CMR COLLEGE OF ENGINEERING & TECHNOLOGY

(UGC AUTONOMOUS)

B. Tech - Civil Engineering

CBCS & OUTCOME BASED COURSE STRUCTURE & SYLLABUS

(Effective for the students admitted into I year from the Academic Year 2025-26)

SEMESTER - I							
S. No	**Course Code**	**Course Title**	**Course Category**	**Hours per Week**			**Credits**
				L	**T**	**P**	
1	A500001	Matrices and Calculus	BSC	3	1	0	4
2	A500010	Applied Chemistry	BSC	3	0	0	3
3	A503201	Engineering Graphics	ESC	2	0	2	3
4	A503202	Engineering Mechanics	ESC	3	0	0	3
5	A505203	C Programming and Data Structures	ESC	3	0	0	3
6	A500508	Chemistry Laboratory For Engineers	BSC	0	0	2	1
7	A500506	Introduction to Social Innovation	HSMC	0	0	2	1
8	A503501	Engineering Workshop	ESC	0	0	2	1
9	A505503	C Programming and Data Structures Laboratory	ESC	0	0	2	1
	--	Induction Program	VAC	-	-	-	-
		Total:		**14**	**1**	**10**	**20**
		Total hours per Week:		**25**			
	SEMESTER - II						
S. No	**Course Code**	**Course Title**	**Course Category**	**Hours per Week**			**Credits**
				L	**T**	**P**	
1	A500002	Ordinary Differential Equations and Vector Calculus	BSC	3	0	0	3
2	A500008	Advanced Engineering Physics	BSC	3	0	0	3
3	A505206	Python Programming	ESC	3	0	0	3
4	A502203	Basic Electrical and Electronics Engineering	ESC	3	0	0	3
5	A500101	English for Skill Enhancement	HSMC	3	0	0	3
6	A500502	Advanced Engineering Physics Laboratory	BSC	0	0	2	1
7	A500504	English Language and Communication Skills Lab	HSMC	0	0	2	1
8	A503502	Engineering Exploration and Practice	ESC	0	0	2	1
9	A505507	Python Programming Laboratory	ESC	0	0	2	1
10	A502502	Basic Electrical and Electronics Engineering Laboratory	ESC	0	0	2	1
		Total:		**15**	**0**	**10**	**20**
		Total hours per Week		**25**			
	Total Credits in I Year: 40						

SEMESTER – III							
S. No	**Course Code**	**Course Title**	**Course Category**	**Hours per Week**			**Credits**
				L	**T**	**P**	
1	A501301	Engineering Geology	PCC	2	0	0	2
2	A501302	Building Materials, Construction and Planning	PCC	2	0	0	2
3	A501303	Strength of Materials	PCC	3	0	0	3
4	A501304	Surveying and Geomatics	PCC	3	0	0	3
5	A501305	Fluid Mechanics	PCC	3	0	0	3
6	A500507	Social Innovation and Entrepreneurship	**HSMC**	**0**	**1**	**2**	**2**
7	A501501	Engineering Geology Laboratory	PCC	0	0	2	1
9	A501502	Strength of Materials Laboratory	PCC	0	0	2	1
10	A501503	Surveying & Geomatics Laboratory	PCC	0	0	2	1
11	A501701	Skill Development Course- Engineering Drawing Using Computer Aided Drafting Laboratory	SDC	0	0	2	1
12	A500901	Environmental Science	VAC	1	0	0	1
		Total:		**14**	**1**	**10**	**20**
		Total hours per Week:		**25**			
	SEMESTER – IV						
S. No	**Course Code**	**Course Title**	**Course Category**	**Hours per Week**			**Credits**
				L	**T**	**P**	
1	A500003	Probability and Statistics	BSC	3	0	0	3
2	A501306	Structural Mechanics	PCC	3	0	0	3
3	A501307	Water Resources and Irrigation Engineering	PCC	3	0	0	3
4	A501308	Hydraulics and Hydraulic Machinery	PCC	3	0	0	3
5	A501309	Theory of Structures	PCC	3	0	0	3
6	A501310	Concrete Technology	PCC	2	0	0	2
7	A500501	Computational Mathematics Lab	BSC	0	0	2	1
8	A501504	Computer Aided Building Drafting Laboratory	PCC	0	0	2	1
9	A501505	Material Testing Laboratory	PCC	0	0	2	1
10	A501506	Hydraulics and Hydraulic Machinery Laboratory	PCC	0	0	2	1
11	A501702	Skill Development Course- Digital Surveying Laboratory	SDC	0	0	2	1
		Total:		**17**	**0**	**10**	**22**
		Total hours per Week		**27**			
	Total Credits in Year II: 42						

SEMESTER –V							
S. No	**Course Code**	**Course Title**	**Course Category**	**Hours per Week**			**Credits**
				L	**T**	**P**	
1	A501311	Environmental Engineering	PCC	3	0	0	3
2	A501312	Design of Reinforced Concrete Members	PCC	3	0	0	3
3	A501313	Transportation Engineering	PCC	3	0	0	3
4	A5014XX	Professional Elective-I	PEC	3	0	0	3
5	A5XX601	Open Elective-I	OEC	2	0	0	2
6	A501507	Environmental Engineering Laboratory	PCC	0	0	2	1
7	A501508	Computer Aided Design Laboratory	PCC	0	0	2	1
8	A501509	Highway Materials Laboratory	PCC	0	0	2	1
9	A501801	Field Based Project/ Internship	PROJ	0	0	4	2
10	A501703	Skill Development Course- Building Information Modelling Laboratory	SDC	0	0	2	1
11	A500903	Gender Sensitization *	VAC	1	0	0	1
	A500904	Human Values and Professional Ethics*					
		Total:		**15**	**0**	**12**	**21**
		Total hours per Week:		**27**			
	SEMESTER – VI						
S. No	**Course Code**	**Course Title**	**Course Category**	**Hours per Week**			**Credits**
				L	**T**	**P**	
1	A500102	Business Economics and Financial Analysis	HSMC	3	0	0	3
2	A501314	Geotechnical Engineering	PCC	3	0	0	3
3	A501315	Design of Steel Structures	PCC	3	0	0	3
4	A5014XX	Professional Elective-II	PEC	3	0	0	3
5	A5XX603	Open Elective – II	OEC	2	0	0	2
6	A500505	English for Employability Skills Lab	HSMC	0	0	2	1
7	A501510	Geotechnical Engineering Laboratory	PCC	0	0	2	1
8	A501511	GIS Laboratory	**PCC**	**0**	**0**	**2**	**1**
9	A501512	Civil Engineering Software Laboratory	PCC	0	0	2	1
10	A501704	Skill Development Course- Project Management Software Laboratory	SDC	0	0	2	1
11	A500902	Indian Knowledge System	VAC	1	0	0	1
		Total:		**15**	**0**	**10**	**20**
		Total hours per Week		**25**			
	Total Credits in III Year: 41						

SEMESTER – VII							
S. No	**Course Code**	**Course Title**	**Course Category**	**Hours per Week**			**Credits**
				L	**T**	**P**	
1	A500103	Fundamentals of Management	HSMC	3	0	0	3
2	A501316	Estimation Quantity Surveying & Valuation	PCC	3	0	0	3
3	A501317	Foundation Engineering	PCC	3	0	0	3
4	A5014XX	Professional Elective-III	PEC	3	0	0	3
5	A5014XX	Professional Elective – IV	PEC	3	0	0	3
6	A5XX605	Open Elective – III	OEC	2	0	0	2
7	A501513	Quantity Surveying Laboratory	PCC	0	0	2	1
8	A501514	Computational Laboratory / IOT Laboratory	PCC	0	0	2	1
9	A501802	Industry Oriented Mini Project/ Summer Internship	PROJ	0	0	4	2
	Total:			**17**	**0**	**08**	**21**
	Total hours per Week:			**25**			

SEMESTER – VIII							
S. No	**Course Code**	**Course Title**	**Course Category**	**Hours per Week**			**Credits**
				L	**T**	**P**	
1	A5014XX	Professional Elective – V	PEC	3	0	0	3
2	A5014XX	Professional Elective – VI	PEC	3	0	0	3
3	A501803	Project Work	PROJ	0	0	28	14
	Total:			**6**	**0**	**28**	**20**
	Total hours per Week			**34**			
Total Credits in IV Year: 41							

List of Professional Electives

Professional Elective-I		
S.No.	**CourseCode**	**CourseName**
1	A501401	Structural Analysis
2	A501402	AI Applications in Civil Engineering
3	A501403	Remote Sensing and GIS
4	A501404	Green Building Technologies
5	A501405	Advanced Construction Technology
Professional Elective-II		
1	A501406	Prestressed Concrete
2	A501407	Machine Learning and Data Analytics in Civil Engineering
3	A501408	Hydraulic Structures
4	A501409	Industrial Waste Water Treatment
5	A501410	Railways, Airports and Water ways
Professional Elective-III		
1	A501411	Smart Cities
2	A501412	IoT Applications in Civil Engineering
3	A501413	Air pollution and Control
4	A501414	Ground water Hydrology
5	A501415	Pre Engineered Buildings
Professional Elective-IV		
1	A501416	Solid and Hazardous Waste Management
2	A501417	Fuzzy Logic and ANN Applications in Civil Engineering
3	A501418	Intelligent Transportation Systems
4	A501419	Structural Dynamics and Earth Quake Engineering
5	A501420	Construction Planning and Management
Professional Elective-V		
1	A501421	Pavement Analysis and Design
2	A501422	Computer Vision and Digital Image Processing in Civil Engineering
3	A501423	Urban Hydrology and Hydraulics
4	A501424	Ground Improvement Techniques
5	A501425	Finite Element Methods
Professional Elective-VI		
1	A501426	Structural Health Monitoring and Retrofitting of Structures
2	A501427	Quantum Computing Applications in Civil Engineering
3	A501428	Sustainable Engineering Technologies
4	A501429	Climate Change Adaptation & Mitigation
5	A501430	EIA and Life Cycle Analysis

List of Open Electives

Open Elective-I		
S.No.	**Course Code**	**Course Name**
1	A500601	Numerical Methods for Engineers
2	A500603	Basics of Logistics and Supply Chain Management
3	A500604	Industrial Relations
4	A501601	Disaster Management
5	A501602	Low Cost Materials and Green Buildings
6	A502601	Fundamentals of Electric Vehicles
7	A502602	Industrial Automation and Control
8	A503601	Optimization methods
9	A503602	Industrial Robotics
10	A504601	Principles of Communication
11	A504602	Fundamentals of Cyber Physical Systems
12	A505604	Operating Systems Fundamentals
13	A505602	Structured Query Language
Open Elective -II		
1	A500602	Mathematics for Machine Learning
2	A500605	Ethics in Business & Corporate Governance
3	A500606	Basics of Marketing
4	A501603	Building Science and Technology
5	A501604	Environmental Impact Assessment
6	A502603	Digital Energy
7	A502604	Energy Audit
8	A503603	Artificial Intelligence in mechanical Engineering
9	A503604	Non-conventional Sources of Energy
10	A504603	Fundamentals of Image Processing
11	A504604	Principles of Communication
12	A505603	Introduction to Computer Networks
13	A505604	Fundamentals in Software Engineering
Open Elective-III		
1	A500607	Strategic Management
2	A500608	Digital Marketing
3	A501605	Road Safety Engineering
4	A501606	Building Services Engineering
5	A502605	Sustainable Energy
6	A502606	Smart Grid Systems
7	A503605	Engineering Materials
8	A503606	Digital manufacturing
9	A504605	Principles of VLS
10	A504606	Electronics for Health Care
11	A505605	Algorithms Design
12	A505606	Fundamentals of Cyber Security

(A500001) MATRICES AND CALCULUS
(Common to All)

L	T	P	C
3	1	0	4

UNIT-I: Matrices
Rank of a matrix by Echelon form and Normal form – Inverse of Non-singular matrices by Gauss-Jordan method. System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations. Gauss Seidel Iteration Method.

UNIT - II: Eigen values and Eigen vectors
Linear Transformation and Orthogonal Transformation: Eigen values – Eigen vectors and their properties – 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 Quadratic form to canonical form by Orthogonal Transformation.

UNIT - III: Single Variable Calculus
Limits and Continuous functions and its properties. Mean value theorems: Rolle's theorem – Lagrange's Mean value theorem with their Geometrical Interpretation and applications – Cauchy's Mean value Theorem – Taylor's Series (All the theorems without proof).

Definition of Improper Integral: Beta and Gamma functions and their applications.

UNIT - IV: Multivariable Calculus (Partial Differentiation and applications)
Definitions of Limit and continuity – Partial Differentiation: Euler's Theorem – Total derivative – Jacobian – Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT - V: Multivariable Calculus (Integration)
Evaluation of Double Integrals (Cartesian and polar coordinates) – change of order of integration (only Cartesian form) – Change of variables for double integrals (Cartesian to polar). Evaluation of Triple Integrals – Change of variables for triple integrals (Cartesian to Spherical and Cylindrical polar coordinates). Applications: Areas by double integrals and volumes by triple integrals.

TEXT BOOKS

1. Higher Engineering Mathematics (36th Edition), B.S. Grewal, Khanna Publishers, 2010.
2. Advanced Engineering Mathematics (5th Edition), R.K. Jain and S.R.K. Iyengar, Narosa Publications, 2016.

REFERENCES

1. Advanced Engineering Mathematics (9th Edition), Erwin Kreyszig, John Wiley & Sons, 2006.
2. Calculus and Analytic geometry (9th Edition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.

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

1. Formulate the matrix representation of a system of linear equations and analyze the corresponding solution set.

2. Determine the eigenvalues and eigenvectors of a matrix, and reduce a quadratic form to its canonical form using orthogonal transformations.
3. Apply the mean value theorems to solve relevant problems in mathematical analysis. Find solution of improper integrals by using Beta and Gamma function
4. Find the extreme values of functions of two variables, both with and without constraints.
5. Evaluatemultiple integrals and apply the concept to calculate areas and volumes.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO2	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO3	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO5	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

(A500010) APPLIED CHEMISTRY
(Common toCIV, MEC)

L	T	P	C
3	0	0	3

UNIT - I: Water and its treatment

Introduction- Hardness, types, degree of hardness and units. Estimation of hardness of water byEDTA complexometric method - Numerical problems. Potable water and its specifications (WHO) - Stepsinvolved in the treatment of potable water - Disinfection of potable water by chlorination and breakpointchlorination. Defluoridation - Nalgonda technique.

Boiler troubles: Scales, Sludges and Caustic embrittlement. Internal treatment of boiler feed water -Calgon conditioning, Phosphate conditioning, Colloidal conditioning. External treatment methods -Softening of water by ion- exchange processes. Desalination of brackish water - Reverse osmosis, Electrodialysis.

UNIT - II: Electrochemistry and Corrosion

Introduction- Electrode potential, standard electrode potential, Nernst equation (no derivation),electrochemical cell - Galvanic cell, cell representation, EMF of cell - Numerical problems. Types ofelectrodes, reference electrodes - Primary reference electrode - Standard Hydrogen Electrode (SHE),Secondary reference electrode - Calomel electrode. Construction, working and determination of p^H ofunknown solution using SHE and Calomel electrode.

Corrosion: Introduction- Definition, causes and effects of corrosion - Theories of corrosion, chemicaland electrochemical theories of corrosion, Types of corrosion: galvanic, waterline and pitting corrosion.Factors affecting rate of corrosion - Nature of the metal, Nature of the corroding environment. Corrosioncontrol methods - Cathodic protection Methods - Sacrificial anode and impressed current methods.

UNIT - III: Energy sources

Batteries: Introduction - Classification of batteries - Primary, secondary and reserve batteries withexamples. Construction, working and applications of Zn-air and Lithium-ion battery. Fuel Cells -Differences between a battery and a fuel cell, Construction and applications of Direct Methanol FuelCell (DMFC).

Fuels: Introduction and characteristics of a good fuel, Calorific value - Units, HCV& LCV- Dulong'sformula - Numerical problems.

Fossil fuels: Introduction, Classification, Petroleum - Refining of Crude oil, Cracking - Types of cracking- Moving bed catalytic cracking. LPG and CNG composition and uses.

Synthetic Fuels: Fischer-Tropsch process, Introduction and applications of Hythane and GreenHydrogen.

Biofuels: Biodiesel.

UNIT - IV: Polymers

Definition - Classification of polymers: Based on origin and tacticity with examples - Types ofpolymerization - Addition (free radical addition mechanism) and condensation polymerization.Plastics, Elastomers and Fibers: Definition and applications (PVC, Buna-S, Nylon-6,6). Differencesbetween thermoplastics and thermosetting plastics, Fiber reinforced plastics (FRP).

Conducting polymers: Definition, Classification with examples - Mechanism of conduction in trans-polyacetylene and applications of conducting polymers.

Biodegradable polymers: Polylactic acid and its applications.

UNIT - V: Applications for Engineering Materials

Cement: Portland cement, its composition, setting and hardening.

Phase rule: Definition - Phase, component, degrees of freedom. Phase rule equation. Phase diagrams - One component system - water. Two component system - Lead silver system.

