMENT TECHNIQUES

(Professional Elective– IV)

Subject Code: 23CEE442

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To explain in-situ densification techniques for granular and cohesive soils at surface level and at deeper level.
- To explain methods of stabilization for different types of soils.
- To illustrate different dewatering techniques to improve soil properties.
- To explain about geo synthetics and its applications and reinforced earth.
- To understand components of reinforced earth.
- To describe expansive soils and foundation considerations on expansive soils and grouting techniques.

COURSE OUTCOMES:

After the completion of the course, students will be able to

1. Explain in-situ densification methods for granular and cohesive soils at surface level and at deeper level.
2. Explain methods of stabilization and applications.
3. Illustrate different dewatering techniques to improve soil properties.
4. Explain about geo synthetics and its applications.
5. Explain components of reinforced earth and grouting techniques.

UNIT – I

Insitu densification methods

Insitu densification methods in granular Soils: Vibration at the ground surface and at depth, Impact at the Ground Surface and at depth. Insitu densification methods in Cohesive soils: Preloading, Vertical drains – Sand Drains and geodrains – Stone columns – thermal methods.

UNIT – II

Stabilization of Soils: Methods of stabilization-mechanical-cement-lime-bituminous and polymer stabilization-chemical stabilization with calcium chloride, sodium silicate and gypsum.

UNIT – III

Dewatering: Dewatering-sumps and interceptor ditches- single and multi stage well points-vacuum well points-Horizontal wells-criteria for selection of fill material around drains-electro osmosis.

UNIT –IV

Geosynthetics: Types, functions and applications of geotextiles (woven; nonwoven; knitted) geogrids, geonet, geomembranes, gabions, geocells and geosynthetic clay liners.

UNIT - V

Reinforce earth – principles – components of reinforced earth – design principles of reinforced earth walls – stability checks – soil nailing.

Grouting: Objectives of grouting- grouts and their applications- grouting methods- stages of grouting-hydraulic fracturing in soils and rocks- post grout test.

TEXT BOOKS:

1. Hausmann M.R. (1990), Engineering Principles of Ground Modification, McGraw-Hill International Edition.
2. Raj, P. Purushothama (2005), Ground improvement techniques., Laxmi Publications, NewDelhi

REFERENCES:

1. Moseley M.P. (1993) Ground Improvement, Blackie Academic and Professional, Boca Taton, Florida, USA.
2. Xanthakos P.P, Abramson, L.W and Brucwe, D.A (1994) Ground Control and Improvement, John Wiley and Sons,New York, USA.
3. Robert M. Koerner, Designing with Geosynthetics, Prentice Hall New Jercy,USA

AR-23 B. Tech. Civil **IV year I Sem.**

WATERSHED MANAGEMENT

(Professional Elective– IV)

Course Code: 23CEE443

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To explain the concept, objectives, need &Integrated and multidisciplinary approach of watershed development, characteristics of watershed
- To explain the principles of erosion which include Types, factors affecting, Effects, estimation of soil loss of erosion etc.,
- To explain the different measures to control erosion which include contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control works, rock fill dams, brushwood dam, Gabion structures.
- to discuss the water harvesting which include Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks
- To explain the Land management which include Land use and Land capability classification, management of forest, agricultural, sustainable agriculture, dry land agriculture, Reclamation of saline and alkaline soils.

COURSE OUTCOMES:

1. Understand concepts and characteristics of watershed management.
2. Discuss principles of erosion
3. Understand various measures to control erosion.
4. Describe about rain water harvesting and its structures.
5. Describe about land management.

UNIT-I

Introduction: Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management.

Characteristics of watershed: Size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

UNIT-II

Principles of erosion: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation, revised universal soil loss equation.

UNIT-III

Measures to control erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control works, rock fill dams, brushwood dam and Gabion structures.

UNIT-IV

Water harvesting: Rainwater harvesting and harvesting structures, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks.

UNIT-V

Land management: Land use and Land capability classification, management of forest land, management of agricultural land, sustainable agriculture, dry land agriculture, Reclamation of saline and alkaline soils.

TEXT BOOKS:

1. JVS Murthy (2017), Watershed Management, 2nd edition, New Age International Publishers.
2. R. Awurbs and WP James (2015), Water Resource Engineering, 1st edition, Prentice Hall Publishers.

REFERENCE:

1. VVN Murthy (2013), Land and Water Management, 6th edition Kalyani Publications.
2. D.K.Majumdar (2014), Irrigation and Water Management, 2nd revised edition, Printice HallIndia.

