



TKR COLLEGE OF ENGINEERING & TECHNOLOGY

AN AUTONOMOUS INSTITUTION

Accredited by NBA and NAAC with A+ Grade.

(Sponsored by TKR Educational Society, Approved by AICTE, Affiliated to JNTU H)

Medbowli, Meerpet, Balapur, Hyderabad, Telangana – 500 097

Phone: 9100377790. email: info@tkrcet.ac.in. web site: www.tkrct.ac.in



B.TECH - CIVIL ENGINEERING COURSE STRUCTURE R25

SEMESTER I

S.No.	Course Classification	Course Code	Name of the subject	L	T	P	C	I	E	Total
1	BS	EBSM1	Matrices and Calculus	3	1	0	4	40	60	100
2	BS	EBSC1	Engineering Chemistry	3	0	0	3	40	60	100
3		EESCP1	C Programming & Data Structures	3	0	0	3	40	60	100
4	HS	EHSE1	English for Skill Enhancement	3	0	0	3	40	60	100
5	ES	EESEE1	Elements of Electrical and Electronics Engineering	3	0	0	3	40	60	100
6	BS	EBSC2	Engineering Chemistry Lab	0	0	2	1	40	60	100
7	ES	EESCP2	C Programming and Data Structures Lab	0	0	2	1	40	60	100
8	ES	EESEE2	Elements of Electrical and Electronics Engineering Lab	0	0	2	1	40	60	100
9	HS	EHSE2	English Language and Communication Skills Lab	0	0	2	1	40	60	100
Total Credits				15	01	08	20	400	600	1000

SEMESTER II

S.No.	Course Classification	Course Code	Name of the subject	L	T	P	C	I	E	Total
1	BS	EBSM2	Ordinary Differential Equations and Vector Calculus	3	0	0	3	40	60	100
2	BS	EBSP1	Basic Engineering Physics	3	0	0	3	40	60	100
3	PC	E2PC1	Engineering Geology and Building Materials	3	0	0	3	40	60	100
4	ES	EESED1	Engineering Drawing and Computer Aided Drafting	2	0	2	3	40	60	100
5	ES	EESEM1	Engineering Mechanics	3	1	0	4	40	60	100
6	PC	E2PC2	Geology and Building Materials Testing Lab	0	0	2	1	40	60	100
7	BS	EBSP2	Basic Engineering Physics Lab	0	0	2	1	40	60	100
8	BS	EBSP1	Basic Python Programming Lab	0	1	2	2	40	60	100
9	ES	EESEW1	Engineering Workshop	0	0	2	1	40	60	100
Total Credits				14	02	10	21	400	600	1000



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CIVIL ENGINEERING

B..Tech. I Year I Semester

L/T/P C

3/1/0 4

MATRICES AND CALCULUS

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives:

To learn

1. Understand and apply matrix methods for finding rank, inverse, and solving systems of linear equations
2. Apply eigen concepts, transformations, and the Cayley–Hamilton theorem to analyze matrices and quadratic forms.
3. Apply limits, continuity, mean value theorems, and Taylor’s series to single-variable function problems.
4. Analyze multivariable functions using partial differentiation, Jacobians, and Lagrange multipliers for extrema
5. Evaluate double integrals, apply coordinate transformations, and compute areas using integration

Course outcomes:

After learning the contents of this paper, the student must be able to

1. Apply matrix methods to determine rank using Echelon and Normal forms, find inverses by the Gauss–Jordan method, and solve homogeneous and non-homogeneous systems of linear equations
2. Apply eigenvalue and eigenvector concepts, the Cayley–Hamilton theorem, and orthogonal transformations to solve matrix problems and reduce quadratic forms to canonical form
3. Apply the concepts of limits, continuity, mean value theorems, and Taylor’s series to analyze and solve problems involving single variable functions
4. Analyze multivariable functions using partial differentiation, Euler’s theorem, total derivatives, and Jacobians, and determine extrema through functional dependence, independence, and Lagrange multipliers
5. Analyze and evaluate double integrals in Cartesian and polar forms, apply change of order and variables, and determine areas using double integration techniques.

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**

Limit and Continuous of 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). Curve Tracing: Curve tracing in cartesian coordinates.

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

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.



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CIVIL ENGINEERING

B.Tech. I Year I Semester

L/T/P C

3/0/0 3

ENGINEERING CHEMISTRY

Course Objectives:

1. Understand water quality parameters and apply suitable treatment methods for potable and Industrial water.
2. Learn electrochemical principles for electrode potential measurement, pH determination, and Corrosion prevention.
3. Understand various energy sources, including batteries, fuel cells, fossil fuels, and synthetic Fuels, along with their applications.
4. Learn the classification, preparation, properties, and applications of polymers, including Conducting polymers.
5. Understand the properties, and engineering applications of smart materials, biosensors, cement, And lubricants.

Course Out comes:

At the end of the course, student would be able to -

CO1: Apply water quality analysis and treatment methods, including hardness removal, Disinfection, boiler feed water treatment, and desalination techniques.

CO2: Apply electrochemical principles to measure electrode potentials and pH, and analyze Corrosion mechanisms with appropriate prevention methods.

CO3: Apply the concepts of conventional and alternative energy sources, including batteries, fuel Cells, and fuels, for energy production and applications.

CO4: Analyze polymer types, preparation, properties, and applications, including conducting Polymers.

CO5: Analyze the properties and applications of smart materials, biosensors, cement, and lubricants In engineering.

UNIT-I:

Water and its treatment:

Introduction-types of hardness and units. Estimation of hardness of water by complexometric method - Numerical problems. Potable water and its specifications (WHO) – Steps involved in the treatment of potable water - Disinfection of potable water by chlorination and break-point chlorination.

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.

UNIT-II:

Electro chemistry and Corrosion:

Introduction- Electrode potential, standard electrode potential, Nernst equation (no derivation), electrochemical cell - Galvanic cell, cell representation, EMF of cell - Numerical problems. Types

of electrodes, reference electrodes - Primary reference electrode - Standard Hydrogen Electrode (SHE), Secondary reference electrode - Calomel electrode, Construction, working and determination of pH of unknown solution using SHE and Calomel electrode.