Lubricants: Definition and characteristics of a good lubricant - thin film mechanism of lubrication, properties of lubricants - viscosity, cloud and pour point, flash and fire point.

Interpretative spectroscopic applications of UV-Visible spectroscopy for Analysis of pollutants in dye industry, IR spectroscopy in night vision-security, Pollution Under Control- CO sensor (Passive Infrared detection).

TEXTBOOKS:

1. Engineering Chemistry (1st edition), J. Saroja, D. Divya, Skytech Publishing Company, 2025.
2. Engineering Chemistry (2nd edition), P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010.
3. Engineering Chemistry (1st edition), Rama Devi, P. Aparna and Rath, Cengage learning, 2025.

REFERENCE BOOKS:

1. Engineering Chemistry (1st edition), Thirumala Chary Laxminarayana & Shashikala, PearsonPublications (2020)
2. Engineering Chemistry (2nd edition), Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi 2011.
3. Engineering Chemistry (1st edition), Shikha Agarwal, Cambridge University Press, Delhi 2015.
4. Engineering Analysis of Smart Material Systems (1st edition), Donald J. Leo, Wiley, 2007.
5. Challenges and Opportunities in Green Hydrogen (1st edition), Paramvir Singh, Avinash KumarAgarwal, Anupma Thakur, R.K Sinha.
6. Raman Spectroscopy in Human Health and Biomedicine,https://www.worldscientific.com/doi/epdf/10.1142/13094
7. E-Content:https://doi.org/10.1142/13094 | October 2023
8. E-books:https://archive.org/details/EngineeringChemistryByShashiChawla/page/n11/mode/2u

COURSE OUTCOMES:

On completion of the course students will be able to

1. Apply the principles of water chemistry to determine hardness using EDTA, and analyze various water treatment methods including disinfection, defluoridation, softening, and desalination techniques.
2. Explain electrochemical concepts, determine electrode potentials, and evaluate corrosion phenomena; propose suitable corrosion control methods for engineering applications.
3. Understand the working and applications of batteries and fuel cells; evaluate the characteristics, calorific value, and environmental impact of fossil fuels, synthetic fuels, and biofuels.
4. Classify polymers, describe polymerization mechanisms, examine the properties and applications of plastics, elastomers, conducting polymers, and biodegradable polymers for engineering use.
5. Analyze the composition, setting, and hardening of cement, interpret phase diagrams using phase rule principles, and understand lubricants' characteristics and mechanisms relevant to engineering applications.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	1	2						
CO2	3	3	2	1	2						
CO3	3	2	3	2	2						
CO4	3	2	1	1	2						
CO5	3	3	2	3	2						

(A503202) ENGINEERING MECHANICS

(Common to CE & ME)

B.Tech. (ME): I Semester

L	T	P	C
3	0	0	3

UNIT-I

Introduction to Engineering Mechanics:

Force Systems: Basic concepts, Particle equilibrium in 2-D & 3-D, Rigid Body equilibrium, System of Forces: Coplanar Concurrent Forces, Components in Space – Resultant - Moment of Forces and its Application; Couples and Resultant of Force System.

Equilibrium of System of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial systems.

UNIT-II

Friction and Centre of Gravity:

Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction, Motion of Bodies, Wedge friction, Screw jack and Differential Screw jack

Centroid and Centre of Gravity: Centroid of Lines, Areas and Volumes from first principle, Centroid of composite sections, Centre of Gravity and its implications, Theorem of Pappus

UNIT-III

Moment of Inertia:

Definition, Area Moment of Inertia, Moment of inertia of Plane sections from first principles, Theorems of moment of inertia, Moment of inertia of standard sections and composite sections. Product of Inertia, Parallel Axis theorem, Perpendicular Axis Theorem

Mass Moment of Inertia: Moment of Inertia of Masses, Radius of Gyration, Transfer Formula for Mass Moments of Inertia, Mass moment of inertia of composite bodies.

UNIT-IV

Dynamics of a Particle:

Rectilinear motion, Plane curvilinear motion: Rectangular and Polar coordinates. Relative and constrained motion, Newton's law of motion for a particle (rectangular, path, and polar coordinates)

Work -kinetic energy, power, potential energy. Impulse and momentum: Linear, Angular, Elastic Impact (Direct and oblique).

UNIT-V

Kinetics of Rigid Bodies:

Introduction, Types of motion, Instantaneous centre of rotation in plane motion and simple problems,

D' Alembert's principle and its applications in plane motion and connected bodies

Work-Energy Method: Work-Energy principle and its application in plane motion of connected bodies or Systems, Work energy Applied to particle motion, Kinetics of rigid body rotation.

TEXTBOOKS:

1. Engineering Mechanics – Statics & Dynamics, Reddy Vijay Kumar K. and J. Suresh Kumar, Singer's, 3rd Edition, Rpt, 2024
2. Engineering Mechanics, Shames and Rao, Pearson Education, 4th edition, 2016

REFERENCE BOOKS:

1. Engineering Mechanics, Dumir P.C, Sengupta, Srinivas, Universities Press, 1st edition, 2020
2. Engineering Mechanics, Hibbeler R.C, Pearson, 14th Edition, 2017
3. Engineering Mechanics, Arshad Noor, Zahid & Goel, Cambridge University Press, 1st edition, 2018
4. Engineering Mechanics, Bhavikatti S.S, New age international publishers, 7th Edition, 2019

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Determine resultant of forces acting on a body and analyze equilibrium of a body subjected to a system of forces.
2. Determine the problem of bodies subjected to friction.
3. Find the location of Centroid and Centre of gravity of a given section.
4. Calculate moment of inertia and mass moment of inertia of a given section.

5. Solve problems using work energy equations for translation, fixed axis rotation and plane motion.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1											
CO2											
CO3											
CO4											
CO5											

(A505203) C PROGRAMMING & DATA STRUCTURES

(Common to Civil and Mech)

L	T	P	C
3	0	0	3

B. Tech (CSE): I Year I Semester

UNIT - I:

Basics of Algorithm, Flowchart and Overview of C: Algorithm, flowchart, program development steps, structure of C program, a simple C program, identifiers, basic data types and sizes, constants, variables.

Operators & Expressions: Arithmetic operators, relational and logical operators, increment and decrement operators, conditional operator, bit-wise operators, assignment operators, Special Operators, , Evaluation of Expressions, Formatting Input / Output statements. Type conversions, precedence and order of evaluation, example C programs.

Decision Statements: Introduction, Decision making with if statement, simple if statement, if-else-statement, Nesting if-else-statements, else-if ladder, Switch statement C program examples.

UNIT - II:

Looping Control Statements: While, do-while, for loop statements, Jumping Statements – Goto, Break and Continue Statements, programming examples.

Functions: Designing structured programs, functions, basics, parameter passing, storage classes-extern, auto, register, static, scope rules, block structure, user-defined functions, standard library functions, recursive functions, example C programs**.**

UNIT - III:

Arrays-concepts, declaration, definition, accessing elements, storing elements, One-dimensional array, Two-dimensional arrays and functions, applications of arrays.

Pointers: Pointers and the Indirection Operator, Declaration & Initialization of a pointer, Multiple Calls to a Function with Input / Output Parameters, Formal Output Parameters as Actual Arguments, Pointer – Arithmetic, Pointer to Pointer, Dynamic Memory Allocation, C program examples.

UNIT - IV:

Strings: String Basics, defining a String, Initialization of Strings, Reading and Writing a String, String-handling functions.

Structure and Union: Derived type structures-declaration, definition and initialization of structures. Accessing structures nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, Enumerated data type, C program examples.

UNIT - V:

Introduction to Data Structures: Abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks- Operations, array representations, Queues- operations, array representations.

Searching and Sorting: Linear and Binary search methods, Bubble sort & Selection sort.

TEXTBOOKS:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

REFERENCE BOOKS:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. Jeri R. Hanly and Elliot B. Koffman, Problem solving and Program Design in C 7th Edition, Pearson
3. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
4. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
5. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
6. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
7. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
8. Ashok N. Kamthane, C and Data Structures, Pearson Education, 2009.

Course Outcomes: The student will learn to

1. Apply the basic concepts of algorithms, flowcharts, and C program structure to develop simple programs.

2. Implement programs using control statements and functions to solve real-world problems efficiently.
3. Utilize arrays, pointers, and dynamic memory allocation in C for effective data storage and manipulation.
4. Demonstrate the use of strings, structures, and unions to manage complex and structured data.
5. Apply linear data structures such as linked lists, stacks, and queues, and implement searching and sorting techniques for data processing.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	3	-	-	-	1	-	1	3	-
CO2	3	3	2	-	3	-	-	-	1	1	2	3	-
CO3	3	3	2	2	3	-	-	-	1	1	2	3	-
CO4	3	2	2	2	3	-	-	-	1	2	2	3	2
CO5	3	3	2	2	3	-	-	-	1	2	2	3	2

(A503201) ENGINEERING GRAPHICS

(Common to CE & ME)

B.Tech. (ME): I Semester

L	T	P	C
2	0	2	3

UNIT-I

Introduction to Engineering Graphics:

Principles of Engineering Graphics and their Significance, Geometrical Constructions, Conic Sections: Ellipse, Parabola and Hyperbola – General Method (eccentricity) only. Cycloid, Epicycloids and Hypocycloid, Scales – Plain & Diagonal

UNIT-II

Orthographic Projections:

Introduction toPrinciples of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures

UNIT-III

Projections of Regular Solids:

Introduction to Regular Solids – Prism, Cylinder, Pyramid, Cone

UNIT-IV

Sections or Sectional views of Right Regular Solids:

Prism, Cylinder, Pyramid, Cone – sectional views

Development of Surfaces:

Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone

UNIT-V

Isometric Projections:

Principles of Isometric Projection – Isometric Scale – Isometric Views –Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines, Isometric Projection of Spherical Parts.

Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions, Conversion of orthographic projection into isometric view

TEXTBOOKS:

1. Engineering Drawing, N.D. Bhatt, Charotar Publishers, 54th Edition, 2023.
2. Engineering Drawing, Basant Agrawal and C M Agrawal, McGraw Hill, 3rd Edition, 2019

REFERENCE BOOKS:

1. Engineering Drawing, M. B. Shah, B.C. Rane, Pearson, 3rd Edition, 2015
2. Engineering Graphics and Design, WILEY, John Wiley and sons Inc, 3rd Edition, 2020
3. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford, 1st Edition, 2015
4. Engineering Drawing and graphics Using AutoCAD, T. Jeyapoovan, Vikas, S. Chand and Company Ltd, 3rd Edition, 2010

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Understand and Apply concepts to construct engineering curves and scales
2. Understand and Apply the principle of Orthographic projection for Points, Lines and Planes
3. Construct and interpret Orthographic projections of Solids
4. Create the Sectional views of Solids and Development of surfaces
5. Conversion of 2D to 3D objects and Create the Orthographic to Isometric view & vice versa

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1											
CO2											
CO3											
CO4											
CO5											

(A500508) CHEMISTRY LABORATORY FOR ENGINEERS

(Common to CE and ME)

B. Tech. (CE): I Year I Semester

L	T	P	C
0	0	2	1

I. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometric method.

II. **Conductometry:**
1. Estimation of the concentration of strong acid by Conductometry.
2. Estimation of the concentration of strong and weak acid in an acid mixture by Conductometry.

III. **Potentiometry:**
1. Estimation of concentration of Fe^{+2}ion by Potentiometry using $KMnO_4$.
2. Estimation of concentration of strong acid with strong base by Potentiometry using quinhydrone

IV. **p^H Metry:** Determination of an acid concentration using p^H meter.

V. **Preparations:**
1. Preparation of Bakelite.
2. Preparation of bioplastic from Starch.

VI. **Corrosion:** Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.

VII. **Lubricants:**
1. Estimation of acid value of given lubricant oil.
2. Estimation of viscosity of lubricant oil using Ostwald's Viscometer.

VIII. **Virtual lab experiments:**
1. Construction of Fuel cell and it's working.
2. Smart materials for Biomedical applications.
3. Batteries for electric vehicles.

4. Functioning of solar cells and its applications

TEXT BOOKS:

1. Engineering Chemistry Lab manual (1st edition),J. Saroja, andD. Divya, Skytech Publishing Company (2025)
2. Lab manual for Engineering chemistry (1st edition), B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)

REFERENCE BOOKS:

1. Vogel's textbook of practical organic chemistry (5th edition)
2. Inorganic Quantitative Analysis (3rd edition), A.I. Vogel, ELBS Publications.
3. College Practical Chemistry (1st edition), V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).

VIRTUAL LABS LINKS:

1. https://www.vlab.co.in/broad-area-chemical-sciences
2. https://chemcollective.org/
3. https://phet.colorado.edu/en/simulations/filter?subjects=chemistry&type=html
4. https://www.labster.com/discipline/chemistry

COURSE OUTCOMES:

On completion of the course students will be able to

1. Estimate the hardness of water using the EDTA Complexometric method and determine the concentration of acids and bases using conductometric, potentiometric, and p^H metric techniques.
2. Synthesize polymers such as Bakelite and bioplastics from starch and relate their properties to real-world engineering applications in material science.
3. Determine the rate of corrosion of mild steel in the presence and absence of inhibitors and assess their effectiveness in corrosion prevention.
4. Estimate the acid value and viscosity of lubricant oils and understand their relevance to engineering applications in machinery and lubrication systems.
5. Simulate the functioning of fuel cells, smart materials, batteries, and solar cells through virtual laboratory simulations and assess their engineering applications.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	-	2	-	-	-	-	-	-
CO2	3	3	2	-	2	-	-	-	-	-	-
CO3	3	2	2	-	2	-	-	-	-	-	-
CO4	3	2	2	-	2	-	-	-	-	-	-
CO5	3	3	3	-	3	2	-	-	-	-	-

****End****

(A500506) INTRODUCTION TO SOCIAL INNOVATION

(Common to All Branches)

	L	T	P	C
B. Tech. (CE): I Year I Semester	**0**	**0**	**2**	**1**

WEEK-1

Types and features of community **-** Rural, Sub urban, Urban and Regional

WEEK-2

Service based learning, Aims of Community based projects, Sustainable Development Goals

WEEK-3

Community visit, Report Writing, Resource Diagram, Chapati Diagram, Transect Walk

WEEK-4

Then on-profit sector, public sector, the private sector, the inform all sector

WEEK-5

Poster presentation on four sectors

WEEK-6

Process of Design Thinking

WEEK-7

Social organization sand enterprises, social movements

WEEK-8

Social software sand open-source methods

WEEK-9

Introduction to Ethics, moral values, significance of professional ethics code of conduct for engineers

WEEK-10

Identify ethical dilemmas in different tasks of engineering, applying moral theories and codes of conduct for resolution of ethical dilemmas

WEEK-11

Case studies on Engineering Ethics

WEEK-12

Steps for Patent filing and Start ups, Procedure for grants of patents, Indian Scenario of Patenting, International cooperation on Intellectual Property, Documentation, Panel Presentation

TEXT BOOKS:

1. Social Entrepreneurship for the 21st Century: Innovation Across the Non Profit, Private and Public Sectors; Georgia Levenson Keohane; Tata Mc Graw Hill
2. Solving Problems with Design Thinking – Ten Stories of What Works (Columbia Business School Publishing) Hard cover – 20 Sep 2013 by Jeanne Liedtka (Author), Andrew King (Author), Kevin Bennett (Author)

REFERENCE BOOKS:

1. Fundamentals of Intellectual Property (English) 1st Edition (Paperback, Dr. Kalyan C. Kankanala) Publisher: Asia Law House ISBN: 9789381849514, 938184951 X Edition: 1st Edition, 2012
2. Indian Patent Law (English, Paperback, Kalyan C. Kankanala) Publisher: Oxford University Press – New Delhi, ISBN: 9780198089605, 0198089600 Edition: 2012
3. Social Enterprises: An Organizational Perspective edited; Benjamin Gidron, Yeheskel Hasenfeld; Palgrave Macmillan
4. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011
5. Engineering Ethics: An Industrial Perspective; Gail Baura; Elsevier
6. Intellectual Property and Financing Strategies for Technology Startups; Gerald B. Halt, Jr., John C. Donch Jr., Amber R. Stiles, Robert Fesnak; Springer

COURSE OUTCOMES:

On completion of the course students will be able to

1. Identify community issues through community Interaction
2. Illustrate the factors affecting social innovation in various sectors
3. Apply design thinking concept to analyze the community problems
4. Adopt the ethical values in implementing the Social innovation
5. Describe the process of property rights and patent filing.