AR-23 B. Tech. Civil **IV year I Sem.**

PRESTRESSED CONCRETE

(Professional Elective– V)

Subject Code: 23CEE451

L	T	P	C
3	0	0	3

Course Objectives:

Students will have

1. To introduce basic concepts of prestressed concrete with analysis of sections.
2. To explain calculation of various losses of prestressed concrete.
3. To explain estimation of flexural strength of prestressed concrete members.
4. To explain estimation of shear strength of prestressed concrete members.
5. To explain measurement of short term and long term deflections in prestressed concrete members and analysis of continuous beams

Course Outcomes:

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

1. Understand basic concepts of prestressed concrete with analysis of sections.
2. Calculate of various losses of prestressed concrete.
3. Estimate of flexural strength of prestressed concrete members.
4. Estimate of shear strength of prestressed concrete members.
5. measure of short term and long term deflections in prestressed concrete members and analyze of continuous beams

UNIT I

Introduction – Theory and behavior basic concepts – advantages and disadvantages – materials required – high strength concrete-high strength steel- systems and methods of prestressing – pre tension – post tension members - analysis of sections – stress concept – strength concept – load balancing concept.

UNIT II

Losses in Prestress: Types of losses in pre tension and post tension members; loss due to elastic deformation – loss due to shrinkage and creep of concrete – loss due to relaxation of stress in steel – loss due to anchorage slip – loss due to friction – total allowed losses for design.

UNIT III

Design for flexure: Flexural strength of pre tensioned concrete member – Type of flexural failure - fracture of steel and tension – failure of under and over reinforced section –calculation of flexural strength as per IS: 1343 – 2012.

Shear and Torsion:

Shear and Torsional resistance of pre stressed concrete members – principal stresses – type of shear cracks – web shear cracks – flexural cracks. Design of shear reinforcement as per IS: 1343 – 2012 shear and principal stresses due to torsion.

UNIT IV

Deflection:

Deflection and design of anchorage zone: Factors influencing deflections – short term deflections of uncracked members – prediction of long term deflections due to creep and shrinkage – check for serviceability limit states. Determination of anchorage zone stresses in post-tensioned beams – design of anchorage zone reinforcement – IS code method.

UNIT V

Indeterminate Structures:

Composite beams and continuous beams: Analysis and design of composite beams – methods of achieving continuity in continuous beams – analysis for secondary moments – concordant cable and linear transformation – calculation of stresses – principles of design.

TEXTBOOKS:

1. Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012
2. Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012

REFERENCES:

1. Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013
2. Lin T.Y. and Ned.H.Burns, "Design of prestressed Concrete Structures", Third Edition, Wiley India Pvt. Ltd., New Delhi, 2013.
3. IS1343:2012, Code of Practice for Prestressed Concrete, Bureau of Indian Standards, New Delhi, 2012

AR-23 B. Tech Civil **IV year I Sem**

BRIDGE ENGINEERING

(Professional Elective– V)

L	T	P	C
3	0	0	3

Subject Code: 23CEE452

COURSE OBJECTIVES:

Students will have

- To explain the basic Components of a Bridges
- To explain of R.C.C. Culverts and T-Beam Bridges.
- To discuss various types of steel bridges
- To discuss the Pier and Abutments.
- To explain the Importance of bearings, concrete girder and box girder bridges.

COURSE OUTCOMES:

After completion of this course students will be able to

1. Understand the basic Components of a Bridges.
2. Design of R.C.C. Culverts and T-Beam Bridge.
3. Design of various types of steel bridges.
4. Illustrate the Pier and Abutments.
5. Understand the Importance of bearingsand design of concrete girder and box girder bridges.

UNIT I

Introduction and Investigation for Bridges: Components of a Bridge, Classification, Standard Specifications, Need for Investigation, Selection of Bridge Site, Preliminary Data to be Collected, Preliminary Drawings, Determination of Design Discharge, Economical Span, Location of Piers And Abutments, Vertical Clearance Above HFL, Scour Depth, Choice of Bridge Type, Importance of Proper Investigation.

UNIT II

Design Consideration of RCC bridges: Various types of bridges (brief description of each type), Design of R.C.C. Culverts and T-Beam Bridges.

UNIT III

Design Consideration of steel bridges: Various types of steel bridges (brief description of each type), Design of welded plate girder bridge. Design Principles of continuous bridges and box girder bridges.

UNIT IV

Sub Structure for Bridges: Pier and Abutments Caps; Materials for Piers and Abutments, Design of Pier, Design of Abutment, Backfill behind Abutment, Approach Slab.

UNIT V

Bearings for Bridges: Importance of bearings, bearings for slab bridges, bearings for girder bridges, expansion bearings, fixed bearings, design of elastomeric pad bearing. Foundations for bridges, Scour at abutments and piers, grip length, types of Foundations. Analysis and design of concrete girder and box girder bridges considering only primary torsion, Design of end block, Theory on open web girder.