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

UNIT-III:

Energy sources:

Batteries: Introduction – Classification of batteries - Primary, secondary and reserve batteries with examples. 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 Fuel Cell (DMFC).

Fuels: Introduction and characteristics of a good fuel, Calorific value—Units-HCV, LCV

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.

UNIT-IV:

Polymers:

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

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

UNIT-V:

Advanced Functional Materials:

Smart materials: Introduction, Classification with examples - Shape Memory Alloys – Nitinol, Piezoelectric materials – quartz and their engineering applications.

Biosensor: Definition, Amperometric Glucose monitor sensor.

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

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.

Suggested Text Books:

1. Engineering Chemistry by P.C.Jain and M. Jain, Dhanpatrai Publishing Company, 2010.
2. Engineering Chemistry by Rama Devi, Dr.P. Aparna and Rath, Cengage learning, 2025.

Reference Text books:

1. Engineering Chemistry by Thirumala Chary, Laxminarayana & Shashikala, Pearson Publications (2020).
2. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company(P)Ltd. Delhi 2011.
3. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi 2015.
4. Engineering Analysis of Smart Material Systems by Donald J.Leo, Wiley, 2007.

5. Challenges and Opportunities in Green Hydrogen by **Editors:** Paramvir Singh, Avinash Kumar Agarwal, Anupma Thakur, R.K Sinha.
6. <https://www.worldscientific.com/doi/epdf/10.1142/13094>
7. E-Content-<https://doi.org/10.1142/13094>|October2023
8. E-books:
<https://archive.org/details/EngineeringChemistryByShashiChawla/page/n11/mode/2up>



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CIVIL ENGINEERING

B.Tech. I Year I Semester

L/T/P C

3/0/0 3

C PROGRAMMING AND DATA STRUCTURES

Course Objectives:

Introduce the importance of programming, C language constructs, program development, data structures, searching and sorting.

Course Outcomes:

Upon successful completion of this course, students will be able to:

- Demonstrate foundational knowledge of computer systems, number systems, algorithms, and Structured programming constructs in C to foster computational thinking and analytical learning
- Apply decision-making and iterative constructs, arrays, and string operations in C to solve real-World problems using modern programming tools
- Develop modular C programs using functions, pointers, and dynamic memory allocation to design and investigate complex problems
- Design and implement recursive algorithms and user-defined data types (structures/unions) for Robust, ethically responsible solutions
- Implement file handling and basic search/sort algorithms in C for efficient data processing, Demonstrating lifelong learning and professional behavior

CO-PO MAPPING

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	2	2	0	1	1	1	0	3
CO2	3	3	3	2	3	0	1	1	2	0	3
CO3	3	3	3	3	3	0	1	1	2	1	3
CO4	3	2	3	2	2	1	1	1	2	1	3
CO5	3	2	3	2	3	0	1	1	2	1	3

UNIT - I

Introduction to Computers – Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development

Introduction to C Language – Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output

Structure of a C Program – Operators, Bit-wise operators, Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Statements.

UNIT - II

Statements – if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Recursion.

Designing Structured Programs- Functions, basics, user defined functions, inter function communication, standard functions.

Arrays – Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays.

UNIT - III

Pointers – Introduction, Pointers for inter function communication, pointers to pointers, compatibility,

Pointer Applications – Passing an array to a function, Memory allocation functions, array of pointers

Strings – Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion.

UNIT - IV

Derived types – The Typedef, enumerated types, Structures – Declaration, definition and initialization of structures, accessing structures, operations on structures, complex structures. Unions – Referencing unions, initializers, unions and structures.

Input and Output – Text vs Binary streams, standard library functions for files, converting file types, File programs – copy, merge files.

UNIT – V

Sorting- selection sort, bubble sort, insertion sort,

Searching-linear and binary search methods.

Data Structures – Introduction to Data Structures, abstract data types, Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, Stacks-Operations, array and linked representations of stacks, stack applications, Queues-operations, array and linked representations.

Text Books:

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Education.
3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

Reference Books:

1. C & Data structures – P. Padmanabham, 3rd Edition, B.S. Publications.
2. C Programming with problem solving, J.A. Jones & K. Harrow, Dreamtech Press
3. Programming in C – Stephen G. Kochan, III Edition, Pearson Education.
4. C for Engineers and Scientists, H. Cheng, McGraw-Hill International Edition
5. Data Structures using C – A. M. Tanenbaum, Y. Langsam, and M.J. Augenstein, Pearson Education / PHI
6. C Programming & Data Structures, E. Balagurusamy, TMH.
7. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press
8. C & Data structures – E V Prasad and N B Venkateswarlu, S. Chand & Co.

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**CIVIL ENGINEERING****B.Tech. I Year I Semester****L/T/P C****3/0/0 3****ENGLISH FOR SKILL ENHANCEMENT****INTRODUCTION**

National Education Policy-2020 aims at preparing students with knowledge, skills, values, leadership qualities and initiates them for lifelong learning. It also emphasizes language study and promotion of languages through understanding and proper interpretation. English language is central to the educational eco system. The importance of language as medium of communication for personal, social, official and professional needs to be emphasized for clear and concise expression. Teaching and learning of receptive and productive skills viz., Listening, Speaking, Reading and Writing (LSRW) are to be taught and learnt effectively in the undergraduate Engineering programs. Learners should be encouraged to engage in a rigorous process of learning to become proficient users of English language by adopting a deeply focused and yet flexible approach as opposed to rote learning.

In this connection, suitable syllabus, effective pedagogy, continuous assessments and students' involvement result in productive learning. This course supports the latest knowledge and skill requirements and shall meet specified learning outcomes. The main objectives of English language teaching and learning as medium of communication and for promotion of cultural values are embedded in this syllabus. Efforts are being made in providing a holistic approach towards value-based language learning which equips the learner with receptive as well as productive skills.

The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed textbook for detailed study. The students should be encouraged to read the texts leading to reading comprehension. The time should be utilized for working out the exercises given after each excerpt, and also for supplementing the exercises with authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material.