CO-POMAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	3	-	3	2	-	-
CO2	-	-	-	-	-	3	1	3	2	-	-
CO3	-	3	-	2	-	2	-	2	-	2	2
CO4	-	-	-	-	-	-	3	2	2	-	2
CO5	-	-	-	-	-	2	2	1	1	-	3

****End****

(A503501) ENGINEERING WORKSHOP

(Common to CE and ME)

B. Tech. (CE): I Year I Semester

L	T	P	C
0	0	2	1

Pre-requisites: Practical skill

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

I. Carpentry: T Lap joint, Cross Lap joint, Dovetail joint, Mortise and Tenon joint
II. Fitting: V fit, Dovetail fit and Semi-circular fit
III. Tin-Smithy: Square tin, Rectangular try and Conical funnel
IV. Foundry: Preparation of Green Sand mould using Single piece and Split pattern
V. Welding Practice: Arc welding and Gas welding
VI. House-wiring: Parallel and Series, Two-way Switch and Tube light
VII. Black Smithy: Round to Square, Fan hook and S-hook

2. TRADES FOR DEMONSTRATION & EXPOSURE:

Plumbing, Lathe, Power tools and Wood working

TEXT BOOKS:

1. Workshop Practice, B. L. Juneja, Cengage Learning India, 1st Edition, 2016
2. Workshop Practice Manual, Venkat Reddy, BS Publications, 6th Edition, Rpt 2025

REFERENCE BOOKS:

1. Work shop Manual, P. Kannaiah & K.L. Narayana, Scitech Publishers, 2nd Edition, 2008
2. Workshop Manual, K. Venugopal, Anuradha Publications, 12th Edition, 2012

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Study and practice on trade tools and their operations
2. Practice and prepare components using workshop trades including carpentry, fitting, Tin smithy.
3. Practice and prepare components using workshop trades including Foundry, welding.
4. Practice and prepare components using workshop trades including House wiring, black smithy and Plumbing.
5. Acquire knowledge by exposure to modern Tools.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	-	-	3	1	1	-	-	-	1
CO2	2	2	2	-	3	1	1	-	2	-	1
CO3	2	2	2	-	3	2	2	-	2	-	1
CO4	2	2	2	-	3	2	2	-	2	-	1
CO5	1	1	2	-	3	1	1	-	2	-	2

****End****

(A505503) C PROGRAMMING AND DATA STRUCTURES LABORATORY

(Common to CE and ME)

B. Tech. (CE): I Year I Semester

L	T	P	C
0	0	2	1

[Note:The programs may be executed using any available Open Source/ Freely available IDE
Some of the Tools available are:
CodeLite: https://codelite.org/
Code::Blocks: http://www.codeblocks.org/
DevCpp :http://www.bloodshed.net/devcpp.html
Eclipse: http://www.eclipse.org
This list is not exhaustive and is NOT in any order of preference]

Course Outcomes:

After completing this course, the student will be able to:
CO1: Write simple programs using C language to perform basic input/output operations and evaluate expressions using operators and selection statements.
CO2: Apply iterative constructs and functions to solve real-time computational problems.
CO3: Implement programs using arrays and pointers for storing and manipulating data efficiently.
CO4: Develop applications using strings and structures for text processing and record management.
CO5: Apply data structures such as linked lists, stacks, and queues and implement searching and sorting algorithms for effective data processing.

Operators and Expressions:
Practice Programs:

- Write a simple program that prints the results of all the operators available in C, Read required operand valuesfrom standard input.
- Write a program that reads the radius of a circle (as a float value) and computes and prints the diameter, the circumference and the area, consider π value as a symbolic constant.
- Write a C program for the simple and compound interest.

Additional Programs:

- Write a C program to compute $s = ut + ½ at^2$ [Read u, t & a values from keyboard].
- Write a program that asks the user to enter the total time elapsed, in seconds, since an event and converts the time to hours, minutes and seconds. The time should be displayed as hours: minutes: seconds. [Hint: Use the remainder operator]

Decision statements:
Practice Programs:

- Write a C program for finding the max and min from the given three numbers.
- Write a C program to find the roots of a Quadratic equation.
- Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement).

Additional Programs:

- Write a C program to calculate the electricity bill. Read starting and ending meter readings. The charges are as follows:

No. of Units Consumed	**Unit Cost (per unit)**
>=500	5.00 Rs/unit
>=200 to <500	3.50 Rs/unit
>=100 &<200	2.50 Rs/unit
Less than 100	1.50 Rs/unit

- Write a C program to convert years into 1. MINUTES 2. HOURS 3. DAYS 4. MONTHS 5. SECONDS using switch-case statement.

Loop Control Statements:
Practice Programs:

- Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
  5 x 1 = 5

5 x 2 = 10
5 x 3 = 15

- Write a C program to print all the prime numbers between the given limits.
- Write a C program to find the sum of individual digits of a positive integer.
- Write a C program to construct a pyramid of numbers as follows:

```
1                    a
1  2                 b b
1  2  3              c c c
1  2  3  4           d d d d
```

Additional Programs:

- A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
- Write a C program to check whether the given year is leap-year or not using goto statement.
- Write a C program to summate the Sin Series of n terms [Hint: input x and n terms]

$$\sin(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \cdots$$

Functions & Recursion:

Practice Programs:

- Write a C program to find the sum of any two integers, using function.
- Write C programs that uses recursive functions:
  a. To find the factorial of a given integer.
  b. To find the GCD (greatest common divisor) of two given integers.

Additional Programs:

- Write a C program to check whether the given number is Armstrong or not? using function
- Write a C program to convert the given decimal number into equivalent binary form.

Arrays:

Practice Programs:

- Write a C program to find the minimum, maximum and average in an array of integers.
- Write a C program that uses functions to perform the Addition of Two Matrices

Additional Programs:

- Write a C program that uses functions to perform the Multiplication of Two Matrices
- Write a C program to find second largest number from given array.

Strings:

Practice Programs:

- Write C programs using String-Handling functions:
  a**. T**o find the length of a given string
  b. To append one string at end of another string
- Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, etc.) using string handling functions
- Write a C program that displays the position of a character ch in the string S or – 1 if S doesn't contain ch.

Additional Programs:

- Write a C program to count the lines, words and characters in a given text.
- Write a C program that uses functions to perform the following operations:
  i. To insert a sub-string into a given main string from a given position.
  ii. To delete n Characters from a given position in a given string

Pointers:

Practice Programs:

- Write a C program to perform different arithmetic operations using pointers.
- Write a C program to swap two numbers using call-by-value and call-by-reference concept.

Additional Programs:

- Write a C program to read and display array elements using pointers only, and compute the minimum, maximum, and average using pointer operations.
- Write a program for display values in reverse order from an array using a pointer.

- Write a C program to find the length of a given string including and excluding spaces using pointers.
- Write a C program to read string from keyboard and display it using character pointer.

Structures:

Practice Programs:

- Write a C program to read and display a student structure with the following data items: student_name, student_rno, student_percentage.
- Write a C program to copy the structure elements from one structure variable to another.
- Write a C program to declare pointer to structure and display the contents of the structure.

Additional Programs:

- Write a C program to find the sum of any two complex numbers using function.
- Write a C program to read and display roll number, full name and date of birth of a student using nested structures.
- Write a C program to create enumerated data type for 12 months. Display their values in integer constants.

Files:

Practice Programs:

- Write a C program to write data to text file and read it.
- Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents and read the result file.

Additional Programs:

- Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)using CLA.
- Write a C program to read and display the contents of an existing file by skipping the first n-characters from the beginning of the file. [Hint: Use fseek() funcion]

DataStructures

Practice Programs:

- Writeaprogramthatusesfunctionstoperformthefollowingoperationsonsinglylinkedlist
  - Creation,ii)Insertion,iii)Deletionandiv) Traversal
- Writeaprogramthatimplementstack(itsoperations)using Arrays
- WriteaprogramthatimplementQueue(itsoperations)using Arrays

Additional Programs:

- Write a C Program to display the elements in the Single Linked List in reverse Order.
- Write a C Program to store and display a Polynomial Equation of order n ($4X^8+2X^5-3X^3+X^2-10$, here 'n' is 8)

Sorting and Searching:

Practice Programs:

- Write a C program that uses function to search for a Key value in a given list of integers using linear search method.
- Write a C program that uses recursive and non-recursive functions to search for a Key value in a given sorted list of integers using binary search method.
- Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.

Additional Programs:

- Write a C program that sorts the given array of integers using selection sort in descending order
- Write a C program that sorts the given array of integers using insertion sort in ascending order
- Write a C program that sorts a given array of names.

TEXT BOOKS:

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. Jeri R. Hanly and Elliot B. Koffman, Problem solving and Program Design in C 7th Edition, Pearson

REFERENCE BOOKS:

- Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
- E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill

- Yashavant Kanetkar, Let Us C, 18th Edition, BPB
- R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
- Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
- Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
- B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

CO-PO MAPPING:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11
CO 1	3	2	1	-	1	-	-	-	-	-	-
CO 2	3	3	2	-	2	-	-	-	-	-	-
CO 3	3	3	2	-	2	-	-	-	-	-	-
CO 4	3	3	3	-	2	-	-	-	1	1	-
CO 5	3	3	3	2	3	-	-	-	-	-	-

****End****

L	T	P	C
3	0	0	3

(A500002) ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS
(Common to All Branches)

UNIT-I: First Order Ordinary Differential Equations
Exact differential equations – Equations reducible to exact differential equations – linear and Bernoulli's equations – Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling – Law of natural growth and decay.

UNIT-II: Ordinary Differential Equations of Higher Order
Higher order linear differential equations with constant coefficients: Non-Homogeneous terms of the type $e^{ax}, \sin ax, \cos ax,$ polynomials in x, $e^{ax}V(x)$ and $x\,V(x)$ – Method of variation of parameters.

UNIT-III: Laplace Transforms
Laplace Transforms: Laplace Transform of standard functions – First shifting theorem – Laplace transforms of functions multiplied by 't' and divided by 't' – Laplace transforms of derivatives and integrals of function – Evaluation of integrals by Laplace transforms – Laplace transform of periodic functions – Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

UNIT-IV: Vector Differentiation
Vector point functions and scalar point functions – Gradient – Divergence and Curl – Directional derivatives – Vector Identities – Scalar potential functions – Solenoidal and Irrotational vectors.

UNIT-V: Vector Integration
Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications

TEXT BOOKS

1. Higher Engineering Mathematics (36th Edition), B.S. Grewal, Khanna Publishers, 2010.
2. Advanced Engineering Mathematics (5th Edition), R.K. Jain and S.R.K. Iyengar, Narosa Publications, 2016.

REFERENCES

1. Advanced Engineering Mathematics (9th Edition), Erwin Kreyszig, John Wiley & Sons, 2006.
2. Calculus and Analytic geometry (9th Edition), G.B. Thomas and R.L. Finney, Pearson, Reprint, 2002.

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

1. Determine whether a given first-order differential equation is exact, linear or Bernoulli's and apply the concepts to model and analyze real-world problems.
2. Solve higher-order differential equations and apply Method of variation of parameters.
3. Utilize Laplace transform techniques for solving ordinary differential equations.
4. Find Gradient, Divergence, Curl and Directional derivatives of vector point functions and scalar point functions
5. Evaluate line, surface, and volume integrals in various coordinate systems. Transform one type of integral into another using the appropriate vector integral theorems.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	**3**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO2	**3**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO3	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO5	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**2**

(A500008) ADVANCED ENGINEERING PHYSICS

(Common to All)

L	T	P	C
3	0	0	3

UNIT - I: CRYSTALLOGRAPHY

Introduction: Unit cell, space lattice, basis, lattice parameters; crystal structures, Bravais lattices, packing factor: SC, BCC, FCC; Miller indices, inter-planar distance, defects in crystals (qualitative): point defects, line defects, surface defects and volume defects.

CONCEPT OF NANOMATERIALS & MATERIALS CHARACTERIZATION:

Surface to volume ratio, X -ray diffraction: Bragg's law, powder method, crystallite size - Debye Scherrer's formula, scanning electron microscopy (SEM): block diagram, working principle.

UNIT - II: QUANTUM MECHANICS

Introduction, de-Broglie hypothesis, physical significance of wave function, postulates of quantum mechanics, operators in quantum mechanics, Eigen values and Eigen functions, expectation value; Schrödinger's time independent wave equation, particle in a 1D box, Kronig-Penny Model (qualitative), classification of solids, concept of discrete energy levels and quantum confinement in nanomaterial.

SEMICONDUCTORS AND DEVICES:

Intrinsic and Extrinsic semiconductors (qualitative), Hall effect, Construction, principle of operation and characteristics of P-N Junction diode. Direct and indirect band gap semiconductors – LED and Solar cells, their structure, materials, working principle and characteristics.

UNIT - III: QUANTUM COMPUTING

Introduction, linear algebra for quantum computation, Dirac's Bra and Ket notation and their properties, Hilbert space, Bloch's sphere (qualitative), concept of quantum computer, classical bits. Qubits, multiple Qubit system.

Quantum computing system for information processing, evolution of quantum systems, quantum measurements, Entanglement(qualitative), Single qubit gates, multi qubit gate, challenges and advantages of quantum computing over classical computation(qualitative). Quantum algorithms: Deutsch-Jozsa, Shor, Grover.

UNIT - IV: MAGNETIC MATERIALS

Introduction to magnetic materials, origin of magnetic moment-classification of magnetic materials, hysteresis, Weiss domain theory of ferromagnetism, soft and hard magnetic materials, synthesis of ferromagnetic materials using sol-gel method, applications: magnets for electric vehicles (EV).

DIELECTRIC MATERIALS :

Introduction to dielectric materials, types of polarization (qualitative): electronic, ionic & orientation; ferroelectric, piezoelectric, pyroelectric materials and their applications: Ferroelectric Random-Access Memory (Fe-RAM), production of Ultrasonics by piezoelectric method.

UNIT - V: LASER

Introduction to laser, characteristics of laser, Einstein coefficients and their relations, metastable state, population inversion, pumping mechanism, lasing action, Ruby laser, He-Ne laser, CO_2 laser, semiconductor diode laser, applications: Bar code scanner, LIDAR for autonomous vehicle.

FIBER OPTICS

Introduction to Fiber optics, total internal reflection, construction of optical fiber, acceptance angle, numerical aperture, classification of optical fibers, losses in optical fiber (qualitative), applications: optical fibers for communication system.

TEXTBOOKS:

4. Crystallography: An Introduction (3rd Edition), Walter Borchardt-Ott, Springer, 2011.
5. Introduction to Solid State Physics (9th Edition) Charles Kittel, John Wiley & Sons, Inc, 2018
6. Introduction to Classical and Quantum Computing, (1st Edition) Thomas G. Wong, Rooted Grove, 2022.
7. Physics of Semiconductor devices (4th edition), Simon.MSze and Kwok K . Ng, Wiley Student Edition, 2006.

REFERENCE BOOKS:

9. Quantum Computing (1st Edition), Jozef Gruska, McGraw Hill, 1999.
10. Quantum Computation and Quantum Information (10th Edition), Cambridge University Press, 2010
11. Optical Fiber Communications Principles and Practice (3rd Edition), Pearson Education Limited,2009
12. Essentials of Nano science& Nanotechnology(1stedition), Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 2021
13. Engineering Physics(3rd edition), PK Palanisam, SciTech Publications, 2015.

COURSE OUTCOMES:

On completion of the course students will be able to

6. Analyze crystal structures, identify defects, and apply XRD and SEM techniques for material characterization.
7. Apply quantum mechanical principles to explain particle behavior and energy band formation in solids and classify semiconductor devices.
8. Understand quantum computing concepts, use quantum gates, and explain basic quantum information process.
9. Classify magnetic and dielectric materials and explain their properties, synthesis, and applications.
10. Appreciate the principles of lasers and fiber optics and their applications in communication.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2								
CO2	3	3	2		2						
CO3	3	3	2	2	2						
CO4	3	3	2								
CO5	3	3	2		2						

(A505206) PYTHON PROGRAMMING
(Common to All)

L	T	P	C
3	0	0	3

B. Tech (CSE): I Year II Semester

UNIT – I
Introduction to Python Programming: History and features of Python, Installation and setup of Python environment, Python interpreter and help utility, Variables, data types, and operators, Input/output operations, Using Python as a calculator, Writing basic Python programs, Control structures: if, if-else, if-elif-else, Looping constructs: for, while, break, continue, String operations and formatting

UNIT – II
Functions, Recursion and Data Structures: Defining and calling functions, Function parameters and return values, Recursion and recursive functions, Lists, tuples, dictionaries: creation and manipulation, List and dictionary operations, Searching and sorting in lists, Detecting and removing duplicates, Working with arrays using NumPy, Set operations and common value detection

UNIT – III
Object-Oriented Programming and Modules: Classes and objects, Attributes and methods, Constructors and destructors, Inheritance and polymorphism, Creating and using modules, Exception handling: try, except, finally, GUI programming using Tkinter, Drawing shapes on canvas: rectangles, points, circles, Adding attributes like color and position

UNIT – IV
File Handling and Text Processing: Reading and writing text files, File operations: open, read, write, append, Merging file contents, Searching for words in files, Word frequency analysis, Counting vowels, spaces, and case letters, Validating email and phone numbers, Removing and replacing words in strings

UNIT – V
Scientific Libraries and Logic Design: Introduction to NumPy, SciPy, and Matplotlib, Installing and exploring NumPy functionalities, Array operations and plotting basics, Implementing digital logic gates: AND, OR, NOT, XOR, Creating GUI windows with labels, text fields, buttons, Event handling in GUI applications, Recursive generation of binary strings

TEXTBOOKS:
1. Python Programming: A Complete Beginners Guide To Python, Nicholas I. Murphy, ISBN-13: 979-8343258240, Publisher: Independently published
2. Python Programming: Using Problem Solving Approach by Reema Thareja, Oxford University Press

REFERENCE BOOKS:
1. Think Python: How to Think Like a Computer Scientist by Allen B. Downey

Course Outcomes: The student will learn to
1. Understand the foundational concepts of Python programming including syntax, data types, operators, control structures, and string manipulation.
2. Apply functions, recursion, and data structures such as lists, tuples, dictionaries, and arrays to solve computational problems efficiently.
3. Implement object-oriented programming principles using Python classes and modules, and develop GUI applications using Tkinter.
4. Perform file handling operations and text processing tasks including reading, writing, searching, and analyzing textual data.
5. Explore scientific libraries such as NumPy, SciPy, and Matplotlib, and design logic-based applications including digital gates and GUI-based tools.

CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	–	2	–	–	–	–	1	–	3	2
CO2	3	3	2	2	2	–	–	–	–	1	–	3	2
CO3	2	2	3	2	3	–	–	–	–	2	1	2	3
CO4	2	2	2	2	3	–	–	–	–	2	–	2	2
CO5	3	3	3	2	3	–	–	–	–	1	1	3	3

(A502203) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING
(Common to ME & CE)

B. Tech. (ME & CE):

L	T	P	C
3	0	0	3

Course Objectives:

1. To introduce the concepts of electrical circuits and its components
2. To understand magnetic circuits, DC circuits and AC single phase and three phase circuits
3. To study and understand the different types of DC, AC machines and Transformers.
4. To import the knowledge of various electrical installations.
5. To introduce the concept of power, power factor and its improvement.
6. To introduce the concepts of diodes and transistors, and
7. To impart the knowledge of various configurations, characteristics and applications

UNIT - I: D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. A.C. Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits, Threephase balanced circuits, voltage and current relations in star and delta connections.

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

UNIT - III: Electrical Machines: Working principle of Single-phase transformer, equivalent circuit, losses in transformers, efficiency, Three-phase transformer connections. Construction and working principle of DC generators, EMF equation, working principle of DC motors, Torque equations and Speed control of DC motors, Construction and working principle of Three-phase Induction motor, Torques equations and Speed control of Three-phase induction motor. Construction and working principle of synchronous generators

UNIT - IV: P-N Junction and Zener Diode: Principle of Operation Diode equation, Volt-Ampere characteristics, Temperature dependence, Ideal versus practical, Static and dynamic resistances, Equivalent circuit, Zener diode characteristics and applications. Rectifiers and Filters: P-N junction as a rectifier - Half Wave Rectifier, Ripple Factor - Full Wave Rectifier, Bridge Rectifier, Harmonic components in Rectifier Circuits, Filters – Inductor Filters, Capacitor Filters, L- section Filters, π- section Filters.

UNIT - V: Bipolar Junction Transistor (BJT): Construction, Principle of Operation, Amplifying Action, Common Emitter, Common Base and Common Collector configurations, Comparison of CE, CB and CC configurations. Field Effect Transistor (FET): Construction, Principle of Operation, Comparison of BJT and FET, Biasing FET.

TEXT BOOKS:

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education

REFERENCE BOOKS:

1. Electronic Devices and Circuits – R. L. Boylestad and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, SatyabrataJit, TMH, 2/e, 1998.
3. Engineering circuit analysis- by William Hayt and Jack E. Kemmerly, McGraw Hill Company, 6th edition.
4. Linear circuit analysis (time domain phasor and Laplace transform approaches) - 2 nd edition by Raymond A. De Carlo and Pen-Min-Lin, Oxford University Press-2004.
5. Network Theory by N. C. Jagan& C. Lakshminarayana, B.S. Publications.
6. Network Theory by Sudhakar, Shyam Mohan Palli, TMH.
7. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
8. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
9. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

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

1. Analyze and solve electrical circuits using network laws and theorems.

2. Understand and analyze basic Electric and Magnetic circuits
3. Study the working principles of Electrical Machines
4. Introduce components of Low Voltage Electrical Installations
5. Identify and characterize diodes and various types of transistors.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1											
CO2											
CO3											
CO4											
CO5											

(A500101) ENGLISH FOR SKILL ENHANCEMENT

(Common to All)

L	T	P	C
3	0	0	3

Unit –I

Theme: Perspectives

Lesson on 'The Generation Gap' by Benjamin M. Spock from the prescribed textbook titled *English for the Young in the Digital World* published by Orient Black Swan Pvt. Ltd.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Words Often Misspelt - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing with Reference to Parts of Speech particularly Articles and Prepositions – Degrees of Comparison

Reading: Reading and Its Importance- Sub Skills of Reading – Skimming and Scanning.

Writing: Sentence Structures and Types -Use of Phrases and Clauses in Sentences- Importance of Proper Punctuation- Techniques for Writing Precisely –Nature and Style of Formal Writing.

Unit –II

Theme: Digital Transformation

Lesson on '*Emerging Technologies*' from the prescribed textbook titled *English for the Young in the Digital World* published by Orient Black Swan Pvt. Ltd.

Vocabulary: Homophones, Homonyms and Homographs

Grammar: Identifying Common Errors in Writing with Reference to Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Reading Strategies-Guessing Meaning from Context – Identifying Main Ideas – Exercises for Practice

Writing: Paragraph Writing – Types, Structures and Features of a Paragraph - Creating Coherence – Linkers and Connectives - Organizing Principles in a Paragraph – Defining- Describing People, Objects, Places and Events – Classifying- Providing Examples or Evidence - Essay Writing - Writing Introduction and Conclusion.

Unit –III

Theme: Attitude and Gratitude

Poems on '*Leisure'* by William Henry Davies and '*Be Thankful'*- Unknown Author from the prescribed textbook titled *English for the Young in the Digital World* published by Orient Black Swan Pvt. Ltd.

Vocabulary: Words Often Confused - Words from Foreign Languages and their Use in English.

Grammar: Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses.

Reading: Sub-Skills of Reading – Identifying Topic Sentence and Providing Supporting Ideas- Exercises for Practice.

Writing: Format of a Formal Letter-Writing Formal Letters E.g.., Letter of Complaint, Letter of Requisition, Job Application with CV/Resume –Difference between Writing a Letter and an Email - Email Etiquette.

Unit –IV

Theme: Entrepreneurship

Lesson on '*Why a Start-Up Needs to Find its Customers First*' by Pranav Jain from the prescribed textbook titled *English for the Young in the Digital World* published by Orient Black Swan Pvt. Ltd.

Vocabulary: Standard Abbreviations in English – Inferring Meanings of Words through Context – Phrasal Verbs – Idioms.

Grammar: Redundancies and Clichés in Written Communication – Converting Passive to Active Voice and Vice-Versa.

Reading: Prompt Engineering Techniques– Comprehending and Generating Appropriate Prompts- Exercises for Practice

Writing: Writing Practices- Note Making-Précis Writing.

Unit –V

Theme: Integrity and Professionalism

Lesson on '*Professional Ethics*' from the prescribed textbook titled *English for the Young in the Digital World* published by Orient Black Swan Pvt. Ltd.

Vocabulary: Technical Vocabulary and their Usage– One Word Substitutes – Collocations.

Grammar: Direct and Indirect Speech - Common Errors in English (Covering all the other aspects of grammar which were not covered in the previous units)

Reading: Survey, Question, Read, Recite and Review (SQ3R Method) – Inferring the Meaning and Evaluating a Text- Exercises for Practice

Writing: ***Report Writing - Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Technical Report.***

Prescribed Textbook

1. *English for the Young in the Digital World,*Orient BlackSwan Pvt. Ltd, Board of Editors. *2025.*

References:

1. *Practical English Usage,* Swan,Michael, Oxford University Press. New Edition..(2016).

2. *English Grammar Just for You. Karal, Rajeevan.*Oxford University Press. New Delhi (*2023).*

3. *Communication Skills –A Workbook.*Sanjay Kumar & Pushp Lata. Oxford University Press New Delhi (2022).

4. *English for Technical Communication for Engineering Students.*Vishwamohan, AyshaMc Graw-Hill Education India Pvt. Ltd.(2013)

COURSE OUTCOMES:

Students will be able to

1. Choose appropriate vocabulary in their oral and written communication.
2. Demonstrate their understanding of the rules of functional grammar and sentence structures.
3. Develop comprehension skills from known and unknown passages.
4. Write paragraphs, essays, précis and draft letters.
5. Write abstracts and reports in various contexts.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1		**2**							**2**		
CO2										**3**	**2**
CO3										**2**	
CO4									**3**		**2**
CO5										**3**	

(A500502) (A500502) ADVANCED ENGINEERING PHYSICS LABORATORY
(Common to All Branches)

B. Tech (CE): I Year II Semester

L	T	P	C
0	0	2	1

(Any 8 experiments are to be performed)

1. Determination of Planck's constant using Photo Electric Effect.
2. Determination of energy gap of a semiconductor.
3. Determination of Hall coefficient and carrier concentration of a given semiconductor.
4. Study of V-I characteristics of a LED
5. Study of V-I characteristics of a Solar Cell and find its Fill factor.
6. Determination of magnetic moment of a bar magnet and horizontal earth magnetic field.
7. Study of B-H curve of a ferromagnetic material.
8. Determination of dielectric constant of a given material.
9. Study of V-I & L-I characteristics of a given laser diode
10. a. Determination of wavelength of a laser using diffraction grating.
    b. Determination of LASER beam divergence
11. a. Determination of numerical aperture of a given optical fiber.
    b. Determination of bending losses of a given optical fiber.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Determine the energy gap using semiconductors using experimental methods.
2. Appreciate **and apply** the principles of **quantum physics** in the field of **optoelectronics**
3. Analyze the variation of Magnetic fields and their properties
4. Examine and interpret the variation of dielectric properties of a material.
5. Demonstrate working knowledge of laser systems and optical fiber parameters through experimental study.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	1	-	-	-	-	-	-	-
CO2	3	3	2	1	-	-	-	-	-	-	-
CO3	3	3	2	1	-	-	-	-	-	-	-
CO4	3	3	2	1	-	-	-	-	-	-	-
CO5	3	3	2	1	-	-	-	-	-	-	-

****End****

(A500504) ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY
(Common to All Branches)

B. Tech (CE): I Year II Semester	L	T	P	C
	0	0	2	1

Exercise – I
CALL Lab:
Instruction: Speech Sounds-Listening Skill - Importance – Purpose - Types- Barriers- Active Listening
Practice: Listening to Distinguish Speech Sounds (Minimal Pairs) - *Testing Exercises*
ICS Lab:
5.* Diagnostic Test – Activity titled '*Express Your View'
Instruction: Spoken and Written language- Formal and Informal English -Greetings - Introducing Oneself and Others
Practice: Any Ice-Breaking Activity

Exercise – II
CALL Lab:
Instruction: Listening vs. Hearing - Barriers to Listening
Practice: Listening for General Information -Multiple Choice Questions -*Listening Comprehension Exercises (It is essential to identify a suitable passage with exercises for practice.)*
ICS Lab:
Instruction: Features of Good Conversation – Strategies for Effective Communication
Practice: Role Play Activity -Situational Dialogues –Expressions used in Various Situations –Making Requests and Seeking Permissions – Taking Leave - Telephone Etiquette

Exercise - III
CALL Lab:
Instruction: Errors in Pronunciation – Tips for Neutralizing Mother Tongue Influence (MTI)
Practice: Differences between British and American Pronunciation –*Listening Comprehension Exercises*
ICS Lab:
Instruction: Describing Objects, Situations, Places, People and Events
Practice: Picture Description Activity – Looking at a Picture and Describing Objects, Situations, Places, People and Events *(A wide range of Materials / Handouts are to be made available in the lab.)*

Exercise – IV
CALL Lab:
Instruction: Techniques for *Effective* Listening
Practice: Listening for Specific Details - Listening - Gap Fill Exercises - *Listening Comprehension Exercises*
(It is essential to identify a suitable passage with exercises for practice.)
ICS Lab:
Instruction: How to Tell a Good Story -Story Star- Sequencing-Creativity
Practice: Activity on Telling and Retelling Stories -Collage

Exercise – V
CALL Lab:
Instruction: Identifying the literal and implied meaning
Practice: Listening for Evaluation- Write the Summary –Listening Comprehension Exercises
(It is essential to identify a suitable passage with exercises for practice.)
ICS Lab:
Instruction: Understanding Non-Verbal Communication
Practice: Silent Speech - Dumb Charades Activity

SUGGESTED SOFTWARE:
1. Punctuation Made Easy by Darling Kindersley.
2. **Free Mobile App**: The official OALD 10th Edition app provides **100 free sample entries.**
3. **Free Access**: Limited to downloadable samples (table of contents, sample pages, copyright information) available on the Cambridge website.

REFERENCES BOOKS:

- Communicative English – A workbook, Shobha, KN &Rayen, J. Lourdes. Cambridge University Press, (2019).
- English Language Communication Skills – Lab Manual cum Workbook, Cengage Learning India Pvt. Ltd (2022).
- Five Minute Activities – A Resource Book for Language Teachers Ur, Penny and Wright, Andrew Cambridge University Press (2022).

COURSE OUTCOMES:

On completion of the course students will be able to

1. Listen actively and identify important information in spoken texts
2. Interpret the speech and infer the intention of the speaker
3. Improve their accent for intelligibility
4. Speak fluently with clarity and confidence
5. Use the language in real life situations

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	-	-	-	-	-	-	-	-	**2**	-	-
CO2	-	-	-	-	-	-	-	**1**	-	**2**	-
CO3	-	-	-	-	-	-	-	-	-	**2**	-
CO4	-	-	-	-	-	-	-	-	**2**	-	-
CO5	-	-	-	-	-	-	-	-	-	**2**	**2**

****End****

(A503502) ENGINEERING EXPLORATION AND PRACTICE
(Common to All Branches)

B. Tech (CE): I Year II Semester

L	T	P	C
0	0	2	1

Week-1: Difference between Science and Engineering, Scientist and Engineer needs and wants various disciplines of engineering, some misconceptions of engineering, Expectation for the 21st century engineer. Significance of team work, Importance of communication in engineering profession

Week-2: Engineering Design Process, Need statement to Problem conversion, Pair wise comparison chart, decision matrix, Concepts of reverse engineering

Week-3: Project management tools: Check list, Time line, Gantt chart, Requirement Analysis

Week-4: Basic Components of a Mechanism, Degrees of Freedom or Mobility of a Mechanism, 4 bar Chain, Crank Rocker Mechanism, Slider Crank Mechanism

Week-5: 3-D Modelling of a Box with two holes and curvature

Week-6: 3-D Modelling of Electronic Enclosure and Assembly of two parts

Week-7: Introduction to various platform – based development, Introduction to basic components, transducers, actuators and sensors, Introduction to Tinker cad

Week-8: Introduction to Arduino, basics of programming

Week-9: Interfacing Arduino with actuators and transducers

Week-10: Interfacing Arduino with Sensors, Liquid Crystal Display (LCD)

Week-11: Assembly and Crafting the Prototype

Week-12: Test and Validate the Prototype, Documentation, Panel Presentation

TEXT BOOKS:

1. Concepts in Engineering Design, Sumesh Krishnan and Dr. Mukul Shukla, Notion Press, 2016
2. Workshop Practice, B. L. Juneja, Cengage, 2016

REFERENCE BOOKS:

1. Theory of Mechanism and Machine, A. Ghosh and A K Malik, East West Press (Pvt) Ltd., New Delhi.
2. Arduino Cook book, O'Reilly Media, 2nd Edition
3. Introduction to auto cad - 2D and 3D design, Bernd S. Palmand, Alf Yarwood and Routledge, Taylor & Francis group, 2017
4. Engineering Fundamentals: An Introduction to Engineering (Mind Tap Course List), Saeed Moaveni, 5th Edition
5. Software Project Management (SIE) , Bob Hughes, Mike Cotterell, Rajib Mall, 5th Edition, Tata McGraw – Hill Education Pvt. Ltd, 2011, ISBN10:0071072748ISBN13:9780071072748

COURSE OUTCOMES:

On completion of the course students will be able to:

1. Explain the importance of engineering profession in the world.
2. Identify multi-disciplinary approach required in solving an engineering problem
3. Build a mechanism for a given application
4. Create basic 3D models and animations

5. Design a mechatronic system using Mechanical and Electronic components

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	1	-	-	-	2	2	1	2	2	2
CO2	2	3	2	-	2	2	2	2	3	2	2
CO3	3	2	3	2	3	-	1	-	2	-	1
CO4	2	2	3	2	3	-	-	-	1	-	1
CO5	3	3	3	2	3	2	2	2	3	2	2

****End****

(A505507) PYTHON PROGRAMMING LABORATORY

(Common to All Branches)

B. Tech (CE): I Year II Semester

L	T	P	C
0	0	2	1

LIST OF EXPERIMENTS:

1.
   I. Use a web browser to go to the Python website http://python.org. This page contains information about Python and links to Python-related pages, and it gives you the ability to search the Python documentation.
   II. Start the Python interpreter and type help() to start the online help utility.
1. Start a Python interpreter and use it as a Calculator.
2. Write a program to calculate compound interest when principal, rate and number of periods are given.
3. Read the name, address, email and phone number of a person through the keyboard and print the details.
4. Print the below triangle using for loop.
   5
   4 4
   3 3 3
   2 2 2 2
   1 1 1 1 1
5. Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character(use 'if-else-if' ladder)
6. Python program to print all prime numbers in a given interval (use break)
7. Write a program to convert a list and tuple into arrays.
8. Write a program to find common values between two arrays.
9. Write a function called palindrome that takes a string argument and returns True if it is a palindrome and False otherwise. Remember that you can use the built-in function len to check the length of a string.
10. Write a function called is sorted that takes a list as a parameter and returns True if the list is sorted in ascending order and False otherwise.
11. Write a function called has duplicates that take a list and returns true if there is any element that appears more than once. It should not modify the original list.
12. Write a function called remove duplicates that takes a list and returns a new list with only the unique elements from the original. Hint: they don't have to be in the same order.
13. The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string.
14. Write a python code to read dictionary values from the user. Construct a function to invert its content. i.e., keys should be values and values should be keys.
15. Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'
16. Remove the given word in all the places in a string?
17. Write a function that takes a sentence as an input parameter and replaces the first letter of every word with the corresponding upper case letter and the rest of the letters in the word by corresponding letters in lower case without using a built-in function?
18. Writes a recursive function that generates all binary strings of n-bit length
19. Write a python program that defines a matrix and prints
20. Write a python program to perform multiplication of two square matrices
21. How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions.
22. Use the structure of exception handling all general-purpose exceptions.
23. Write a function called draw rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.
24. Add an attribute named color to your Rectangle objects and modify draw rectangle so that it uses the color attribute as the fill color.
25. Write a function called draw point that takes a Canvas and a Point as arguments and draws a representation of the Point on the Canvas.