Text Book(s)

1. Krishna Raju N., Design of Bridges, 4/e, Oxford & IBH Publishing, 2008.
2. Jagadish. T.R and Jayaram. M.A, Design of Bridge Structures, 2/e, PHI Learning Pvt. Ltd., 2009.

Reference Book(s):

1. D.Johnson Victor, Essentials of Bridge Engineering, 6/e, Oxford & IBH Publishing Co. Pvt. Ltd., 2007.
2. Ponnuswamy.S, Bridge Engineering, 2/e, Tata McGraw Hill Education, 2007.

FINITE ELEMENT METHODS
(Professional Elective– V)

Subject Code: 23CEE453

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:
1. To explain the concept FEM which includes merits and demerits, energy principles, Rayleigh-Ritz method of functional approximation and principles of elasticity, equilibrium equations, strain displacement relationships.
2. To explain one dimensional element-stiffness matrix for bar elements, shape function for one dimensional elements, and problems.
3. To explain two dimensional elements which includes different types of elements for plane stress and plane strain analysis, displacement formulation, shape functions.
4. To explain the two dimensional elements which includes truss element and beam element in both local and global coordinates
5. To explain finite element formulation for beams which includes stiffness matrix, load vector, comparison of FE solution to exact solution and isometric formulation which includes concept of isometric elements for 2D analysis, formulation of CST element.

COURSE OUTCOMES:
On completion of the course, the students will be able to:
1. Appreciate concepts FEM which includes merits and demerits, energy principles, Rayleigh-Ritz method of functional approximation and principles of elasticity, equilibrium equations, strain displacement relationships.
2. Analyze one dimensional element-stiffness matrix for bar elements, shape function for one dimensional elements, and problems.
3. Analyze two dimensional elements which includes different types of elements for plane stress and plane strain analysis, displacement formulation, shape functions.
4. analyze two dimensional elements which includes truss element and beam element in both local and global coordinates
5. Analyze finite element formulation for beams which includes stiffness matrix, load vector, comparison of FE solution to exact solution and isometric formulation which includes concept of isometric elements for 2D analysis, formulation of CST element.

UNIT -I
Introduction: Concepts of FEM – Steps involved – merits & demerits – energy principles – Discretization – Rayleigh –Ritz method of functional approximation.
Principles of Elasticity: Equilibrium equations – strain displacement relationships in matrix form – Constitutive relationships for plane stress, plane strain.

UNIT -II
One Dimensional FEM: Stiffness matrix for bar element - shape functions for one dimensional element – one dimensional problems.
Two Dimensional FEM : Different types of elements for plane stress and plane strain analysis – Displacement models –generalized coordinates – shape functions – convergent and compatibility requirements – Geometric invariance – Natural coordinate system.

UNIT –III

Generation of element stiffness and nodal load matrices for 3-node triangular element and four node rectangular elements.

UNIT –IV

Two dimensional analysis –Stiffness Matrix for a two noded Truss Element ,Three noded Truss element and Two noded Beam element in Local and Global (2D).

UNIT-V

Isoparametric formulation – Concepts of, isoparametric elements for 2D analysis -formulation of CST element, 4 –noded and 8-noded iso-parametric quadrilateral elements –Lagrangian and Serendipity elements.

TEXT BOOK:

1. Finite Elements Methods in Engineering by Tirupati.R. Chandrepatla and Ashok D. Belegundu - Pearson Education Publications.
2. Finite element analysis by S.S. Bhavakatti-New age international publishers
3. .Finite element analysis by David V Hutton, Tata Mcgraw Hill, New Delhi

REFERENCES:

1. Concepts and Applications of Finite Element Analysis by Robert D.Cook, David S. Malkus and Michael E.Plesha. Jhon Wiley & Sons.
2. Finite Element analysis – Theory & Programming by C.S.Krishna Murthy- Tata Mc.Graw Hill Publishers.
3. Text book of Finite Element analysis by P.Seshu – Prentice Hall of India.