Learning Objectives:

This course will enable the students to:

- Improve their vocabulary.
- Use appropriate sentence structures in their oral and written communication.
- Develop their reading and study skills.
- Equip students to write paragraphs, essays, précis and draft letters.
- Acquire skills for Technical report writing.

Course Outcomes:

Students will be able to:

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

SYLLABUS: The course content / study material is divided into **Five Units**.

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 BlackSwan 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 BlackSwan 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 BlackSwan 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 BlackSwan 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.**

Note: *Listening and Speaking skills which are given under Unit-6 in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.*

- (Note: As the syllabus of English given in AICTE Model Curriculum-2018 for B.Tech. First Year is **Open-ended**, besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the

class.)

Text Book:

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

Reference Books:

1. Swan, Michael. (2016). *Practical English Usage*. Oxford University Press. New Edition.
2. Karal, Rajeevan. 2023. *English Grammar Just for You*. Oxford University Press. New Delhi 2024. *Empowering with Language: Communicative English for Undergraduates*. Cengage Learning India Pvt. Ltd. New Delhi
3. Sanjay Kumar & Pushp Lata. 2022. *Communication Skills – A Workbook*. Oxford University Press. New Delhi
4. Wood, F.T. (2007). *Remedial English Grammar*. Macmillan.
5. Vishwamohan, Aysha. (2013). *English for Technical Communication for Engineering Students*. Mc Graw-Hill Education India Pvt. Ltd.



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CIVIL ENGINEERING

B.Tech. I Year I Semester

L/T/P C

3/0/0 3

ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Prerequisites: Mathematics

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 impart 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.

Course Outcomes:

After learning the contents of this course the student must be able to

1. Apply fundamental laws to analyze DC and AC circuits including power and three-phase systems.L3
2. Identify components of LT switchgear, wiring, earthing, batteries, and perform simple Energy-related calculations.L3
3. Explain the construction, principle of operation, and performance characteristics of Electrical machines.L3
4. Analyze diode characteristics, rectifier circuits with filters, and their practical Applications.L4
5. Differentiate between BJT and FET, analyze their configurations, and evaluate their Applications in amplifiers.L3

Course Articulation Matrix:

(Correlation of Course Outcomes with Program Outcomes using mapping levels

1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	-	-	-	-	-	-	1
CO2	3	3	2	2	2	2	-	-	-	-	-	1
CO3	3	3	2	2	2	-	-	-	-	-	-	1
CO4	3	3	3	2	2	-	-	-	-	-	-	1
CO5	3	3	3	2	2	-	-	-	-	-	-	1

UNIT - I:

D.C. Circuits: Electrical circuit elements (R, L and C), voltage and current sources, KVL and 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, Three phase 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 And TK Nagasarkar, Oxford University, 1st Edition, 2012
2. Basic Electrical And Electronics Engineering, D P Kothari And I J Nagarath, Mcgraw Hill Education, 2nd Edition, 2020

Reference Books:

1. Electronic Devices and Circuits, R. L. Boylestad and Louis Nashelsky, PEI and PHI, 9th Edition, 2006.
2. Millman's Electronic Devices and Circuits, J. Millman, C. C. Halkias and Satyabrata Jit, TMH, 2nd Edition, 1998.
3. Engineering Circuit Analysis, William Hayt and Jack E. Kemmerly, McGraw Hill, 6th Edition, 1971.

4. Linear circuit analysis, Raymond A. De Carlo and Pen, Min, Lin, Oxford University Press, 2nd edition, 2004.
5. Network Theory, N. C. Jagan and C. Lakshminarayana, McGraw Hill, 2nd Edition, 2005.
6. Network Theory, Sudhakar and Shyam Mohan Palli, Tata McGraw Hill, 2nd Edition, 2011.
7. Fundamentals of Electrical Engineering, L. S. Bobrow, Oxford University Press, 12th edition, 2003.
8. Electrical and Electronic Technology, E. Hughes, Pearson Education, 10th Edition, 2010.
9. Electrical Engineering Fundamentals, V. D. Toro, Prentice Hall India, 2nd Edition, 1989.



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CIVIL ENGINEERING

B.Tech. I Year I Semester

L/T/P C

0/0/2 1

ENGINEERING CHEMISTRY LAB

Course Description:

The course includes experiments based on fundamental principles of chemistry essential for Engineering students, aiming to develop practical skills and reinforce theoretical concepts.

Course Objectives:

1. **Estimate** water hardness and **assess** its suitability for drinking.
2. **Demonstrate** acid-base titrations using conductometry, potentiometry, and pH metry.
3. **Synthesize** Bakelite and Nylon 6,6 in the lab.
4. **Measure** acid value and viscosity to **evaluate** material properties.
5. **Interpret** virtual experiments for engineering applications

Course Outcomes:

At the end of the course, student would be able to

CO1: Determine the hardness in water to verify its suitability for drinking purpose.

CO2: Apply techniques like conductometry, potentiometry, pH metry to determine Concentrations in acid-base reactions.

CO3: Use fundamental preparatory techniques for the synthesis of Bakelite and Nylon-6, 6.

CO4: Determine physical properties, namely acid value and viscosity of a given fluid.

CO5: Demonstrate the ability to analyze and interpret virtual experiments based on fundamental Chemical principles applicable to engineering systems.

List of Experiments:

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. Colorimetry: Verification of Lambert-Beer's law using KMnO_4

V. Preparations:

1. Preparation of Bakelite.
2. Preparation of Nylon- 6,6.

VI. pH Metry: Determination of an acid concentration using pH meter.

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

Additional Experiments:

1. Thin layer Chromatography calculation of Rf values
2. Determination of Surface tension of given liquid by using Stalagmometer.

Reference Books:

1. Lab manual for Engineering chemistry by B. Ramadevi and P.Aparna, S Chand Publications, New Delhi (2022)
2. Vogel's textbook of practical organic chemistry 5th edition
3. Inorganic Quantitative analysis by A.I.Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007).



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CIVIL ENGINEERING

B.Tech. I Year I Semester

L/T/P C
0/0/2 1

C PROGRAMMING & DATA STRUCTURES LAB

Course Objectives:

Introduce the importance of programming, C language constructs, program development, data structures, searching and sorting.