26. Define a new class called Circle with appropriate attributes and instantiate a few Circle objects. Write a function called draw circle that draws circles on the canvas.
27. Write a python code to read a phone number and email-id from the user and validate it for correctness.
28. Write a Python code to merge two given file contents into a third file.
29. Write a Python code to open a given file and construct a function to check for given words present in it and display on found.
30. Write a Python code to Read text from a text file, find the word with most number of occurrences
31. Write a function that reads a file *file1*and displays the number of words, number of vowels, blank spaces, lower case letters and uppercase letters.
32. Import numpy, Plotpy and Scipy and explore their functionalities.
33. Install NumPy package with pip and explore it.
34. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
35. Write a GUI program to create a window wizard having two text labels, two text fields and two buttons as Submit and Reset.

TEXT BOOKS:

1. Supercharged Python: Take your code to the next level, Overland
2. Learning Python, Mark Lutz, O'reilly

REFERENCE BOOKS:

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications, Sheetal Taneja, Naveen Kumar, Pearson
3. Introduction to Python Programming, Gowrishakar S, Veena A, CRC Press
4. Programming with Python, A User's Book, Michael Dawson, Cengage Learning, India Edition
5. Python for Data Science, Dr. Mohd Abdul Hameed, Wiley publications
6. Core Python Programming, Dr. R. Nageswara Rao, Dreamtech press
7. Introduction to Python, Gowrishankar S, Veena A., CRC Press

COURSE OUTCOMES:

On completion of the course students will be able to:

3. Understand and apply basic Python syntax, data types, control structures, and string operations.
4. Develop Python programs using functions, recursion, and data structures like lists, tuples, dictionaries, and arrays.
5. Implement object-oriented programming concepts and GUI applications using Python modules and Tkinter.
6. Perform file handling and text processing operations including reading, writing, searching, and analyzing textual data.
7. Utilize scientific libraries (NumPy, SciPy, Matplotlib) and design logic-based applications including digital gates and GUI tools.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	2	2	2	3	2	-	2	1	2	2
CO2	3	2	2	-	3	2	-	-	1	1	2
CO3	2	2	-	-	3	3	3	-	1	1	2
CO4	1	-	-	-	2	-	-	2	3	2	2
CO5	2	2	2	-	3	-	-	-	2	2	2

****End****

(A502502) BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY
(Common to Mechanical and Civil)

L	T	P	C
0	0	2	1

B. Tech. (ME & CE): I Year
Pre-requisites: Basic Electrical and Electronics Engineering
Course Objectives:

1. To introduce the concepts of electrical circuits and its components
2. To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
3. To study and understand the different types of DC/AC machines and Transformers.
4. To import the knowledge of various electrical installations.
5. To introduce the concept of power, power factor and its improvement.
6. To introduce the concepts of diodes & transistors, and
7. To impart the knowledge of various configurations, characteristics and applications.

List of Experiments/ Demonstrations:
PART A: ELECTRICAL

1. Verification of KVL and KCL
2. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single-Phase Transformer
3. Measurement of Active and Reactive Power in a balanced Three-phase circuit
4. Performance Characteristics of a DC Shunt Motor
5. Performance Characteristics of a Three-phase Induction Motor
6. No-Load Characteristics of a Three-phase Alternator

PART B: ELECTRONICS

1. Study and operation of (i) Multi-meters (ii) Function Generator (iii) Regulated Power Supplies (iv) CRO.
2. PN Junction diode characteristics
3. Zener diode characteristics and Zener as voltage Regulator
4. Input & Output characteristics of Transistor in CB / CE configuration
5. Full Wave Rectifier with & without filters
6. Half Wave Rectifier with & without filters

TEXT BOOKS:

1. Basic Electrical and electronics Engineering –M S Sukija TK Nagasarkar Oxford University
2. Basic Electrical and electronics Engineering-D P Kothari. I J Nagarath, McGraw Hill Education

REFERENCE BOOKS:

1. Electronic Devices and Circuits – R. L. Boylestead and Louis Nashelsky, PEI/PHI, 9th Ed, 2006.
2. Millman's Electronic Devices and Circuits – J. Millman and C. C. Halkias, SatyabrataJit, TMH, 2/e, 1998.

COURSE OUTCOMES:

1. To Verify basic laws of electrical circuits and Network theorems.
2. To study the working principles of Electrical Machines.
3. To Verify the transformer principle with suitable practical arrangement.
4. To identify and plot characteristics of diodes and various types of transistors.
5. To understand the operation of Half wave and full wave rectifiers.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1											
CO2											
CO3											
CO4											
CO5											

(A501301) ENGINEERING GEOLOGY

B. Tech (CE) III Semester **L T P C**
2 0 0 2

UNIT – I

Introduction: Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological drawbacks. Importance of Physical geology, Petrology and Structural geology. Weathering of Rocks: Its effect over the properties of rocks importance of weathering with reference to dams, reservoirs and tunnels weathering of common rock like "Granite"

UNIT - II

Mineralogy: Definition of mineral, Importance of study of minerals, Different methods of study of minerals. Advantages of study of minerals by physical properties. Role of study of physical properties of minerals in the identification of minerals. Study of physical properties of following common rock forming minerals: Feldspar, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite, Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chlorite, Galena, Pyrolusite, Graphite, Magnesite, and Bauxite. Petrology: Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Dykes and sills, common structures and textures of igneous. Sedimentary and metamorphic rocks. Their distinguishing features, Megascopic and microscopic and microscopic study of Granite, Dolerite, Basalt, Pegmatite, Laterite, Conglomerate, Sandstone, Shale, Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

UNIT - III

Structural Geology: Out crop, strike and dip study of common geological structures associating with the rocks such as folds, faults unconformities, and joints-their important types and case studies. Their importance Insitu and drift soils, common types of soils, their origin and occurrence in India, Stabilization of soils. Ground water, Water table, common types of ground water, springs, cone of depression, geological controls of ground water movement, ground water exploration.

UNIT - IV

Earthquakes: Causes and effects, shield areas and seismic belts. Seismic waves, Richter scale, precautions to be taken for building construction in seismic areas. Landslides, their causes and effect; measures to be taken to prevent their occurrence. Importance of Geophysical Studies: Principles of geophysical study by Gravity methods. Magnetic methods, Electrical methods. Seismic methods, Radio metric methods and geothermal method. Special importance of Electrical resistivity methods, and seismic refraction methods. Improvement of Competence of sites by grouting etc. Fundamental aspects of Rock mechanics and Environmental Geology.

UNIT – V

Geology of Dams, Reservoirs, and Tunnels: Types of dams and bearing of Geology of site in their selection, Geological Considerations in the selection of a dam site. Analysis of dam failures of the past. Factors contributing to the success of a reservoir. Geological factors influencing water Lightness and life of reservoirs - Purposes of tunneling, Effects of Tunneling on the ground Role of Geological Considerations (i.e. Lithological, structural and ground water) in tunneling over break and lining in tunnels.

TEXTBOOKS:

1. Principles of Engineering Geology (2023) by K.V.G.K. Gokhale– B.S. Publications
2. Engineering Geology by N. Chennakesavulu, McMillan, India Ltd.2005

REFERENCE BOOKS:

1. F.G. Bell, Fundamental of Engineering B.S. Publications,2005.
2. Krynine& Judd, Principles of Engineering Geology & Geotechnics, CBS Publishers & Distribution
3. Engineering Geology by Subinoy Gangopadhyay, Oxford university press.
4. Engineering Geology for Civil Engineers– P.C. Varghese PHI

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

1. Recognize the importance of geological knowledge in civil engineering and evaluate how geological factors contribute to the success or failure of engineering structures like dams, tunnels, and buildings.
2. Identify and classify common rock-forming and economic minerals using physical properties and understand the geological classification and characteristics of igneous, sedimentary, and metamorphic rocks.
3. Analyze geological structures such as folds, faults, and joints, and assess their impact on soil behavior,

groundwater movement, and site stability in civil engineering projects.

4. Able to apply geophysical techniques and geological knowledge to investigate subsurface conditions and mitigate natural hazards like earthquakes and landslides in construction planning.
5. Evaluate geological factors in the selection and design of dams, reservoirs, and tunnels, ensuring structural integrity and long-term performance through proper geological assessment.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	-	-	-	-	2	-	-	2	-
CO2	3	3	-	-	-	-	3	-	-	2	-
CO3	3	3	2	2	-	-	2	-	-	2	-
CO4	3	3	2	2	-	-	2	-	-	2	-
CO5	3	3	3	2	2	-	2	-	-	3	-

(A501302) BUILDING MATERIALS, CONSTRUCTION AND PLANNING

B. Tech (CE) III Semester **L T P C**
2 0 0 2

Pre-Requisite: Nil

UNIT–I:

Stones and Bricks, Tiles: Building stones – classifications and quarrying – properties – structural requirements – dressing. Composition of Brick earth – manufacture and structural requirements, Fly ash BRICKS, Ceramics.
Timber, Aluminum, Glass, Paints and Plastics: Wood - structure – types and properties – seasoning– defects; alternate materials for Timber – GI / fiber– reinforced glass bricks, steel & aluminum, types and requirement of paints and Plastics.

UNIT–II:

Building Components: Lintels, Arches, walls, vaults – stair cases – types of floors, types of roofs –flat, curved, trussed; foundations – types; Damp Proof Course; Joinery – doors – windows – materials– types.

UNIT–III:

Building Services: Plumbing Services: Water Distribution, Sanitary – Lines & Fittings; Ventilations: Functional requirements systems of ventilations. Air-conditioning - Essentials and Types; Acoustics –characteristic – absorption – Acoustic design; Fire protection – Fire Hazards – Classification of fire resistant materials and constructions.

UNIT–IV:

Mortars, Masonry and Finishing's Mortars: Cement Mortar, Brick masonry – types – bonds; Stonemasonry – types; Composite masonry – Brick-stone composite; Concrete, Reinforced brick.
Finishers: Plastering, Pointing, Painting, Claddings – Types – Tiles – ACP.
Form work: Types: Requirements – Standards – Scaffolding – Design; Shoring, Underpinning.

UNIT–V:

Building Planning: Classification of buildings, functional Planning of buildings: Sustainability and concept of green building, General aspects to consider for planning, byelaws and regulations, Selection of site for building construction, Principles of planning, Orientation of building and its relation to outside environment.

TEXTBOOKS:

1. Building Materials and Construction – Arora &Bindra, Dhanpat Roy Publications.
2. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) ltd., New Delhi.

REFERENCE BOOKS:

1. Building Materials by Duggal, New Age International.
2. Building Materials by P. C. Varghese, PHI.
3. Building Construction by PC Varghese PHI.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Understand the different construction material.
2. Understand the different component parts of building and their construction practices and techniques
3. Understand the functional requirements to be considered for design and construction of building
4. Identify the factors to be considered in planning and construction of buildings
5. Plan a building based on the factors and principles of planning.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	2	1	2	1	1	1	1
CO2	3	2	2	1	2	1	2	1	1	1	1
CO3	3	3	2	2	2	1	2	1	1	2	1
CO4	3	2	2	2	2	2	3	1	1	2	1
CO5	3	3	3	2	2	2	3	1	2	2	1

(A401303) STRENGTH OF MATERIALS

B. Tech (CE) III Semester **L T P C**
3 0 0 3

Pre-Requisites: Engineering Mechanics

UNIT–I

Simple Stresses and Strains: Concept of stress and strain- St. Venant's Principle-Stress and Strain Diagram-Elasticity and plasticity –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 – Pure shear and Complementary Shear-Elastic moduli, Elastic constants and the relationship between them–Bars of varying section–composite bars–Temperature stresses.

Strain Energy–Resilience–Gradual, sudden, and impact loadings–simple applications.

UNIT–II

Shear Force and Bending Moment: Types of beams–Concept of shear force and bending moment — S. F and B.M diagrams for cantilever, simply supported including overhanging beams subjected to point loads, uniformly distributed load, uniformly varying load, couple 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-Section Modulus Determination of flexural/bending stresses of rectangular and circular sections (Solid and Hollow), I, T, Angle and Channel sections—Design of simple beam sections.

Shear Stresses: Derivation of formula for shear stress distribution – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle and channel sections.

UNIT–IV

Deflection of Beams: Slope, deflection and radius of curvature–Differential equation for the elastic line of a beam–Double integration and Macaulay's methods–Determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, uniformly varying load and Couple-Mohr's theorems —Moment area method —Application to simple cases.

UNIT–V

Thin Cylinders: Thin seamless cylindrical shells—Derivation of formula for longitudinal and circumferential stresses–hoop, longitudinal and Volumetric strains–changes in diameter, and volume of thin cylinders – Thin spherical shells.

Thick Cylinders: Introduction-Lame's theory for thick cylinders–Derivation of Lame's formulae– distribution of hoop and radial stresses across thickness–design of thick

cylinders–compound cylinders–Necessary difference of radii for shrinkage.

TEXT BOOKS:

1. Strength of Materials by B. Raghu Kumar, BS Publications.
2. Strength of Materials by B.S. Basavarajaiah and P. Mahadevappa, 3rd Edition, Universities Press

REFERENCE BOOKS:

1. Mechanics of Materials by R.C. Hibbeler, Prentice Hall publications
2. Engineering Mechanics of Solids by Egor P. Popov, Prentice Hall publications
3. Strength of Materials by T.D. Gunneswara Rao and M. Andal, Cambridge Publishers
4. Strength of Materials by R.K. Bansal, Lakshmi Publications House Pvt.Ltd.

COURSE OUTCOME:

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

1. Describe the concepts and principles, understand the theory of elasticity including strain/displacement and Hooke's law relationships; and perform calculations, related to the strength of structured and mechanical components.
2. Analyze different types of beams under various loading conditions by drawing shear force and bending moment diagrams.
3. Recognize various types loads applied on structural components of simple framing geometries and understand the nature of internal stresses that will develop within the components.
4. To evaluate the strains and deformation that will result due to the elastic stresses developed within the materials for simple types of loading.
5. Analyze various situations involving structural members subjected to plane stresses by application of Mohr's circle of stress.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	-	-	-	-	-	2	-
CO2	3	3	3	2	-	-	-	-	-	2	-
CO3	3	3	3	2	-	-	-	-	-	2	-
CO4	3	3	2	2	-	-	-	-	-	2	-
CO5	3	3	2	2	-	-	-	-	-	2	-

(A501304) SURVEYING AND GEOMATICS

B. Tech (CE) III Semester **L T P C**
3 0 0 3

UNIT-I

Introduction and Basic Concepts: Introduction, Objectives, classification and principles of surveying, Scales, Shrinkage of Map, Conventional symbols and Code of Signals, Surveying accessories, phases of surveying.

Measurement of Distances and Directions

Linear distances – Approximate methods, Direct Methods- Chains-Tapes, ranging, Tape corrections, indirect methods- optical methods- E.D.M. method.

Prismatic Compass-Bearings,included angles, Local Attraction, Magnetic Declination and dip.

UNIT- II

Levelling and Contouring Leveling- Basics definitions, types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels- HI Method-Rise and Fall method, Effect of Curvature of Earth and Refraction.

Contouring- Characteristics and uses of Contours, Direct& Indirect methods of contour surveying, interpolation and sketching of Contours.