ENTREPRENEURIAL DEVELOPMENT

(Open Elective-II)
(Common to all Branches)

Subject Code:23OET421

L	T	P	C
3	0	0	3

OBJECTIVES:

1. To develop an understanding on entrepreneur andentrepreneurship.
2. To have an understanding on nature and development of entrepreneurship inIndia
3. To provide steps to start an enterprise and projectpreparation.
4. To make Students gaining the knowledge about Governmental and Institutional support to entrepreneurs.
5. To make the students familiar with e-entrepreneurship and functional areas of Managing a venture in India

OUTCOME:

1. Understand the concept of Entrepreneurship and demonstrate the ability to provide a self analysis on Entrepreneurship qualities in the context of an Entrepreneurial career.
2. Understanding Entrepreneurship Development programmes in India and contents for training for Entrepreneurial competencies.
3. Understand the steps to start MSME and develop well presented business plan that is feasible for the student.
4. Understanding the Govt. Policy and Institutional Support for Entrepreneurs in India.
5. Understanding about e-Entrepreneurship and how to manage effectively the selected Venture in India

UNIT 1:

Entrepreneur and Entrepreneurship: Nature and Scope of Business. Concept of Entrepreneur & Entrepreneurship, characteristics of an Entrepreneur, types of Entrepreneurs, Entrepreneur. Role of Entrepreneurship in Economic development. Ethics and social responsibility of an entrepreneur. Future of Entrepreneurship in India.

UNIT 2:

Entrepreneurship Development in India: Emergence of entrepreneurial class in India, Environmental factors effecting entrepreneurship, local mobility of Entrepreneurs, Concept of women entrepreneurship and rural entrepreneurship. Development of women Entrepreneurship, problems and remedies of women Entrepreneurship. Entrepreneurship Development programme (EDP) - need and objectives of EDPs, Designing Appropriate training programme for existing and new entrepreneurs. Institutions supporting for EDP-EDII,NIESBUD, APITCO, NIMSME and DIC.

UNIT 3:

Creating and starting the venture: Steps to start an MSME. Meaning of a project. Project Identification- Sources of new Ideas, methods of generating ideas, creative problem solving, and opportunity recognition. Project selection - meaning of project report (Business Plan) & Formulation of a project report, Preparation of sample project report of any one product and service.

UNIT 4 :

Government and Institutional support to Entrepreneurs: AP Industrial policy (2020-23) - incentives and subsides, industrial estates, Technology Incubation Centre, Business Incubation Centre, National Skill Development Corporation, AP Skill Development Corporation. Institutional finance – sources of short term and long term capital including Venture capital. Role of SIDBI, NSIC, EXIM Bank and commercial Banks, APSFC.

UNIT 5:

E-Entrepreneurship & Managing the venture. Concept of e-Entrepreneurship, Difference between Entrepreneurship and e-Entrepreneurship, Purpose of Creating e-Entrepreneur, Essence of e-Entrepreneurship, e-Business Ventures in different sectors. Managing the Venture- Concepts of working capital management, Marketing management, Human Resource management, Operations management and financial management Problems and prospects of MSME in India. Profile of Entrepreneurs.

Text Books:

1. Dr.S.S.Khanka & Dr.C.B.Gupta Entrepreneurship and Small Business Management, Eighth edition, Sultan Chand & Sons, 2022
2. Rajeev Roy: Entrepreneurship, Third edition, Oxford university press, New delhi,2021
3. Vasat Desai, The Dynamics of Entrepreneurial Development and Management, Eight edition, Himalaya Publishing House, 2018

References:

1. H.Nandan: Fundamentals of Entrepreneurship, Third edition, PHI Learning, New Delhi, 2013
2. Robert D Hisrich, Michel P Peters, Dean A Sheperd, Sabyasachi Sinha, Entrepreneurship, 11 th edition, Mc Graw Hill India, 2020
3. Prasanna Chandra: Projects, 10 th Edition, Mc Graw Hill India,2023

DIGITAL MARKETING

(Open Elective-II)
(Common to all Branches)

Subject Code: 23OET422

L	T	P	C
3	0	0	3

Course Objectives:

1. To develop an understanding on the digital marketing.
2. To make students gaining the knowledge and skills related to the area of search engine optimization (SEO).
3. To make student understand Social Media Optimization (SMO).
4. To develop an understanding on SEM (Search Engine Marketing) through AdWords.
5. To familiarize the students with the Lead Management & Digital Marketing Practices with Hands on Experience

Course Outcomes:

After completion of the course the student will be able to

1. Appreciate the concept on digital marketing.
2. Synthesize the concept on search engine optimization (SEO).
3. Synthesize the concept and work on Social Media Optimization (SMO).
4. Illustrate the practices on SEM (Search Engine Marketing) through AdWords.
5. Justify the concepts and developments on Lead Management & Digital Marketing.