Course Outcomes:

Upon successful completion of this course, students will be able to:

- Demonstrate foundational knowledge of C programming constructs (data types, control flow, Functions) and computational thinking to solve basic algorithmic problems.
- Implement iterative and recursive algorithms (loops, recursion) in C for mathematical Sequences, factorial, GCD, and Towers of Hanoi, optimizing for correctness and efficiency.
- Design and manipulate complex data structures using pointers, user-defined types (structures/unions), and dynamic memory allocation to build modular C applications.
- Develop file-based utilities—file copy, merge, reverse, and text processing—ensuring reliable Data handling and ethical responsibility.
- Apply searching, sorting, and advanced string operations to process and analyze data, Demonstrating teamwork, professional communication, and commitment to lifelong learning.

CO-PO MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	1	2	0	1	2	2	0	3
CO2	2	3	3	2	2	0	1	2	2	0	3
CO3	3	3	3	2	3	0	1	2	2	1	3
CO4	2	2	2	2	3	1	3	2	2	1	2
CO5	2	3	3	1	2	0	1	3	3	1	3

List of Experiments:

1. Write a C program to find the sum of individual digits of a positive integer.
2. 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.
3. Write a C program to generate all the prime numbers between 1 and n, where n is a value Supplied by the user.
4. Write a C program to find the roots of a quadratic equation.
5. Write a C program to find the factorial of a given integer.
6. Write a C program to find the GCD (greatest common divisor) of two given integers.
7. Write a C program to solve Towers of Hanoi problem.
8. 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)

9. Write a C program to find both the largest and smallest number in a list of integers.
10. Write a C program that uses functions to perform the following:
 - a. Addition of Two Matrices
 - b. Multiplication of Two Matrices
11. Write a C program that uses functions to perform the following operations:
 - a. To insert a sub-string in to a given main string from a given position.
 - b. To delete n Characters from a given position in a given string.
12. Write a C program to determine if the given string is a palindrome or not
13. Write a C program that displays the position or index in the string S where the string T Begins, or – 1 if S doesn't contain T.
14. Write a C program to count the lines, words and characters in a given text.
15. Write a C program to generate Pascal's triangle.
16. Write a C program to construct a pyramid of numbers.
17. Write a C program that uses functions to perform the following operations:
 - a. Reading a complex number
 - b. Writing a complex number
 - c. Addition of two complex numbers
 - d. Multiplication of two complex numbers
18. (Note: represent complex number using a structure.)
19. Write a C program which copies one file to another.
20. Write a C program to reverse the first n characters in a file. (Note: The file name and n are Specified on the command line.)
21. Write a C program to display the contents of a file.
22. 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)
23. Write a C program that uses functions to perform the following operations on singly linked List.
 - i) Creation ii) Insertion iii) Deletion iv) Traversal
24. Write C programs that implement stack (its operations) using
 - i. Arrays ii) Pointers
25. Write C programs that implement Queue (its operations) using
 - i) Arrays ii) Pointers
26. Write a C program that implements the following sorting methods to sort a given list of Integers in ascending order
 - i) Bubble sort ii) Selection sort iii) Insertion sort
27. Write C programs that use both recursive and non-recursive functions to perform the Following searching operations for a Key value in a given list of integers:
 - i) Linear search ii) Binary search

Text Books:

1. C Programming & Data Structures, B.A. Forouzan and R. F. Gilberg, Third Edition, Cengage Learning.
2. Let us C, Yeswanth Kanitkar
3. C Programming, Balaguruswamy.



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CIVIL ENGINEERING

B.Tech I Year I Semester

L/T/P C
0/0/2 1

ELEMENTS OF ELECTRICAL AND ELECTRONIC ENGINEERING LAB

Prerequisites: Elements of Electrical and Electronic Engineering

Course Objectives:

1. To introduce the fundamental concepts of electrical circuits and their components.
2. To understand the construction, operation, and characteristics of DC machines, AC machines, And transformers.
3. To impart knowledge of various types of electrical installations.
4. To explain the concept of power, power factor, and methods of power factor improvement.
5. To introduce the principles of diodes and transistors, including their configurations, Characteristics, and applications.

Course Outcomes:

1. Analyze and solve electrical circuits using network laws L4
2. Evaluate the performance characteristics of different types of Electrical machines and single phase transformer by conducting various tests L5
3. Design and analyze electrical wiring systems, including staircase wiring, godown wiring, and Bell connection.L4
4. Illustrate the characterize diodes and various types of filters l3
5. Analyze the Different Configurations of Transistor Characteristics L4

Course Articulation Matrix:

(Correlation of Course Outcomes with Program Outcomes using mapping levels

1 = Slight, 2 = Moderate and 3 = Substantial)

CO	PROGRAM OUTCOMES (PO)											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	–	–	–	–	–	–	2
CO2	3	3	2	3	3	1	–	–	–	–	–	2
CO3	3	2	3	2	2	2	–	–	–	–	–	2
CO4	3	2	2	2	3	1	–	–	–	–	–	2
CO5	3	3	2	2	3	1	–	–	–	–	–	2

List of Experiments:**PART A:****ELECTRICAL** (any six experiments from the given list)

1. Verification of KVL and KCL
2. (i) Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a SinglePhase Transformer
3. Measurement of Active and Reactive Power in a balanced Threeep hase circuit
4. Performance Characteristics of a Separately Excited DC Shunt Motor
5. Performance Characteristics of a Threeep hase Induction Motor
6. No Load Characteristics of a Three phase Alternator
7. Make a circuit for stair case wiring.
8. Make a circuit for Godown wiring.

PART B:**ELECTRONICS** (any four experiments from the given list)

1. Study and operation of
(i) Multimeters (ii) Function Generator (iii) Regulated Power Supplies (iv) CRO.
2. P-N Junction diode characteristics
3. Zener diode characteristics and Zener as voltage Regulator
4. Full Wave Rectifier with and without filters
5. Input and Output characteristics of Transistor in CB, CE configuration
6. .Input and Output characteristics of FET in CS configuration

Text Books:

1. Basic Electrical and electronics Engineering, M.S. Sukija and T.K. Nagasarkar, Oxford University press, 1stEdition, 2012.
2. Basic Electrical and electronics Engineering, D.P. Kothari and I.J. Nagarath, McGraw Hill Education, 2nd Edition, 2020.