Computation of Areas and Volumes

Areas -Determination of areas consisting of irregular boundary and regular boundary (coordinates, MDM, DMD methods), Planimeter.

Volumes - Computation of areas for level section and two level sections with and without transverse slopes, determination of volume of earth work in cutting and embankments, volume of borrow pits, capacity of reservoirs.

UNIT- III

Theodolite Surveying: Types of Theodolites, Fundamental Lines, temporary adjustments, measurement of horizontal angle by repetition method and reiteration method, measurement of vertical Angle, Trigonometrically levelling when base is accessible and inaccessible.

Traversing: Methods of traversing, traverse computations and adjustments, Gale's traverse table, Omitted measurements.

UNIT-IV

Tachometric Surveying: Principles of Tachometry, stadia and tangential methods of Tachometry.

Curves: Types of curves and their necessity, elements of simple curve, setting out of simple Curves,

UNIT-V

Modern Surveying Methods: Total Station and Global Positioning System: Basic principles, classifications, applications, comparison with conventional surveying. Electromagnetic wave theory – electromagnetic distance measuring system-principle of working and EDM instruments, Components of GPS–space segment, control segment and user segment, reference systems, satellite orbits, GPS observations. Applications of GPS.

TEXTBOOKS:

1. Surveying with Geomatics and R First Edition (2022) by Marcelo de Carvalho Alves, Luciana Sanches.
2. Surveying and leveling by R. Subramanian, Oxford university press, NewDelhi.

REFERENCEBOOKS:

1. Arthur R Benton and Philip J Taety, Elements of Plane Surveying, McGraw-Hill–2000.
2. Arora K R "Surveying Vol 1,2&3, Standard Book House, Delhi,2004.
3. Surveying (Vol–1,2&3), byB.C. Punmia, AshokKumar Jain and ArunKumar Jain-Laxmi Publications (P) ltd., New Delhi.
4. Chandra A M,"Plane Surveying", New Age International Pvt.Ltd., NewDelhi,2002.
5. Surveying by Bhavikatti; Vikas publishing house ltd.
6. Duggal S K,"Surveying (Vol–1&2), Tata McGrawHill Publishing Co. Ltd. New Delhi,2004.
7. Surveying and leveling by R. Agor Khanna Publishers 2015.

COURSE OUTCOMES:

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

1. Classify and describe different types and phases of surveying, and explain conventional symbols and scales.
2. Measure linear distances and directions using chains, tapes, compasses, and EDM methods, and apply corrections accurately.
3. Perform differential levelling and contouring using various instruments and compute heights using HI and Rise & Fall methods.
4. Use the-odolite for angle measurements, trigonometric levelling, and traverse computations including adjustments.
5. Utilize Total Station and GPS for advanced survey work and differentiate between modern and traditional surveying methods.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**2**	**-**

(A501305) FLUID MECHANICS

B. Tech (CE) III Semester **L T P C**
3 0 0 3

UNIT–I

Properties of Fluid

Distinction between a fluid and a solid; Properties of fluids – Viscosity, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility. **Fluid Statics**

Fluid Pressure: Pressure at a point, Pascal's law, Hydrostatic law, Piezometer, U-Tube Manometer, Single Column Manometer, U-Tube Differential Manometer, Micromanometers. Pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces.

UNIT- II

Fluid Kinematics

Classification of fluid flow: steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow;rotational and irrotational flow; compressible and incompressible flow;ideal and real fluid flow; One, two- and three-dimensionalflows; Streamline, path line, streak line and stream tube; stream function, velocity potential function, flow net, One, two- and three-dimensional

Continuity equations in Cartesian coordinatesapplications.

Fluid Dynamics

Surface and Body forces -Euler's and Bernoulli's equation; Momentum equation. Correction factors. Bernoulli's equation to real fluid flows.

UNIT- III

Flow Measurement in Pipes

Practical applications of Bernoulli's equation: venturi meter, orifice meter and pitot tube, applications of Momentum equations; Forces exerted by fluid flow on pipe bend, sudden enlargement in pipes.

Flow Over Notches &Weirs

Flow through rectangular; triangular and trapezoidal notches and weirs; End contractions; Velocity of approach. Broad crested weir.

UNIT–IV

Flow through Pipes

Reynolds experiment, Reynolds number**,** Loss of head through pipes, Darcy- Wiesbatch equation, minor losses, total energy line, hydraulic grade line, Pipes in series, equivalent pipes, pipes in parallel, siphon, branching of pipes, three reservoir problem, power transmission through pipes. Analysis of pipe networks: Hardy Cross method and EPANET, water hammer in pipes and control measures.

UNIT-V

Laminar & Turbulent Flow

Laminar flow through circular pipes, and fixed parallel plates.

Boundary Layer Concepts

Prandtl contribution, Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness concepts of laminar and turbulent boundary layers on a flat plate; Laminar sub-layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control. Drag and Lift and types of drag, magnus effect.

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TEXTBOOKS:

1. Theory and Applications of Fluid Mechanics, K. Subramanian, Tata Mc Graw Hill
2. Fluid Mechanics by Modi and Seth, Standard Book House.

REFERENCEBOOKS:

1. Fluid Mechanics–Frank M. White–8th Edition–McGraw-Hill Education.
2. Introduction to Fluid Mechanics and Fluid Machines by S K Som, Gautam Biswas, Suman Chakraborty, Mc Graw Hill Education (India) Private Limited
3. Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
4. Fluid Mechanics & Hydraulic Machines, Domkundwar&DomkundwarDhanpat Rai &Co
5. Fluid Mechanics and Hydraulic Machines, R.K. Bansal, Laxmi Publication Pvt. Ltd.

COURSE OUTCOMES:

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

1. Understand fluid properties and analyze pressure using hydrostatic principles and manometer
2. Classify fluid flows and apply Euler's and Bernoulli's equations to fluid motion.
3. Measure flow using devices and analyze discharge over notches and weirs.
4. Analyze head losses and flow in pipe systems and networks using various methods.
5. Distinguish laminar and turbulent flows and apply boundary layer concepts to flow analysis.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO2	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**
CO3	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**-**
CO4	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**2**	**-**
CO5	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**2**	**-**

(A500507) SOCIAL INNOVATION AND ENTREPRENEURSHIP
(Common to All Branches)

B. Tech (CE): II Year I Semester

L	T	P	C
0	1	2	2

Week-1
Identify community issues to be addressed, Requirements Analysis: Extensive User requirements analysis, generating effective System Requirement document
Week-2
Introduction to Innovation & Entrepreneurship, Innovation vs. Invention vs. Creativity, Types of Entrepreneurs (Tech, Social, Green)
Week-3
Social Innovation – Case Studies, Impact of Social Innovation on communities
Week-4
Process of Social Innovation Prompts – identifying needs, Proposals – generating ideas, Proto typing – testing the idea in practice
Week-5
Sustaining – developing a business model, Scaling and diffusion – growing social innovations, Systematic change
Week-6
Introduction to sustainability, Sustainability leadership, Life cycle assessment, Carbon foot print calculation
Week-7
Business Model & Start-Up Ecosystem Elements of a business model (Canvas model)
Week-8
Identify and map global competitors, review industry trends, and understand market sizing: TAM, SAM, and SOM. Assessing scope and potential scale for the opportunity
Week-9
Types of Start - Ups, Market analysis and feasibility Minimum Viable Product (MVP), Market risks and Marketing strategies, legal aspects in start up, National Innovation Start up Policy (NISP) and its features
Week-10
Government schemes for startups (Startup India, Atal Innovation Mission) Incubators, accelerators
Week-11
Financial planning, budgeting, and cost estimation for the Business model
Week-12
Funding options: Bootstrapping, Angel investors, venture pitching readiness, Documentation, Panel Presentation

TEXT BOOKS:
1. "Innovation and Entrepreneurship" by Peter F.Drucker
2. "Entrepreneurship Development" by S.S.Khanka
3. "Design Thinking" by Tim Brown

REFERENCE BOOKS:
1. AICTE Innovation Cell & Startup India Toolkit
2. Social Enterprise Law: Trust, Public Benefit and Capital Markets By Dana Brakman Reiser & Steven A. Dean
3. Introduction to Sustainability by Robert Brinkmann, Wiley-Blackwell

COURSE OUTCOMES:
On completion of the course students will be able to:
1. Understand the fundamentals of innovation, creativity, and entrepreneurs
2. Develop innovative solutions to the community issues
3. Assess market competition, estimate market size, and develop a prototype.
4. Develop a scalable business model
5. Analyze Business and financial planning models and Go-to-Market strategies

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	1	-	-	-	-	3	1	2	-	-	1
CO2	2	3	3	-	2	2	1	3	-	-	-
CO3	-	2	-	-	-	-	-	2	3	2	-
CO4	2	2	3	-	2	2	2	3	-	2	1
CO5	-	2	-	-	-	-	-	2	3	2	-

****End****

(A501501) ENGINEERING GEOLOGY LABORATORY

B. Tech (CE) III Semester **L T P C**
0 0 2 1

Pre-Requisites: Engineering Geology Theory

LIST OF EXPERIMENTS

1. Study of physical properties of minerals.
2. Study of different group of minerals.
3. Study of Crystal and Crystal system.
4. Identification of minerals: Silica group: Quartz, Amethyst, Opal; Feldspar group: Orthoclase, Plagioclase; Cryptocrystalline group: Jasper; Carbonate group: Calcite;Element group: Graphite; Pyroxene group: Talc; Mica group: Muscovite; Amphibole group: Asbestos, Olivine, Hornblende, Magnetite, Hematite, Corundum, Kyanite, Garnet, Galena, Gypsum.
5. Identification of rocks (Igneous Petrology): Acidic Igneous rock: Granite and its varieties, Syenite, Rhyolite, Pumice, Obsidian, Scoria, Pegmatite, Volcanic Tuff. Basic rock: Gabbro, Dolerite, Basalt and its varieties, Trachyte.
6. Identification of rocks (Sedimentary Petrology): Conglomerate, Breccia, Sandstone and itsvarieties, Laterite, Limestone and its varieties, Shales and its varieties.
7. Identification of rocks (Metamorphic Petrology): Marble, slate, Gneiss and its varieties, Schist and its varieties. Quartzite, Phyllite.
8. Study of topographical features from Geological maps. Identification of symbols in maps.
9. Simple structural Geology Problems (Folds, Faults & Unconformities)

COURSE OUTCOMES:

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

1. Accurately identify minerals from various mineral groups using hand specimens.
2. Classify and identify igneous rocks based on texture, structure, and mineral content.
3. Classify and identify sedimentary rocks and interpret their depositional environments.
4. Identify and distinguish metamorphic rocks and their textures and structures.*)*
5. Interpret topographic features and geological structures from maps and identify conventional geological symbols.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	1	1	-	-	-	-	2	-
CO2	3	2	2	1	1	-	-	-	-	2	-
CO3	3	2	2	1	1	-	1	-	-	2	-
CO4	3	2	2	1	1	-	1	-	-	2	-
CO5	3	3	2	2	2	-	1	-	-	3	-

(A501502) STRENGTH OF MATERIALS LABORATORY

B. Tech (CE) III Semester **L T P C**
0 0 2 1

List of Experiments:

1. Tension test
2. Bending test on (Steel/Wood) Cantilever beam.
3. Bending test on simple support beam.
4. Torsion test
5. Hardness test
6. Spring test
7. Compression test on concrete.
8. Impact test
9. Shear test
10. Verification of Maxwell's Reciprocal theorem on beams.
11. Use of electrical resistance strain gauges.
12. Continuous beam–deflection test.

COURSE OUTCOMES:

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

1. Perform tension, compression, and hardness tests to determine fundamental mechanical properties of materials such as strength, elasticity, and hardness.
2. Evaluate the bending behavior and deflection in cantilever, simply supported, and continuous beams under various loading conditions.
3. Conduct torsion and shear tests to assess the material's resistance to torsional and shear loads.
4. Analyze the impact resistance and energy absorption capacity of materials through standardized impact testing.
5. Apply principles of experimental mechanics to verify theoretical concepts and use modern measurement tools like strain gauges.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	3	1	1	1	1	1	1	1
CO2	3	3	2	3	2	1	1	1	1	1	1
CO3	3	3	2	3	2	1	1	1	1	1	1
CO4	3	2	2	3	2	1	1	1	1	1	1
CO5	3	3	3	3	3	1	1	1	1	1	2

(A501503) SURVEYING & GEOMATICS LABORATORY

B. Tech (CE) III Semester **L T P C**
0 0 2 1

CYCLE-I

Theodolite surveying:

1. Measurement of horizontal angles and vertical angles.
2. Distance between two inaccessible points.
3. Measurement of area by theodolite traversing (Gales traverse table).
4. Determination of tachometer constants.
5. Distance between two inaccessible points using the principles of tachometer surveying.
6. Distance between two inaccessible points using the principles of trigonometric surveying

CYCLE-II

Total Station:

7. Area Measurement
8. Stake Out
9. Remote Elevation Measurement
10. Missing Line Measurement
11. Longitudinal & Cross Section Profile
12. Contouring
13. Providing a Simple Circular Curve

COURSE OUTCOMES:

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

1. Measure horizontal and vertical angles, and compute distances between inaccessible points using theodolite.
2. Conduct theodolite traversing and compute areas using Gale's traverse table.
3. Determine distances using tachometric and trigonometric methods, and calculate tachometer constants.
4. Perform advanced surveying tasks such as area measurement, stake out, elevation measurement, and missing line using Total Station.
5. Generate longitudinal and cross-section profiles, conduct contouring, set circular curves using Total Station.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	2	1	-	-	-	1	1	1
CO2	3	3	2	2	1	-	-	-	1	1	1
CO3	3	3	2	2	2	-	-	-	1	1	1
CO4	3	3	3	3	3	-	-	-	1	2	2
CO5	3	3	3	3	3	-	-	-	1	2	2

(A501701) ENGINEERING DRAWING USING COMPUTER AIDED DRAFTING LABORATORY

B. Tech (CE) III Semester **L T P C**
0 0 2 1

List of Experiments:

1. **Introduction to CAD Environment** – Drawing setup, layers, line types, units.
2. **Basic Drawing Commands** – Line, circle, rectangle, polygon, arc, etc.
3. **Editing Tools** – Trim, extend, offset, mirror, fillet, chamfer.
4. **Geometric Constructions** – Tangents, perpendiculars, bisectors, etc.
5. **Orthographic Projection of Simple Objects** – Front, top, and side views.
6. **Sectional Views of Solids** – Prism, cylinder, pyramid, etc.
7. **Isometric Drawings** – Using isoplane and isometric snap.
8. **Dimensioning and Text Annotation** – Types of dimensioning and styles.
9. **Building Plan Drawing** – Drawing of single-room residential plan.
10. **Elevation and Section of a Building** – From the given plan.
11. **Column and Footing Details** – Drawing of structural components.
12. **Printing and Plotting of Drawings** – With proper scale and layout.

COURSE OUTCOMES:

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

1. Use basic CAD tools to create, edit, and annotate 2D engineering drawings.
2. Construct standard geometric shapes and develop orthographic projections of simple objects.
3. Generate sectional and isometric views of objects using CAD software.
4. Prepare plan, elevation, and section drawings of simple buildings and structural elements.
5. Apply dimensions, text, and plotting techniques to produce professional engineering drawings.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	1	2	1	3	-	-	-	1	2	2
CO2	3	2	2	1	3	-	-	-	1	2	2
CO3	3	2	3	1	3	-	-	-	1	2	2
CO4	3	2	3	1	3	1	1	-	1	3	2
CO5	3	1	2	1	3	-	-	1	1	3	3

(A500901) ENVIRONMENTAL SCIENCE

L	T	P	C
1	0	0	1

UNIT-I

Environmental Studies: Introduction, Definition, scope and importance, Ecosystems: Introduction, types, characteristic features, structure and functions of ecosystems, Bio-geo chemical cycle, Classification of Eco system.

UNIT-II

Natural Resources: Classification of Resources, Land resources, Land as resource, Common property resources, Land degradation, Soil erosion and desertification, Effects of modern agriculture, fertilizer –pesticide problems, Forest resources, Use and over-exploitation. Mining and dams – their effects on forest and tribal people, Water resources, Use and over- utilization of surface and groundwater, Floods, droughts, Water logging and salinity, Dams –benefits and costs, Conflicts over Water, Energy resources.

UNIT-III

Bio-diversity and its conservation, Value of bio-diversity-consumptive and productive use, social, ethical, aesthetic and option values, Bio-geographical classification of India – India as a mega diversity habitat, Threats to bio-diversity –Hot-spots, habitat loss, poaching of wild life, loss of species, seeds, etc. Conservation of bio-diversity– In-situ and Ex-situ conservation.

UNIT-IV

Environmental Pollution–Local and Global Issues, Nature of thermal pollution and nuclear hazards, Global warming, Acid rain, Ozone depletion, Environmental case studies.

UNIT-V

Environmental Problems in India, Drinking water, sanitation and public health, Effects of the activities on the quality of environment, Water scarcity and groundwater depletion, Controversies on major dams – resettlement and rehabilitation of people: problems and concerns, Rain water harvesting, cloud seeding and watershed management. Economy and Environment, The economy and environment interaction, Economics of development, preservation and conservation, Sustainability: theory and practices, Limits to growth, Equitable use of resources for sustainable life styles, Environmental Impact Assessment.