UNIT -I:

Introduction to Digital Marketing: Digital Marketing- Importance -Digital Marketing Platforms- Difference between Traditional Marketing and digital Marketing- Advantages of Digital Marketing. Role and functions of a Digital Marketing Manager

Case Study: Analyze the change in ranking of your Web Promotion Page

. [Hands on Experience on the above tools are to be undertaken]

UNIT - II:

Search Engine Optimisation: Definition, Scope of SEO, On-page optimisation and Off Page Optimisation, Report Preparation- Keywords,Titles, Meta Tags

Case Study: Analyse the impact of your Twitter Campaign

. [Hands on Experience on the above tools are to be undertaken]

UNIT –III:

Search Engine Marketing (SEM): SEM through AdWords, Keyword Selection, Create Text Ads- CPC Bidding- Navigate Ad Words- SEM Metrics & Optimization

Case Study: Analyze the performance of your Facebook and Instagram Page 2. Analyze the performance of your YouTube Video. [Hands on Experience on the above tools are to be undertaken]

UNIT – IV:

Social Media Marketing: Definition, Importance, Role of SMM, Social Media Advertising, Impact of Social Media.

[Hands on Experience on the above tools are to be undertaken]

UNIT – V:

Social Media Optimization (SMO): Meaning and scope of SMO. Social Media Optimization of Facebook- X – LinkedIn - Social Media Services Optimization

List of Cases and Analysis to be studied.

1. Digital Marketing Implementation in Business Scenario
2. Create the Digital Marketing Webpage
3. Conducting the Search Engine Optimization and Search Engine Marketing
4. Using Google Analytics to analyze website performance
5. Creating Promotional banner through Canva
6. Face book Promotion using banners
7. Creating YouTube Channel for Marketing
8. X Marketing
9. Instagram Marketing

TEXT BOOKS:

1. Gupta, Seema, Digital Marketing,3rd Edition, McGraw Hill Education, New York August 2022

2. Bhatia, by Punit Singh, Pearson, Fundamentals of Digital Marketing Second Edition Pearson Paperback, 2019

REFERENCES:

1. Kaufman, I., & Horton, C. Digital marketing: Integrating strategy and tactics with values, a guidebook for executives, managers, and students. Routledge. (2014).
2. Stokes, R. E-Marketing: The essential guide to digital marketing. Quirk eMarketing. 2022
3. Kamalesh K.Bajaj: Debjani Nag: E-commerce - The cutting edge of business, Tata Mc-

RENEWABLE ENERGY SOURCES
(Open Elective-II)

Subject Code: 23OET423

L	T	P	C
3	0	0	3

Course Objective:

- To outline the concept regarding solar radiation.
- To Outline the concept regarding the collection of solar energy and storage of solar energy
- To outline the concept regarding different types of wind mills.
- To outline the concept regarding different types of biomass digesters and geothermal energy conversion.
- To Outline the concept regarding ocean energy conversion and to Outline the concept regarding direct energy conversion

Course Outcomes:

After completion of this course the student can able to

CO1: Appreciate different kind of solar radiation, different methods of collection of solar energy and storage of solar energy.
CO2: Illustrate different types of wind mills.
CO3: Classify different types of biomass digesters and geothermal energy.
CO4: Distinguish different types of ocean energy extracting techniques.
CO5: Distinguish different kinds of direct energy conversion techniques.

UNIT – I Principles of solar radiation: Role and potential of new and renewable source, the solar energy option, the solar constant, extraterrestrial and terrestrial solar radiation, instruments for measuring solar radiation. Solar energy collection, storage and applications: Flat plate and concentrating collectors, Solar Applications- solar heating/cooling technique, solar distillation and, photovoltaic energy conversion.

UNIT-II Wind energy: Sources and potentials, block diagram, Types: horizontal and vertical axis windmills. Types of generators and its parts.

UNIT-III Biomass and Geothermal energy: Principles of Bio-Conversion, Anaerobic/aerobic digestion, gas yield. Resources, types of wells, Open loop and closed loop energy conversion.

UNIT-IV Ocean energy: OTEC, Principles utilization, setting of OTEC plants, Tidal and wave energy: Potential and conversion techniques.

UNIT-V Direct energy conversion (DEC): Need for DEC, principles of DEC. Thermoelectric generators, seebeck, peltier and joul Thomson effects, MHD generators, principles, hall effect, magnetic flux, principle of MHD, power generation with closed loop MHD systems.

TEXT BOOKS:

1. Non-Conventional Energy Sources /G.D. Rai
2. Renewable Energy Technologies /Ramesh & Kumar /Narosa

REFERENCE BOOKS:

1. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
2. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
3. Non-Conventional Energy Systems / K Mittal /Wheeler
4. Solar Energy /Sukhame.

IT SYSTEMS MANAGEMENT

(Open Elective - II)

Subject Code: 23OET424

L	T	P	C
3	0	0	3

Course Objectives:

- Provides extensive theoretical knowledge of IT infrastructure.
- Enhances the student's computing environment knowledge.
- Provides broad based knowledge of IT System management.
- Develops management skills required for a business environment.
- Builds upon the essential core Network Security and storage management with greater emphasis.