Reference Books:

1. Electronic Devices and Circuits, R. L. Boylestad and Louis Nashelsky, PEI and PHI, 9th Edition, 2006.



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CIVIL ENGINEERING

B.Tech. I Year I Semester

L/T/P C

0/0/2 1

ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB

The **English Language and Communication Skills (ELCS) Lab** focuses on listening and speaking skills, particularly on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts.

Listening Skills:

Objectives

1. To enable students develop their active listening skills
2. To equip students with necessary training in listening, so that they can comprehend the Speech of people from different linguistic backgrounds

Speaking Skills:

3. To improve their pronunciation and neutralize accent
4. To enable students express themselves fluently and appropriately
5. To practise speaking in social and professional contexts

Learning Outcomes:

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

Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:

- a. **Computer Assisted Language Learning (CALL) Lab** which focusses on listening skills
- b. **Interactive Communication Skills (ICS) Lab** which focusses on speaking skills

The following course content is prescribed for the

English Language and Communication Skills Lab.

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:**❖ 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

❖ Post-Assessment Test on ‘Express Your View’

Minimum Requirement of infrastructural facilities for ELCS Lab:**1. Computer Assisted Language Learning (CALL) Lab:**

The Computer Assisted Language Learning Lab has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

System Requirement (Hardware component):

Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:

- i) Computers with Suitable Configuration
- ii) High Fidelity Headphones

2. Interactive Communication Skills (ICS) Lab:

The Interactive Communication Skills Lab: A Spacious room with movable chairs and audio- visual aids with a Public Address System, a T. V. or LCD, a digital stereo – audio & video system and camcorder etc.

□ Note: English Language Teachers are requested to prepare Materials / Handouts for each Activity for the Use of those Materials in CALL & ICS Labs.

Suggested Software:

- Cambridge Advanced Learners' English Dictionary with CD.
- Grammar Made Easy by Darling Kindersley.
- Punctuation Made Easy by Darling Kindersley.
- Oxford Advanced Learner's Compass, 10th Edition.
- English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).

Reference Books:

1. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook*. Cambridge University Press
2. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities*. Orient BlackSwan Pvt. Ltd.
3. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach*. Cambridge University Press
4. (2022). *English Language Communication Skills – Lab Manual cum Workbook*. Cengage Learning India Pvt. Ltd.
5. Ur, Penny and Wright, Andrew. 2022. *Five Minute Activities – A Resource Book for Language Teachers*. Cambridge University



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CIVIL ENGINEERING

B.Tech. I Year II Semester

L/T/P C

3/0/0 3

ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Pre-requisites: Mathematical Knowledge at pre-university level

Course Objectives:

To learn

1. Understand and apply methods to solve first-order differential equations and model basic Physical phenomena.
2. Learn techniques to solve higher-order linear differential equations with constant Coefficients and variable parameters.
3. Understand Laplace transform concepts and apply them to solve initial value problems and Evaluate integrals
4. Learn vector differentiation concepts to analyze vector fields and determine their properties.
5. Understand vector integration and apply fundamental theorems to evaluate integrals in Engineering contexts.

Course outcomes:

After learning the contents of this paper, the student must be able to

1. Apply methods to solve first-order differential equations and model real-life problems such As Cooling, growth, and decay
2. Apply methods to solve higher-order linear differential equations with constant coefficients Using standard techniques and variation of parameters
3. Apply Laplace transform techniques to solve initial value problems and evaluate integrals for Engineering applications
4. Analyze vector point functions using gradient, divergence, curl, and vector identities to Determine scalar potentials and classify vector fields
5. Analyze and evaluate line, surface, and volume integrals using Green's, Gauss's, and Stokes' Theorems for solving engineering problems

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 , $e^{ax}(x)$ 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. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.
2. R.K. Jain and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th Edition, 2016.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
4. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.



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CIVIL ENGINEERING

B..Tech. I Year II Semester

L/T/P C

3/0/0 3

ADVANCED ENGINEERING PHYSICS

Pre-requisites: 10+2 Physics

Course Objectives:

1. Understand quantum mechanics and band theory concepts to study the electronic properties of solids.
2. Learn crystallography fundamentals, nanomaterials and their characterization techniques.
3. Understand quantum computing principles, qubit operations, and quantum algorithms for information processing.
4. Learn the properties, classification, and applications of magnetic and dielectric materials in engineering.
5. Understand the principles, construction, and applications of lasers and optical fibres in communication and sensing.

Course Outcomes:

- CO1:** Apply quantum mechanics and band theory concepts to analyze the Electronic Properties of solids.
- CO2:** Apply crystallography principles, nanomaterial and their characterization Techniques to Analyze material structures and properties.
- CO3:** Apply quantum computing principles, qubit operations, and quantum Algorithms to Process and analyze information.
- CO4:** Analyze the properties, classification, and applications of magnetic and Dielectric Materials in advanced engineering devices.
- CO5:** Analyze the principles, types, and applications of lasers and optical fibres In Communication and sensing technologies.

UNIT - I:

Quantum Mechanics and Band theory of Solids

Introduction to Quantum mechanics, de-Broglie hypothesis, Heisenberg uncertainty principle, 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,

Band theory of solids: Introduction to Band theory of solids, Bloch's theorem (qualitative), Kronig-Penney model (qualitative): E-k diagram, effective mass of electron, formation of energy bands, origin of bandgap, classification of solids.

UNIT - II:**Crystallography and Nano Materials & Characterization**

Introduction to Crystallography: Unit cell, space lattice, basis, lattice parameters; crystal structures, Bravais lattices, packing factor: SC, BCC, FCC; Miller indices, inter-planar distance;

Concept of nanomaterials: surface to volume ratio, concept of discrete energy levels and quantum confinement in nanomaterials, X-ray diffraction: Bragg's law, powder method, calculation of average crystallite size using Debye Scherrer's formula, Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM): block diagram, working principle.