Text Books

1. Environmental Science (1st edition), Y. Anjaneyulu, B S Publications.
2. Environmental studies (1st edition), Deekshadave, Cengage learning India Pvt. Ltd.

Reference books

1. Environmental sciences and Engineering (1st edition), P. VenugopalRao, PHI learning Pvt. Ltd.,
2. Environmental Science and Technology (1st edition), M. Anji Reddy, B S Publications.
3. Clark, R.S., Marine Pollution, Clanderson Press, Oxford, 2002.
4. Environmental Encyclopedia (Cunningham, W.P., et al., Jaico Publishing House, Mumbai, 2003.

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

1. Acquire the knowledge on environmental science
2. Acquire the knowledge of various natural resources
3. Understand the importance of conservation and preserve the biodiversity
4. Understand the hazardous effects of environmental pollution
5. Develop skills in understanding various environmental problems

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	2	3	1	-	1	-	2
CO2	3	3	2	2	-	2	3	1	-	-	-	2
CO3	2	2	3	1	-	2	3	1	-	-	-	2
CO4	2	3	2	2	-	2	3	1	-	-	-	2
CO5	2	2	3	3	-	3	3	1	-	-	-	2

(A500003) PROBABILITY AND STATISTICS

(For Civil Engineering)

L	T	P	C
3	0	0	3

UNIT-I: Random Variables and Probability

Concept of a Random Variable – Discrete Probability Distributions – Continuous Probability Distributions – Mean of a Random Variable – Variance of a Random Variable

Discrete Probability Distributions: Binomial Distribution – Poisson distribution

UNIT-II: Continuous Distributions and Sampling

Uniform Distribution – Normal Distribution – Areas under the Normal Curve – Applications of the Normal Distribution – Normal Approximation to the Binomial Distributions.**Fundamental Sampling Distributions:** Random Sampling – Some Important Statistics – Sampling Distributions – Sampling Distribution of Means – Central Limit Theorem.

UNIT-III: Tests of Hypotheses (Large Samples)

Statistical Hypotheses: General Concepts – Testing a Statistical Hypothesis. Single sample: Tests concerning a single mean. Two samples: Tests on two mean (Unknown for equal variance). One sample: Test on a single proportion. Two samples: Tests on two proportions.

UNIT-IV: Tests of Hypotheses (Small Samples)

Students t-distribution, its properties: Test of significance difference between sample mean and population means; difference between means of two small samples. Snedecor's F-distribution and its properties. Two- sample tests concerning variances: F-distribution. Test of equality of two population variances

UNIT-V: Applied Statistics

Curve fitting by the method of least squares – Fitting of straight lines – Second degree parabolas and more general curves. Correlation and Regression – Rank correlation.

TEXT BOOKS

1. Probability & Statistics for Engineers & Scientists (9th Edition), Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying Ye,Pearson Publishers.
2. Fundamentals of Mathematical statistics, S C Gupta and V K Kapoor, Khanna publications.

REFERENCES

1. Fundamentals of Probability and Statistics for Engineers, T.T. Soong, John Wiley & Sons, Ltd, 2004.
2. Probability and Statistics for Engineers and Scientists, Sheldon M Ross, academic press

COURSE OUTCOMES:

On completion of the course students will be able to

1. Apply the concepts of random variables and probability distributions to selected case studies.
2. Explain the principles of sampling theory and demonstrate their applications.
3. Apply hypothesis testing methods to analyze and interpret real-world data for large sample size.
4. Apply hypothesis testing methods to analyze and interpret real-world data for small sample size.
5. Perform curve fitting, correlation, and regression analysis for a given data set.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	1	-	-	-	-	-	-	-	3
CO2	3	2	1	-	-	-	-	-	-	-	2
CO3	3	3	1	-	-	-	-	-	-	-	3
CO4	3	3	1	-	-	-	-	-	-	-	3
CO5	3	2	1	-	-	-	-	-	-	-	2

(A501306) STRUCTURAL MECHANICS

B. Tech (CE) IV Semester **L T P C**
3 0 0 3

Pre-Requisites: Strength of Materials

UNIT–I

Principal Stresses: Introduction—Stresses on an oblique plane of abarunder axial loading— compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses –Two perpendicular normal stresses accompanied by a state of simple shear– Principal stresses–Mohr's circle of stresses–ellipse of Stress-Analytical and graphical solutions.

Theories of Failure:Introduction—Various theories of Failure-Maximum Principal Stress theory, Maximum Principal Strain Theory,Maximum shear stress Theory-Strain Energy and Shear Strain EnergyTheory (VonMises Theory).

UNIT–II

Torsion of Circular Shafts: Theory of pure torsion– Derivation of Torsion Equation-Assumptions made in the theory of pure torsion – Polar section modulus – Power transmitted by shafts – Combined bending and torsion–Designof shafts according to theories of failure.

Springs: Introduction–Types of springs –deflection of close and open coiled helical springs under axial pull and axial couple–springs in series and parallel.

UNIT- III

Direct and Bending Stresses: Stresses under the combined action of direct loading and bending moment,core of a section—determination of stresses in the case of retaining walls,chimneys and dams—conditions for stability- Overturning and sliding—stresses due to direct loading and bending moment about both axes.

UNIT- IV

Columns and Struts: Introduction–Types of columns–Short,medium and long columns– Axially loaded compression members – Crushing load – Euler's theorem for long columns-assumptions- derivation of Euler's critical load formulae for various end conditions – Equivalent length of a column – slenderness ratio–Euler's critical stress–Limitations of Euler's theory– Long columns subjected to eccentric loading – Secant formula–Empirical formulae — Rankine– Gordon formula- Straight line formula—Prof.Perry'sformula.

UNIT–V

UnsymmetricalBending:

Introduction – Centroidal principal axes of section –Moments of inertia referred to any set of rectangular axes – Stresses in beams subjected to unsymmetrical bending – Principal axes – Resolution of bending moment into two rectangular axes through the centroid–Location of neutral axis.

Shear Centre: Introduction - Shear center for symmetrical and unsymmetrical (channel, I, T and L) sections.

TEXT BOOKS:

1. Mechanics of Materials by Dr.B.C. Punmia, Dr. AshokKumar Jain and Dr.Arun Kumar Jain
2. Strength of Materials by R. Subramanian, Oxford University Press.

REFERENCE BOOKS:

1. Mechanics of Materials by R.C. Hibbeler, Pearson Education
2. Engineering Mechanics of Solids by PopovE.P. Prentice-Hall Ltd
3. Strength of Materials by T.D. GunneswaraRao and M. Andal, CambridgePublishers
4. Strength of Materials by R.K. Bansal, Lakshmi Publications House Pvt.Ltd.
5. Fundamentals of Solid Mechanics by M.L.Gambhir,PHILearningPvt.Ltd

COURSE OUTCOMES:

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

1. Analyze stresses on inclined planes and determine principal stresses using analytical and graphical methods, and apply failure theories to assess material safety.
2. Apply torsion theory to circular shafts and design them under combined loading, and analyze deformation of helical springs under axial loads.
3. Determine stresses due to combined direct and bending loads in structural elements like dams, chimneys, and retaining walls, ensuring stability.
4. Evaluate the stability and load-carrying capacity of columns using Euler's theory and empirical formulas under axial and eccentric loading.
5. Analyze stresses in beams under unsymmetrical bending and locate shear centres for various cross-sections to ensure structural stability.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	2	-	-	1	1	2	2
CO2	3	3	3	2	2	-	-	1	1	2	2
CO3	3	3	3	2	2	2	2	1	1	2	2
CO4	3	3	3	2	2	2	-	1	1	2	2
CO5	3	3	3	2	2	-	-	1	1	2	3

(A501307) WATER RESOURCES AND IRRIGATION ENGINEERING

B. Tech (CE) IV Semester **L T P C**
3 0 0 3

Prerequisites: Probability & Statistics, Fluid Mechanics and Hydraulic Machines

Unit I - Precipitation

Introduction-Concepts of Hydrologic Cycle, Global Water Budget, Applications in Engineering.

Precipitation-Forms of Precipitation, Measurement of Precipitation: Recording and Non-Recording Types, Mass Rainfall Curves, Characteristics Mean Rainfall on A Basin – Arithmetic, Theissen and Isohyetal Methods, Intensity – Duration Analysis, PMP, Missing Rainfall Data – Estimation, Consistency of Rainfall Records, Double Mass Curve, Rain Gauge Network Analysis.

Unit II - Abstractions from Precipitation and Runoff

Abstractions from Precipitation-Evaporation Process, Evaporimeters, Analytical Methods of Evaporation Estimation, Reservoir Evaporation and Methods for Its Reduction, Evapotranspiration, Measurement of Evapotranspiration, Evapotranspiration Equations, Potential Evapotranspiration Over India, ActualEvapotranspiration, Interception, Depression Storage, Infiltration, Infiltration Capacity, Measurement of Infiltration, ModelingInfiltration Capacity, Classification of Infiltration Capacities, Infiltration Indices.

Runoff-Components of Runoff, Factors affecting Runoff, Basin Yield, SCS-CN Method of Estimating Runoff, Flow Duration Curves, Mass Curve of Runoff – Analysis.

Unit III - Hydrographs and Groundwater Hydrology

Hydrographs-Hydrograph – Components, Separation of Hydrograph into Base Flow and Effective Rainfall – Methods, Unit Hydrograph – Principles, Derivation of UH of Isolated Unit Storms.

Groundwater Hydrology - Occurrence, Movement and Distribution of Groundwater, Aquifers – Types, Specific Yield, Permeability, Storage Coefficient, Transmissibility, Darcy's Law. Well Hydraulics-Steady Radial Flow into Well for Confined and Unconfined Aquifers, Recuperation Tests.

Unit IV - Water Withdrawals, Dams and Reservoirs

Water Withdrawals- Water Requirement of Crops –CropsAnd Crop Seasons InIndia, Cropping Pattern, Duty and Delta; Quality of Irrigation Water; Soil-Water Relationships, Root Zone Soil Water, Infiltration, Consumptive Use, Irrigation Requirement, Frequency of Irrigation; Methods of Applying Water to the Fields: Surface, Sub-Surface, Sprinkler and Trickle /Drip Irrigation.

Dams and Reservoirs-Classification of Dams, Gravity Dams: Forces on Gravity Dams, Causes of Failure, Stress Analysis, Elementary and Practical Profile. Arch and Buttress Dams, Economic Height of Dam, Selection of Suitable Site. Reservoirs- Types, Capacity of Reservoirs, Yield of Reservoir, Sedimentation.

Unit V - Spillways and Distribution Systems

Spillways- Components of Spillways, Types of Gates for Spillway Crests.

Distribution Ssystems- Canal Systems, Alignment of Canals, Canal Losses, Estimation of Design Discharge. Design of Channels-Rigid Boundary Channels, Alluvial Channels, Kennedy's and Lacey's Theory of Regime Channels. Canal Outlets: Non-Modular, Semi-Modular and Modular Outlets. Water Logging: Causes, Effects and Remedial Measures. Lining of Canals, Types of Lining. Drainage of Irrigated Lands: Necessity, Methods.

Textbooks:

1. Hydrology, P. Jaya Rami Reddy, 3rd edition, Laxmi Publications, 2018.
2. Irrigation and Water Resources Engineering, G L Asawa, New Age Publishers, 2008.

References:

1. Elements of Engineering Hydrology, V.P. Singh, Tata McGraw-Hill, 2017.
2. Ground water Hydrology, David Keith Todd, John Wiley & Son, 2015.
3. Textbook of irrigation Engineering & Hydraulic Structures, R.K. Sharma, Oxford & IBH Publishing Company, 2023.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Describe different concepts of engineering hydrology.
2. Apply appropriate formula to estimate runoff.
3. Apply fundamental principles of hydrograph analysis and estimate ground water Resources.
4. Estimate water requirement for crops and design hydraulic structures.
5. Apply a suitable design methodology for distribution systems.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	**3**	**2**	**1**	**1**	**2**	**2**	**2**	**1**	**1**	**2**	**2**
CO2	**3**	**3**	**2**	**2**	**2**	**2**	**2**	**1**	**1**	**2**	**2**
CO3	**3**	**3**	**2**	**3**	**2**	**2**	**2**	**1**	**1**	**2**	**2**
CO4	**3**	**3**	**3**	**2**	**2**	**2**	**3**	**1**	**2**	**2**	**2**
CO5	**3**	**3**	**3**	**2**	**3**	2	**3**	**1**	**2**	**2**	**2**

(A501308) HYDRAULICS AND HYDRAULIC MACHINERY

B. Tech (CE) IV Semester **L T P C**
3 0 0 3

UNIT-I

Open Channel Flow–I: Introduction to Open channel flow - Comparison between open channel flow and pipe flow, Classification of open channel flows, Velocity distribution. Uniform flow– Characteristics of uniform flow, Chezy's, Manning's and Bazin formulae for uniform flow – Factors affecting Manning's Roughness Coefficient. Most economical sections.Computation of Uniform flow, Normal depth.

Critical Flow: Specific energy – critical depth - computation of critical depth – critical, sub critical and super critical Flows-Channel transitions (Theory only).

UNIT- II

Open Channel Flow–II: Non-uniform flow—Gradually Varied Flow-Dynamic equation for G.V.F; Classification of channel bottom slopes—Classification and characteristics of Surface profiles— Computation of water surface profiles by Numerical and Analytical approaches. Direct step method.

Rapidly varied flow: Elements and characteristics (Length and Height) of Hydraulic jump in rectangular channel– Types, applications and location of hydraulic jump, Energy dissipation and other uses.

UNIT- III

Dimensional Analysis and Hydraulic Similitude: Dimensional homogeneity – Rayleigh's method and Buckingham's π methods—Dimensionless groups. Similitude, Model studies, Types of models. Application of dimensional analysis and model studies to fluid flow problems.

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.

UNIT-IV

Hydraulic Turbines – I: Elements 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, hydraulic design. Draft tube – Classification, functions and efficiency.

HydraulicTurbines–II: Governing of turbines–Surge tanks–Unit and specific turbines–Unit speed – Unit quantity – Unit power – Specific speed – Performance characteristics – Geometric similarity – Cavitation. Selection of turbines.

UNIT-V

Centrifugal Pumps: Pump installation details—classification—work done—Manometric head— minimum starting speed–losses and efficiencies–specific speed. Multistage pumps –pumps in series, parallel – performance of pumps – characteristic curves – NPSH – Cavitation.

TEXT BOOKS:

1. Fluid Mechanics by Modi and Seth, Standard Book House.
2. Fluid Mechanics and Hydraulic machines by Manish Kumar Goyal, PHI learning Private Limited, 2015

REFERENCE BOOKS:

1. Fluid Mechanics by R.C. Hibbeler, Pearson India Education Services Pvt.Ltd
2. Introduction to Fluid Mechanics and Fluid Machines by S K Som, Gautam Biswas, Suman Chakraborty, Mc Graw Hill Education (India) Private Limited
3. Hydraulic Machines by Banga & Sharma (Khanna Publishers).
4. Open channel flow by V.T.Chow (McGraw Hill Book Company).

COURSE OUTCOMES:

On completion of the course students will be able to

1. Differentiate open-channel and pipe flow, classify flow types, and compute uniform and critical flow parameters for various channel sections.
2. Analyze gradually and rapidly varied flows, classify surface profiles, and apply direct step and hydraulic jump methods for water surface computations
3. Apply dimensional analysis and hydraulic similitude to fluid flow problems, and evaluate hydrodynamic forces on vanes in turbo machinery.
4. Explain principles, design, and performance of Pelton, Francis, and Kaplan turbines, including governing, surge tanks, and Cavitation effects.
5. Classify centrifugal pumps, compute performance parameters, and analyze pump systems in series and parallel.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	**3**	**3**	**2**	**2**	**2**	**1**	**2**	**1**	**1**	**2**	**2**
CO2	**3**	**3**	**2**	**3**	**2**	**1**	**2**	**1**	**1**	**2**	**2**
CO3	**3**	**3**	**2**	**3**	**3**	**1**	**1**	**1**	**1**	**2**	**3**
CO4	**3**	**3**	**3**	**2**	**2**	**2**	**3**	**1**	**1**	**2**	**3**
CO5	**3**	**3**	**2**	**2**	**2**	2	**3**	**1**	**1**	**2**	**3**

(A501309) THEORY OF STRUCTURES

B. Tech (CE) IV Semester **L T P C**
3 0 0 3

Prerequisites: Strength of Materials

UNIT-I

ANALYSIS OF PERFECT FRAMES: Types of frames- Perfect, Imperfect and Redundant pin jointed plane frames - Analysis of determinate pin jointed plane frames using method of joints, method of sections and tension coefficient method for vertical loads, horizontal loads and inclined loads.

UNIT-II

ENERGY THEOREMS: Introduction-Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's Theorem-Unit Load Method – Deflections of simple beams and pin- jointed plane frames - Deflections of statically determinate bent frames.