Course Outcomes:

1. Describe the business value and processes of ICT services in an organization and apply that knowledge and skill with initiative to a workplace scenario.
2. Analyze and evaluate the impact of new and current ICT services to an organization. Describe E-Commerce.
3. Enhance how effective IT Infrastructure Management requires strategic planning with alignment from both the IT and business perspectives in an organization.
4. Evaluate The Characteristics of the network Security that affect user operations.
5. Demonstrate, track, and maintain data and data resources and recent trends in IT.

Unit-I

IT Infrastructure Overview: Infrastructure management activities, Evolutions of Systems since 1960s (Mainframes-to-Midrange-to-PCs-to-Client-server computing-to-new age systems) and their Management, growth of internet, current business demands and IT systems issues, complexity of today's computing environment.

Unit-II

Software Management: SDLC, The Waterfall Model, Advantages, Disadvantages, Agile Model, Conventional Software Management performance, Software Economics.
Emerging Trends in IT: Introduction, E-Commerce, Electronic Data Interchange.

Unit-III

Current computing environment: Complexity of current computing, multiple technologies,
Common tasks in IT system management, approaches for organization IT management systems context diagram, patterns for IT system Management,
IT system Management: Service level management, Financial Management, Capacity Management, availability management.

Unit-IV

Security Management: Computer Security, Internet Security, Physical Security, Identity Management, Access control System, Intrusion Detection, Public Key Cryptography Principles, Algorithms: RSA.

Unit-V

Storage Management: Types of Storage management, Benefits of storage management, backups, Archive, Recovery, Disaster recovery. Space management, Hierarchical storage management.

Text Books:

1. Phalguni Gupta, IT Infrastructure & its Management, Tata McGraw-Hill Education, 2009.
2. Walker Royce, Software Project Management, Pearson Education, 2021.

Reference Books:

1. Ivanka Menken, ITIL V3 Foundation Certification Exam Preparation Course in a Book for Passing the ITIL V3 Foundation Exam, Second Edition (The Art of Service), 2009.
2. Van Haren, Passing the ITIL Foundation, Van Haren Publishing, 2011.
3. Service Level Agreements: A Legal and Practical Guide, by Jimmy Desai, Publishing 2010.
4. Schiesser, rich, IT Systems Management, Pearson Education, 2019.

Reference Links:

1. https://www.geeksforgeeks.org/storagemanagement/
2. https://www.geeksforgeeks.org/securitymanagement/
3. https://www.techtarget.com/

ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective - II)

Subject Code: 23OET425

L	T	P	C
3	0	0	3

Course Objectives:
This Course is intended to build the following objectives:
1. To understand basic concepts of EIA
2. To study different methodologies of EIA
3. To appreciate the significance of ecosystem and environmental protection
4. To prepare environmental audit reports
5. To understand the legal and regulatory compliance and prepare the EIA reports

Course Outcomes:
After studying the course, the student able to:
1. Determine and demonstrate the environment and developmental issues to the public effectively.
2. Assess and evaluate the key EIA methodologies and generate the data.
3. Assess and diagnose the impact of developmental activities on ecosystems.
4. Demonstrate environmental audit protocols to conduct on-site audit for the generation of reports.
5. Demonstrate the environmental and legal compliance suitable for the developmental activities and generate comprehensive EIA reports to different developmental activities.

Unit-1
Basic Concepts of EIA: History and guiding principles of EIA-EIA Process-types of EIA-Initial Environmental Evaluation (IEE)-elements of EIA-factors affecting EIA during impact evaluation and analysis-preparation of environmental base maps and importance-classification of environmental parameters.

Unit-2
EIA Methodologies: Introduction-criteria for the selection of EIA methodology-EIA Methods: Ad-hoc method-matrix method-networks Method-Environmental Media Quality Index method (EMQIM)-overlay method-cost/benefit analysis.

Unit-3
Ecosystems Assessment: Assessment of Ecosystems-Assessment of impact of development activities on vegetation and wildlife, mitigation-causes and effects of deforestation-environmental impacts of deforestation.

Unit-4
Environmental Auditing: Environmental audit definition-objectives of environmental audit-types of environmental audit-audit protocol-stages of environmental audit-onsite audit activities-post audit activities-evaluation of audit data and preparation of audit report.

Unit-5

Environmental Legislations: Environmental Legislations introduction-The Environmental (Protection) Act-1986-The Water (Prevention and Control of Pollution) Act-1974-The Air (Prevention and Control of Pollution) Act-1981-The Motor Vehicles Act-1988-The Wildlife (Protection) Act-1972.