UNIT - III:**Quantum Computing and Quantum Information Science**

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

Quantum computing system for information processing, evolution of quantum systems, quantum measurements, entanglement, quantum gates, challenges and advantages of quantum computing over classical computation, quantum algorithms: Deutsch- Jozsa, Shor, Grover.

UNIT - IV:**Magnetic and Dielectric Materials**

Introduction to magnetic materials, origin of magnetic moment-classification of magnetic materials, hysteresis, Weiss domain theory of ferromagnetism, soft and hard magnetic materials, applications: magnetic hyperthermia for cancer treatment, magnets for EV, Giant Magneto Resistance (GMR) device

Introduction to dielectric materials, types of polarization (qualitative): electronics, ionic & orientation; ferroelectric, piezoelectric, pyroelectric materials and their applications: Ferroelectric Random-Access Memory (Fe-RAM), load cell and fire sensor.

UNIT - V:**Lasers and Fibre Optics**

Introduction to laser, characteristics of laser, Einstein coefficients and their relations, metastable state, population inversion, pumping, lasing action, Ruby laser, He-Ne laser, CO₂ laser, semiconductor diode laser, applications: Bar code scanner, LIDAR for autonomous vehicle.

Introduction to fibre optics, total internal reflection, construction of optical fibre, acceptance angle, numerical aperture, classification of optical fibres, losses in optical fibre, applications: optical fibre for communication system, sensor for structural health monitoring.

Text Books:

1. Walter Borchardt-Ott, *Crystallography: An Introduction*, Springer.
2. Charles Kittel, *Introduction to Solid State Physics*, John Wiley & Sons, Inc.
3. Thomas G. Wong, *Introduction to Classical and Quantum Computing*, Rooted Grove

Reference Books:

1. Jozef Gruska, *Quantum Computing*, McGraw Hill
2. Michael A. Nielsen & Isaac L. Chuang, *Quantum Computation And Quantum Information*, Cambridge University Press.
3. John M. Senior, *Optical Fiber Communications Principles and Practice*, Pearson Education Limited.

Useful Links

- <https://shijuinpallotti.wordpress.com/wp-content/uploads/2019/07/optical-fiber-communications-principles-and-pr.pdf>
- https://www.geokniga.org/bookfiles/geokniga-crystallography_0.pdf
- <https://dpbck.ac.in/wp-content/uploads/2022/10/Introduction-to-Solid-State-PhysicsCharles-Kittel.pdf>
- <https://www.thomaswong.net/introduction-to-classical-and-quantum-computing-1e4p.pdf>
- <https://www.fi.muni.cz/usr/gruska/qbook1.pdf>
- <https://profmcruez.wordpress.com/wp-content/uploads/2017/08/quantum-computation-and-quantum-information-nielsen-chuang.pdf>



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CIVIL ENGINEERING

B..Tech. I Year II Semester

L/T/P C

3/0/0 3

ENGINEERING GEOLOGY AND BUILDING MATERIALS

Course Objectives:

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

1. Understand the significance of geology in civil engineering and analyze geological Factors Affecting construction safety and stability.
2. Identify and classify minerals and rocks based on physical properties and their Engineering Relevance.
3. Interpret geological structures and soil types, and evaluate groundwater behavior for Site Suitability.
4. Explore the properties, manufacturing processes, and applications of traditional building materials like stones, bricks, tiles, and timber.
5. Examine the composition, testing, and usage of modern building materials including Cement Paints, plastics, and advanced composites.

Course Outcomes:

1. Explain the role of geology in civil engineering and assess the impact of geological Conditions on Construction projects.
2. Classify minerals and rocks using physical properties and describe their engineering Applications.
3. Analyze geological structures, soil types, and groundwater systems for civil Engineering site Investigations.
4. Evaluate the properties and uses of conventional building materials including stones, Bricks, tiles, and timber.
5. Assess the composition, testing methods, and applications of modern building materials And Cement types.

Syllabus

UNIT - I

Geology-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**Geology-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**Geology-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 In-situ 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**Building Materials-I:**

Stones, Bricks, and Tiles: Classification and properties of building stones, Quarrying, dressing, and testing of stones, Manufacturing, classification, and properties of bricks, Tests on bricks, Types and properties of clay tiles – manufacturing process, Uses of tiles in buildings. Timber and Wood Products: Classification and structure of timber, Defects in timber, seasoning, and preservation, Types of engineered wood – plywood, particle board.

UNIT - V**Building Materials-II:**

Paints, Varnishes, and Miscellaneous Materials: Types of paints, constituents, and applications, Varnishes, distempers – composition and uses, Glass – types and uses, Plastics, asphalt, bitumen, adhesives, and sealants – properties and applications, Modern building materials: GFRP, geo synthetics, AAC blocks. Cement: Types as per IS codes (OPC, PPC, PSC), Composition and hydration of cement compounds, Tests on cement (consistency, setting time, strength)

Text Books:

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.
3. Engineering Methods by D. Venkat Reddy; Vikas Publishers, 2015.

4. Engineering Geology by S K Duggal K Pandey, McGraw Hill Education Pvt. Ltd. 2014.
5. Building Construction by Dr. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, 11th edition 2016, Laxmi Publications.
6. Concrete Technology by M. S. Shetty, S. Chand Publishing Company Pvt. Ltd.

Reference Books:

1. Fundamental of Engineering by F.G. Bell, B.S. Publications, 2005.
2. Principles of Engineering Geology & Geotechnics by Krynine & Judd, CBS Publishers & Distribution.
3. Engineering Geology by Subinoy Gangopadhyay, Oxford University Press.
4. Engineering Geology for Civil Engineers by P.C. Varghese, PHI Learning Pvt. Ltd.
5. Building Materials and Construction by Sushil Kumar, 20th edition, reprint 2015, Standard Publishers.
6. Properties of Concrete by A. M. Neville, 4th edition.
7. Building Materials by P C Varghese, PHI Learning Pvt. Ltd.
8. IS 10262: 2019 Code for Concrete Mix Proportioning.
9. National Building Code (NBC) of India.