Three Hinged Arches – Introduction – Types of Arches – Comparison between Three hinged and Two hinged Arches - Linear Arch - Eddy's theorem - Analysis of Three hinged arches - Normal Thrust and radial shear and bending moment - Geometrical properties of parabolic and circular arches - Three hinged parabolic circular arches having supports at different levels.

UNIT-III

PROPPED CANTILEVER AND FIXED BEAMS: Determination of static and kinematic indeterminacies for beams- Analysis of Propped cantilever and fixed beams, including the beams with different moments of inertia - subjected to uniformly distributed load - point loads - uniformly varying load, couple and combination of loads - Shear force, Bending moment diagrams and elastic curve for Propped Cantilever and Fixed Beams-Deflection of Propped cantilever and fixed beams - effect of sinking of support, effect of rotation of a support.

UNIT-IV

CONTINUOUS BEAMS: Introduction-Continuous beams - Clapeyron's theorem of three moments- Analysis of continuous beams with constant and variable moments of inertia with one or both ends fixed-continuous beams with overhang - effect of sinking of supports.
Slope Deflection Method: Derivation of slope-deflection equation, application to continuous beams with and without sinking of supports -Determination of static and kinematic indeterminacies for frames -Analysis of Single Bay, Single storey Portal Frames by Slope Deflection Method including Side Sway -Shear force and bending moment diagrams and Elastic curve.

UNIT-V

MOVING LOADS AND INFLUENCE LINES: Introduction maximum SF and BM at a given section and absolute maximum shear force and bending moment due to single concentrated load ,uniformly distributed load longer than the span, uniformly distributed load shorter than the span, two point loads with fixed distance between them and several point loads-Equivalent uniformly distributed load-Focal length - Definition of influence line for shear force and bending moment - load position for maximum shear force and maximum bending Moment at a section - Point loads, uniformly distributed load longer than the span, uniformly distributed load shorter than the span.

Text Books:

1. Introduction to Structural Analysis First Edition Indeterminate Structures First Edition (2026) by MeesalaChakradhara Rao, CRC Press..
2. Theory of Structures by R S Khurmi, S Chand & Company Pvt. Ltd, 2020

Reference Books:

1. Structural Analysis Vol –I & II by Vazarani and Ratwani, Khanna Publishers,1999
2. Strength of Materials and mechanics of solids Vol-2 by B.C. Punmia, Laxmi Publications, New Delhi, 2015
3. Structural Analysis -I & II by S.S. Bhavikatti, Vikas Publishing House Pvt. Ltd, 2021.

COURSE OUTCOMES:

On completion of the course students will be able to

1. An ability to apply knowledge of mathematics, science, and engineering.
2. Analyze the statically indeterminate bars and continuous beams.
3. Draw strength behavior of members for static and dynamic loading.
4. Calculate the stiffness parameters in beams and pin jointed trusses.
5. Understand the indeterminacy aspects to consider for a total structural system.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**1**	**2**	**3**
CO2	**3**	**3**	**3**	**3**	**2**	**1**	**1**	**1**	**1**	**2**	**3**
CO3	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**	**2**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**1**	**1**	**1**	**1**	**2**	**3**
CO5	**3**	**3**	**3**	**2**	**2**	**2**	**1**	**1**	**1**	**2**	**3**

(A501310) CONCRETE TECHNOLOGY

B. Tech (CE) IV Semester **L T P C**
2 **0 0 2**

UNIT- I

Aggregate: Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine, Manufactured sand and coarse Aggregates – Gap graded aggregate – Maximum aggregate size- Properties Recycled aggregate.
Admixtures: Types of admixtures – mineral and chemical admixtures.

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, vibration and revibration of concrete – Steps in manufacture of concrete – Quality of mixing water.

UNIT – III

Hardened Concrete: Water / Cement ratio – Abram's Law – Gel/space ratio – Gain of strength of concrete – Maturity concept – Strength in tension and compression – Factors affecting strength – Relation between compression and tensile strength - Curing. Testing of Hardened Concrete: Compression tests– Tension tests – Factors affecting strength – Flexure tests – Splitting tests – Pull-out test, Non-destructive testing methods – codal provisions for NDT.

UNIT - IV

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.
Special Concretes: Introduction to Light weight concrete – Cellular concrete – No-fines concrete – High density concrete – Fibre reinforced concrete – Polymer concrete – High performance concrete – Self compacting concrete, Nano silica and Nano Alumina concrete.

UNIT – V

Elasticity, Creep & Shrinkage – Modulus of elasticity – Dynamic modulus of elasticity – Poisson's ratio – Creep of concrete – Factors influencing creep – Relation between creep & time – Nature of creep – Effects of creep – Shrinkage – types of shrinkage.

TEXTBOOKS:

1. Concrete Technology by M.S. Shetty. – S. Chand & Co.; 2004
2. Concrete Technology by A.R. Santhakumar, 2nd Edition, Oxford university Press, New Delhi

REFERENCE BOOKS:

1. Properties of Concrete by A. M. Neville – Low priced Edition – 4th edition
2. Concrete: Micro structure, Properties and Materials – P.K. Mehta and J.M. Monteiro, Mc Graw Hill Publishers

IS Codes:
IS 383 : 2016
IS 516 : 2018 (Part -1 - 4)
IS 10262 – 2019

COURSE OUTCOMES: After the completion of the coursestudent should be able to

1. Identify and evaluate the physical and chemical properties of aggregates, including deleterious substances, grading, and recycled aggregates, and understand their impact on concrete performance.
2. Analyze the workability and setting behavior of fresh concrete, apply appropriate testing methods, and understand the influence of mixing, vibration, and water quality on concrete production.
3. Explain the strength development in hardened concrete, apply various destructive and non-destructive testing techniques, and interpret results in accordance with codal provisions.

4. Evaluate the elastic and time-dependent properties of concrete, including creep and shrinkage, and understand their implications on structural performance and durability.
5. Design concrete mixes using BIS methods, assess the role of admixtures, and explore the applications of special concretes like self-compacting, fibre-reinforced, and nano-modified concretes.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	**3**	**2**	**–**	**–**	**–**	**–**	**2**	**–**	**–**	**–**	**–**
CO2	**3**	**2**	**2**	**–**	**2**	**–**	**2**	**–**	**–**	**–**	**–**
CO3	**3**	**3**	**2**	**2**	**2**	**–**	**2**	**–**	**–**	**–**	**–**
CO4	**3**	**2**	**2**	**2**	**–**	**–**	**2**	**–**	**–**	**–**	**–**
CO5	**3**	**2**	**3**	**2**	**2**	**–**	**3**	**–**	**–**	**–**	**–**

(A500501) COMPUTATIONAL MATHEMATICS LAB
(Using Python software)
(Common for All Branches)

L	T	P	C
0	0	2	1

Visualize all solutions graphically through programs

Programs:

UNIT-I: Eigen values and Eigenvectors:

WEEK 1

Write a program to find solution of system of homogenous linear equations(trivial and non-trivial)

WEEK 2

Write a program to find solution of system of non-homogenous linear equation (unique and infinite)

WEEK 3

Write a program to obtain the eigen values and eigen vectors for dynamically generated matrix

Write a program to obtain matrix from quadratic form and orthogonalize the matrix

WEEK 4&5

UNIT-II: Solution of Algebraic and Transcendental Equations

Write a program to find real root of a given algebraic/transcendental equation using Bisection method.

WEEK 6&7

Write a program to find real root of a given algebraic/transcendental equation using Newton Raphson Method**.**

UNIT-III: Linear system of equations:

Jacobi's iteration method and Gauss-Seidal iteration method

WEEK 8

Write a program to find solution of given system of linear equations using Jacobi's method

WEEK 9

Write a program to find solution of given system of linear equations using Gauss-Seidal method.

UNIT-IV: First-Order ODEs

Exact and non-exact equations, Applications: exponential growth/decay, Newton's law of cooling.

WEEK 10

Write a program to **s**olve exact and non-exact equations

WEEK 11

Write a program to solve Newton's law of cooling problems and exponential growth/decay

UNIT-V: Higher order linear differential equations with constant coefficients

WEEK 12

Write a program to solve homogeneous ODEs

Write a program to solve non-homogeneous ODEs

WEEK 13

Write a program to solve Partial Derivatives and Jacobian of several variables

WEEK 14

Write a program for finding Maxima and Minima of functions of two variables

TEXT BOOKS

1. The fundamentals of Python: First Programs, Kenneth A. Lambert, CengageLearnings, 2011.
2. Think Python First Edition, by Allen B. Downey, Orielly publishing.

REFERENCES

1. An Introduction to Python, John C. Lusth, The University of Alabama, 2011.
2. Introduction to Python, CDave Kuhlman, 2008.

COURSE OUTCOMES:

On completion of the course students will be able to

1. Develop Python programs to compute the eigenvalues and eigenvectors of a matrix.
2. Implement Python code to solve algebraic and transcendental equations, as well as systems of linear equations.
3. Write Python programs to obtain solutions for first-order ordinary differential equations and higher-order linear differential equations with constant coefficients.
4. Develop Python code to solve partial differential equations
5. Determine maxima and minima of functions.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	-	-	-	-	-	-	-	2
CO2	3	3	1	-	-	-	-	-	-	-	2
CO3	3	3	1	-	-	-	-	-	-	-	2
CO4	3	3	1	-	-	-	-	-	-	-	2
CO5	3	2	1	-	-	-	-	-	-	-	2

(A501504) COMPUTER AIDED BUILDING DRAFTING LABORATORY

B. Tech (CE) IV Semester **L T P C**
0 0 2 1

ListofExperiments:

1. Planning Aspects of Building systems as per National Building Code(NBC).
2. Brick bonds: English bond & Flemish bond– Odd and Even courses.
3. Developing plan and section of dog-legged staircase.
4. Developing plan of single storied residential building.
5. Developing section and elevation of single storied residential building.
6. Developing plan of single/ two storied Residential building as per Building by-laws.
7. Developing plan of public building as per building by-laws.
8. Developing section and elevation of public building.
9. Development of working drawing of building–Electrical Layout.
10. Development of working drawing of building–Plumbing Layout.

TEXT BOOKS:

1. Computer AidedDesignLaboratorybyM.N. SeshaPraksh&Dr.G.S. Servesh–Laxmi Publications.
2. Engineering GraphicsbyP.J. Sha–S. Chand&Co.
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REFERENCE BOOKS:

1. Civil Engineering Drawing-I by S. Mahaboob Basha–Falcon Publishers
2. Building drawing by M. G. Shah-Tata McGraw-Hill Education
3. Structural Engineering Drawing by S. Mahaboob Basha–Falcon Publishers

COURSE OUTCOMES:

On completion of the course students will be able to

1. Interpret and apply *National Building Code (NBC)* and local building by-laws in the planning of residential and public buildings
2. Prepare building layouts, plans, sections, and elevations for single and multi-storey structures as per design requirements.
3. Demonstrate proficiency in representing masonry construction details such as English and Flemish brick bonds.
4. Develop staircase designs, electrical layouts, and plumbing layouts in accordance with functional and safety standards.
5. Produce complete working drawings suitable for construction execution and municipal approval.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	1	1	3	2	2	1	1	1
CO2	3	2	3	2	3	1	1	1	2	2	1
CO3	2	2	2	2	2	1	1	1	1	1	1
CO4	3	2	3	2	3	1	1	1	2	2	1
CO5	3	3	3	2	3	2	2	2	3	3	1

(A501505) MATERIAL TESTING LABORATORY

B. Tech (CE) IV Semester **L T P C**
0 0 2 1

LIST OF EXERCISES:

1. Tests on Cement:
a) Soundness.
b) Compressive strength.

2. Tests on Aggregates:
a) Specific gravity of fine aggregate.
b) Specific gravity of coarse aggregate.
c) Bulking of fine aggregate.
d) Grading of fine aggregate

3. IS method of mix design of normal concrete as per IS:10262

4. Tests on Fresh Concrete:
a) Slump cone test.
b) Compacting factor test.
c) Vee-Bee consist meter test.

5. Tests on Hardened Concrete:
a) Compressive &Tensile strength tests.
b) Modulus of elasticity of concrete.
c) Non-destructive testing of concrete.

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

1. Determine the soundness and compressive strength of cement as per standard procedures.
2. Evaluate physical properties of fine and coarse aggregates including specific gravity, bulking, and grading.
3. Design concrete mix proportion using IS:10262 method for achieving target strength and workability.
4. Assess the workability of fresh concrete using slump, compaction factor, and Vee-Bee tests.
5. Evaluate compressive and tensile strength, modulus of elasticity, and perform non-destructive tests on hardened concrete.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	3	1	-	-	-	-	-	-
CO2	3	2	2	3	1	-	-	-	-	-	-
CO3	3	3	3	3	2	-	-	-	-	-	-
CO4	3	2	2	3	1	-	-	-	-	-	-
CO5	3	3	3	3	2	-	-	-	-	-	-

(A501506) HYDRAULICS AND HYDRAULIC MACHINERY LABORATORY

B. Tech (CE) IV Semester **L T P C**
0 0 2 1

List of Experiments

1. Verification of Bernoulli's equation
2. Determination of Coefficient of discharge for a small orifice by a constant head method
3. Calibration of Venturimeter / Orifice Meter
4. Calibration of Triangular/Rectangular/ Trapezoidal Notch
5. Determination of Minor losses in pipe flow
6. Determination of Friction factor of a pipeline
7. Determination of Energy loss in Hydraulic jump
8. Determination of Manning's and Chezy's constants for Open channel flow.
9. Impact of jet on vanes
10. Performance Characteristics of Pelton wheel turbine
11. Performance Characteristics of Francis turbine
12. Performance characteristics of Kaplan Turbine
13. Performance Characteristics of a single stage/multistage Centrifugal Pump

COURSE OUTCOMES:

On completion of the course students will be able to

1. **Describe** the basic measurement techniques of fluid mechanics and its appropriate application.
2. **Interpre**t the results obtained in the laboratory for various experiments.
3. **Discover** the practical working of Hydraulic machines-different types of Turbines, Pumps, and other miscellaneous hydraulics machines.
4. **Compare** the results of analytical models introduced in lecture to the actual behavior of real fluid flows and draw correct and sustainable conclusions.
5. Write a technical laboratory report

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	1	2	2	-	-	-	-	1	-
CO2	3	3	2	3	1	-	-	-	-	2	-
CO3	2	2	3	2	3	-	-	-	-	2	-
CO4	3	3	3	3	2	-	1	-	-	2	-
CO5	1	2	1	2	1	-	-	-	-	3	-

(A501702) DIGITAL SURVEYING LABORATORY

B. Tech (CE) IV Semester **L T P C**

0 0 2 1

List of Experiments (Two Hours/Week)**:**

1. Introduction and demonstration of digital surveying instruments.
2. Setting up and calibration of the Total Station.
3. Measurement of distances, angles, and coordinates using a Total Station.
4. Traversing and plotting with Total Station.
5. Area and volume computations using digital survey data.
6. Profile and cross-section levelling using Total Station.
7. Introduction to GPS surveying – types and working principles.
8. Static and dynamic GPS survey using handheld devices.
9. Route tracking and waypoint marking with GPS.
10. Contouring using Total Station and digital level.
11. Data extraction and plotting in AutoCAD or similar software.
12. Group mini-project: topographical survey of a given area.
13. Project data processing and map/report preparation.
14. Project presentation and viva-voce.

Software/Tools to be used**:**

- Total Station (Leica, Sokkia, or equivalent)
- GPS Devices (Handheld)
- Surveying Software: AutoCAD

Recommended Books and Manuals**:**

1. B.C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, *Surveying Vol. 1 & 2*, 18th Edition, 2020, Laxmi Publications Pvt. Ltd., ISBN: 9789380856596.
2. Satheesh Gopi, *Advanced Surveying: Total Station, GIS and Remote Sensing*, 2nd Edition, 2017, Pearson Education India, ISBN: 9789332587697.
3. R. Subramanian, *Surveying and Levelling*, 2nd Edition, 2014, Oxford University Press, ISBN: 9780199456154.
4. N.N. Basak, *Surveying and Levelling*, 3rd Edition, 2017, McGraw Hill Education (India), ISBN: 9789353161598.
5. Satheesh Gopi, *GPS Surveying: Theory and Applications*, 1st Edition, 2015, Pearson Education India, ISBN: 9789332541088.

COURSE OUTCOMES:

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

1. Demonstrate working knowledge of modern digital surveying instruments including Total Station, GPS, and digital level.
2. Conduct field surveys for measurement of distances, angles, coordinates, and profiles using Total Station and GPS.
3. Apply digital surveying techniques for traversing, contouring, area and volume computation, and route tracking.
4. Process, extract, and plot survey data using CAD software to generate maps and engineering drawings.
5. Plan, execute, and present a topographical survey project with professional reporting and teamwork skills.

CO-PO MAPPING:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	2	2	3	3	1	1	-	1	2	2
CO2	3	3	3	3	3	1	1	1	2	2	2
CO3	3	3	3	3	3	1	1	1	2	2	2
CO4	3	3	3	3	3	-	1	-	1	3	3
CO5	3	2	3	3	3	2	1	1	3	3	3