EIA Report Writing: Introduction - Case studies and preparation of Environmental Impact Assessment (EIA) statement report for coal mining activities – chemical industries – Thermal power plants.

Text Books:

1. Environmental Science and Engineering by Suresh K. Dhameja, S. K. Kataria& Sons Publications (Recent addition), New Delhi.
2. Environmental Impact Assessment Methodologies by Y. Anjaneyulu, B. S. Publications (Recent addition), Sultan Bazar, Kakinada.

Reference Books:

1. Environmental Pollution and Control by Dr. H. S. Bhatia, Galgotia Publications (P) Ltd., New Delhi (Recent addition).
2. Environmental Science and Engineering by J. Glynn and Gary W. Hein Ke, Prentice Hall Publishers (Recent addition).

CYBER CRIME AND LAW PROTECTION
(Open Elective - II)

Subject Code: 23OET426

L	T	P	C
3	0	0	3

Prerequisite: Basic knowledge of computer networks, IT concepts, and analytical reasoning.

Course Objectives:

1. Understand the fundamental concepts of cybercrime, including its types and impacts.
2. Explore the national and state-level legal frameworks for cybersecurity in India.
3. Learn about cybercrime investigation techniques and digital forensics.
4. Develop an understanding of ethical hacking and preventive cybersecurity measures.
5. Analyze real-world case studies to apply theoretical knowledge practically.

Course Outcomes:

By the end of this course, students will be able to:
1. Differentiate between types of cybercrime and identify their root causes.
2. Analyze and apply national and state-level provisions under Indian cyber laws.
3. Utilize digital forensic tools and techniques for cybercrime investigation.
4. Implement ethical hacking and cybersecurity measures in practice.
5. Critically evaluate real-world cybercrime cases and emerging cybersecurity trends.

Unit 1: Introduction to Cyber Crime
Overview of Cyber Crime and Cyber Law, Evolution of Cyber Crimes, Types of Cyber Crimes, Cyber Crime vs. Traditional Crime, Classification of Cyber Crimes: Individuals, Property, Government, Society, Causes and Motivations Behind Cyber Crimes.

Unit 2: National and State Legal Frameworks for Cyber Security
National Laws: Information Technology Act, 2000, Amendments to IT Act, Cyber Crimes under Indian Penal Code (IPC), National Cyber Security Policy, 2013, Data Protection Bill in India, Intellectual Property Rights in Cyberspace, Jurisdiction and Legal Challenges in Indian Cyber Law.
State Laws: Andhra Pradesh Cyber Security Policy, Andhra Pradesh Data Protection and Governance Policies, Initiatives for Reducing Cyber Crimes in Andhra Pradesh, State-specific Data Protection Rules and Regulations.

Unit 3: Cyber Crime Investigation and Digital Forensics Fundamentals of Cyber Crime Investigation, Digital Forensics Process, Digital Evidence Collection, Chain of Custody and Evidence Preservation, Disk Imaging and Memory Analysis,
Forensic Tools: Network Analysis and Disk Imaging, Challenges in Cyber Crime Investigation.

Unit 4: Cyber Security Measures and Ethical Hacking
Basics of Cyber Security: Threats, Vulnerabilities, and Attacks, Cyber Security Strategies: Prevention, Detection, Response, Role of Encryption and Authentication, Ethical Hacking: Concepts, Phases, Tools and Techniques, Legal and Ethical Boundaries in Cyber Space.

Unit 5: Emerging Trends and Case Studies in Cyber Law
Landmark Cases in Cyber Crime and Cyber Law (Indian and International), Cyber Warfare and Cyber Terrorism, Data Privacy Laws: GDPR and Data Protection Bill in India, State-Level Privacy Initiatives in Andhra Pradesh, Emerging Threats: IoT Security, AI in Cyber Security, Future of Cyber Crime and Cyber Law.

Textbooks

1. Singer, P. W., & Friedman, A. (2014). Cybersecurity and Cyberwar: What Everyone Needs to Know. Oxford University Press. ISBN: 978-0199918119
2. Duggal, P. (2023). Cyber Law. LexisNexis. ISBN: 978-8196241070
3. Casey, E. (2011). Digital Evidence and Computer Crime. Academic Press. ISBN: 978-0123742681
4. Chawki, M., Wahab, M. S., & Abbasi, A. (2011). The Law of Cybercrimes and Their Investigations. CRC Press. ISBN: 978-1439851577