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CIVIL ENGINEERING

B..Tech. I Year II Semester

L/T/P C

2/0/2 3

ENGINEERING DRAWING AND COMPUTER AIDED DRAFTING

Course Objectives:

- 1.To introduce the fundamentals of engineering drawing and projection systems.
- 2.To develop skills in constructing orthographic, isometric, and sectional views.
- 3.To train students in interpreting and creating technical drawings using CAD tools.
- 4.To familiarize students with dimensioning standards and drafting conventions.
- 5.To bridge manual drafting techniques with computer-aided drafting practices.

Course Outcomes:

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

- 1.Understand and apply the principles of orthographic and isometric projections.
- 2.Create sectional views and dimensioned drawings using BIS standards.
- 3.Use CAD software to generate 2D engineering drawings.
- 4.Visualize and construct solid models from 2D views.
- 5.Interpret and produce engineering drawings of mechanical components and assemblies.
- 6.Demonstrate drafting skills for practical and industrial applications.

UNIT – I:

Introduction to Engineering Graphics (Conventional)

Principles of Engineering Graphics and their Significance, Geometrical Constructions, Scales, Plain and Diagonal, Conic Sections including the Rectangular Hyperbola, General method only. Cycloid, Epicycloid and Hypocycloid.

UNIT - II:

Orthographic Projections (Conventional and Computer Aided)

Principles of Orthographic Projections, Conventions, Projections of Points and Lines, Projections of Plane regular geometric figures. Computer aided orthographic projections, points, lines and planes. Introduction to Computer aided drafting, views, commands and conics.

UNIT – III:

Projections of Regular Solids (Conventional and Computer Aided)

Projections of Right Regular Solids, Prism, Cylinder, Pyramid, Cone, Computer aided projections of solids, sectional views

UNIT – IV:

Development of Surfaces (Conventional): Prism, Cylinder, Pyramid and Cone. Sectional views of Development of Surfaces

UNIT – V:**Isometric Projections (Conventional and Computer Aided)**

Principles of Isometric Projection, Isometric Scale, Isometric Views, Conventions, Isometric Views of Lines, Plane Figures, Simple and Compound Solids, Conversion of Isometric Views to Orthographic Views and Vice- versa, Conventions. Conversion of orthographic projection into isometric view.

Note:

1. The End Semester Examination will be in conventional mode.
2. CIE – I will be in conventional mode.
3. CIE – II will be using Computer.

Text Books:

1. Engineering Drawing, N.D. Bhatt, Charotar, 54th Edition, 2023.
2. Engineering Drawing and graphics Using AutoCAD, T. Jeyapoovan and Vikas, S. Chand and company Ltd., 3rd Edition, 2010.

Reference Books:

1. Engineering Drawing, Basant Agrawal and C.M. Agrawal, McGraw Hill, 3rd Edition 2019.
2. Engineering Graphics and Design, WILEY, John Wiley and Sons Inc, 3rd Edition, 2020.
3. Engineering Drawing, M. B. Shah and B.C. Rane, Pearson, 2nd Edition, 2009.
4. Engineering Drawing, N. S. Parthasarathy and Vela Murali, Oxford, 1st Edition, 2015.
5. Computer Aided Engineering Drawing, K. Balaveera Reddy, CBS Publishers, 2nd Edition, 2015.



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CIVIL ENGINEERING

B..Tech. I Year II Semester

**L/T/P C
3/1/0 4**

ENGINEERING MECHANICS

Course Objectives:

This course is expected to enable the student to:

1. Provide Knowledge of force systems and free body diagram to analyze rigid body equilibrium.
2. Comprehend the principles of Friction and solve engineering mechanics problems associated with frictional force.
3. Compute the centroid, first moment and second moment of an area.
4. Impart the concept of motion of particles and rigid bodies.
5. Familiarize the concepts of work-energy method and its applications to translation, rotation and plane motion and the concept of vibrations.

Course Outcomes:

At the end of the course, student 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. Solve problem of bodies subjected to friction.
3. Find the location of centroid and calculate moment of inertia of a given section.
4. Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotator motion and rigid body motion.
5. Interpret and implement work-energy principle and its applications.

Syllabus

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; Static Indeterminacy.

UNIT - II

Friction:

Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, Ladder friction 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 Pappu's.

UNIT - III**Area moment of inertia**

Definition, 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 – Transfer Formula for Mass Moments of Inertia – Mass moment of inertia of composite bodies.

UNIT - IV**Kinematics of Particles:**

Kinematics of particles – Rectilinear motion – Curvilinear motion – Projectiles.

Kinetics of Particles: Kinetics of particles – Newton's Second Law – Differential equations of rectilinear and curvilinear motion – dynamic equilibrium – Inertia force – D. Alembert's Principle applied for rectilinear and curvilinear motion.

UNIT - V**Work-Energy Principle:**

Equation of translation, principle of conservation of energy, work-energy principle applied to particle motion and connected systems, fixed axis rotation. Impulse – Momentum Principle: Introduction, linear impulse momentum, principle of conservation of linear momentum, elastic impact and types of impact, loss of kinetic energy, coefficient of restitution.

Text Books:

1. G. Lakshmi Narasaiah (2023), Engineering Mechanics, B.S. Publications.
2. Reddy Vijay Kumar K. and J. Suresh Kumar (2024), Singer's Engineering Mechanics – Statics & Dynamics, B.S. Publications.
3. Shames and Rao (2006), Engineering Mechanics, Pearson Education.
4. S.S. Bhavikatti (2021), Engineering Mechanics, New age International Publishers.

Reference Books:

1. Timoshenko S. P and Young D.H, "Engineering Mechanics", McGraw Hill International Edition, 2017.
2. Andrew Pytel, Jaan Kiusalaas, "Engineering Mechanics", Cengage Learning, 2014.
3. Beer F. P & Johnston E. R Jr. Vector, "Mechanics for Engineers", TMH, 2004.
4. Hibbeler R.C & Ashok Gupta, "Engineering Mechanics", Pearson Education, 2010.
5. Tayal D.H., "Engineering Mechanics – Statics & Dynamics", Umesh Publications, 2011.
6. Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University Press, 2008.
7. Meriam. J.L., "Engineering Mechanics", Volume-II Dynamics, John Wiley & Sons, 2008.
8. P.C Dhirendra. "Engineering Mechanics", University Press.