Reference Books

1. Britz, M. T. (2013). Computer Forensics and Cyber Crime: An Introduction. Pearson. ISBN: 978-0132677714
2. Tikk, E., Kaska, K., & Vihul, L. (2013). Introduction to Cyber-Warfare: A Multidisciplinary Approach. Syngress. ISBN: 978-0124078147
3. Akhgar, B., & Brewster, B. (2012). Cyberlaw: The Law of the Internet and Information Technology. Pearson. ISBN: 978-0132560870
4. Matwyshyn, A. M. (2009). Privacy, Security, and Information Management: An Overview. Van Haren Publishing. ISBN: 978-9087535403

MOOC:

1. https://datalawonline.co.uk/cpd-courses/cyber-crime/cyber-crime-essentials
2. https://onlinecourses.swayam2.ac.in/cec23_lw01/preview

AR-23 B. Tech Civil **IV year I Sem**

ENVIRONMENTAL ENGINEERING LAB

Course Code: 23CEL408

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

Students will have to:

1. Perform sampling procedure; determine pH and Total Solids in the given sample of water.
2. Perform Alkalinity, Acidity and dissolved oxygen of the given sample of water.
3. Perform Turbidity, Iron and estimation of acid by base
4. Perform B.O.D, dissolved, suspended and Total soilds
5. Perform Optimum Dosage of Coagulant, Chloride content, available Chlorine and residual chlorine in bleaching powder for the given sample of water

COURSE OUTCOMES:

Upon successful completion of this course, students will get ability to:

1. Demonstrate sampling procedure; determine pH and Total Solids in the given sample of water.
2. Determine Alkalinity, Acidity and dissolved oxygen of the given sample of water.
3. Demonstrate Turbidity, Iron and estimation of acid by base
4. Demonstrate B.O.D, dissolved, suspended and Total soilds
5. Demonstrate Optimum Dosage of Coagulant, Chloride content, available Chlorine and residual chlorine in bleaching powder for the given sample of water

Exp. No	Name of the Experiment
1.	Water sampling methods for lab analysis
2.	pH Metric Estimation of Acid By Base
3.	Determination of Total Hardness By EDTA Method
4.	Determination of Acidity Of Water Sample
5.	Determination of Alkalinity Of Water Sample
6.	Estimation of Dissolved Oxygen in Water Sample
7.	Determination of Turbidity of Water
8.	Determination of Iron By Thiocyanate Colorimetry
9.	Conductometric Estimation Of Acid By Base
10.	Determination of Biochemical Oxygen Demand
11.	Determination of Total Solids, Total Dissolved Solids and Total Suspended Solids
12.	Determination of Optimum Coagulant Dosage
13.	Determination of Chloride Content in the Given Sample
14.	Determination of the percentage of Available Chlorine in Bleaching Powder
15.	Determination of the Residual Chlorine

Reference: AR-20 Lab Manual, AITAM

GEOGRAPHIC INFORMATION SYSTEM LAB

Subject Code: 23CEL409

L	T	P	C
0	0	3	1.5

COURSE OBJECTIVES:

The Students will have to

1. Demonstrate the techniques/tools for pre-process the input data
2. Demonstrate the process of topology and evaluate the areas & lengths of entities
3. Demonstrate the process of creating thematic maps, layouts and Digital Elevation Model
4. Demonstrate the volume calculation process for hills/tanks using Digital Elevation Model and create the database for road network
5. Demonstrate the process to create watershed boundary, data mosaic and NDVI Analysis.

COURSE OUTCOMES:

After the completion of the course, students will be able to

1. Apply the techniques/tools for pre-process and digitization
2. Perform the process of topology and estimate the linear measurements of the entities.
3. Create thematic maps, layouts and Digital Elevation Model
4. Calculate the volume for hills/tanks using Digital Elevation Model and create the database for road network
5. Create watershed boundary, perform the data mosaic and NDVI Analysis.

EXCERCISES:

1. Preprocess of image / topo sheet (which includes Geo referencing, Projection and Subset) (CO1)
2. Digitization of Features from the Toposheet (CO1)
3. Topology of digitized of features (CO2)
4. Study of features estimation (CO2)
5. Creation of Thematic maps with Layout Preparation (CO3)
6. Digital Elevation Model (CO4)
7. Calculation of volumes for Hills and Tanks (CO4)
8. Database creation for Road Network analysis (CO5)
9. Delineation of watershed boundary (CO5)
10. Mosaic of dataset (CO6)
11. Normalized Difference Vegetation Index (NDVI) for Crop Health Analysis (CO6)

Software Tool:-

1. Quantum GIS/ArcGIS 10x
2. ERDAS Imagine 10.4.1 or any one or Equivalent.

TEXT BOOK:

1 Concepts & Techniques of GIS by Chor Pang Lo and Albert K.W. Yeung, Pearson Education, 2016