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CIVIL ENGINEERING

B..Tech. I Year II Semester

**L/T/P C
0/0/2 1**

GEOLOGY AND BUILDING MATERIALS TESTING LAB

Course Objectives:

1. Understand the fundamental properties of minerals and rocks.
2. Acquire hands-on skills in mineral and rock identification.
3. Interpret geological maps and structural features.
4. Master standard procedures for testing construction materials.
5. Apply mix design principles and evaluate concrete performance

Course Outcomes:

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

1. Identify and classify minerals and rocks based on physical and chemical properties.
2. Analyze and interpret geological maps and structural formations.
3. Conduct standard laboratory tests on cement and aggregates.
4. Design concrete mixes and assess workability of fresh concrete.
5. Evaluate mechanical properties of hardened concrete using destructive and non-destructive methods.

Syllabus

I. Geology Lab 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;
5. Element group: Graphite; Pyroxene group: Talc; Mica group: Muscovite; Amphibole group: Asbestos, Olivine, Hornblende, Magnetite, Hematite, Corundum, Kyanite, Garnet, Galena, Gypsum.
6. 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.
7. Identification of rocks (Sedimentary Petrology): Conglomerate, Breccia, Sandstone and its varieties, Laterite, Limestone and its varieties, Shales and its varieties.
8. Identification of rocks (Metamorphic Petrology): Marble, slate, Gneiss and its varieties, Schist and its varieties. Quartzite, Phyllite.

9. Study of topographical features from Geological maps. Identification of symbols in maps.
10. Simple structural Geology Problems (Folds, Faults & Unconformities)

II. Material Testing Experiments:

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



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CIVIL ENGINEERING

B.Tech. I Year II Semester

L/T/P C

0/0/2 1

ADVANCED ENGINEERING PHYSICS LAB

Pre-requisites: 10+2 Physics

Course Objectives:

1. To impart practical skills in advanced solid-state and modern physics concepts
2. To prepare and examine properties of semiconductor, ferromagnetic, and ferroelectric Materials.
3. To characterize semiconductors through Hall effect and band gap studies.
4. To investigate laser and optical fiber operation through experiments.
5. To build skills in data analysis, interpretation, and scientific reporting.

Course Outcomes:

CO1: Verify the particle nature of light using the photoelectric effect.

CO2: Measure electrical, magnetic, and optical properties of semiconductors and functional Materials.

CO3: Analyze semiconductor properties using Hall effect and band gap measurements.

CO4: Examine the operation of lasers and parameters of optical fibers through experiments.

CO5: Employ scientific methods for precise data collection, analysis, and technical reporting.

List of Experiments:

1. Determination of Planck's constant using photo electric effect.
2. Determination of Hall coefficient and carrier concentration of a given semiconductor.
3. Determination of energy gap of a semiconductor.
4. Determination of V-I characteristics of LED(Blue,Green,Red)
5. Determination of magnetic moment of a bar magnet and horizontal earth magnetic field.
6. Study of B-H curve of a Ferro magnetic material.
7. Determination of dielectric constant of a given material.
8. Determination of Curie's temperature of a given ferroelectric material.
9. A) Determination of wavelength of a laser using diffraction grating.
B) Study of V-I & L-I characteristics of a given laser diode.
10. A) Determination of numerical aperture of a given optical fibre.
B) Determination of bending losses of a given optical fibre.

Note: Any 8 experiments are to be performed.



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CIVIL ENGINEERING

B.Tech. I Year II Semester

L/T/P C

0/0/2 2

BASIC PYTHON PROGRAMMING LAB

Course Objective

To introduce students to Python programming fundamentals and develop problem-solving skills using control structures, data structures, functions, OOP, file handling, and libraries, with practical applications in data processing, visualization, GUI, and digital logic.

- **Apply** Python control structures, operators, and data types to solve basic computational problems. (L3 – Apply)
- **Analyze** and manipulate data using Python lists, tuples, dictionaries, strings, arrays, and matrices for problem solving. (L4 – Analyze)
- **Develop** modular and object-oriented programs using functions, classes, inheritance, and exception handling. (L5 – Create)
- **Evaluate** file handling techniques and implement text/data processing tasks using Python. (L5 – Evaluate)
- **Apply** Python libraries (NumPy, SciPy, Matplotlib) for scientific computing, data visualization, and real-world applications.
- **Design** Python-based applications integrating GUI programming and digital logic for interdisciplinary problem solving.

Course Outcomes

Upon successful completion of this course, students will be able to:

- Demonstrate proficiency in fundamental Python constructs—syntax, data types, operators, input/output functions, and control structures—to develop correct and efficient scripts for basic computational tasks.
- Employ Python's built-in data structures (lists, tuples, dictionaries, arrays) and advanced string/list operations, including recursion, to manipulate and analyze data collections effectively.
- Develop modular and robust Python programs by defining functions, handling exceptions, performing file I/O, and creating custom modules to solve real-world problems.
- Design and implement object-oriented Python applications using classes, methods, inheritance, and encapsulation to model graphical components and logical systems.
- Integrate scientific computing libraries (NumPy, SciPy, Matplotlib) and GUI frameworks (Tkinter) to build interactive, data-driven applications featuring visualization and digital logic simulation.

CO-PO MAPPING

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	3	3	2	1	2	0	0	1	1	0	3
CO2	3	3	2	2	2	0	0	1	1	0	3
CO3	3	3	3	2	3	0	0	2	2	1	3
CO4	3	3	3	2	3	0	0	2	2	1	2
CO5	3	3	3	3	3	0	0	2	2	1	2

Week 1:

- Start interpreter, use Python as a calculator, explore help ().

Week 2:

- Program to calculate compound interest
- Read and print name, address, email, and phone
- Check if input is digit/lowercase/uppercase/special character

Week 3:

- Print a number triangle using a for loop
- Print all prime numbers in a given interval (use break)

Week 4:

- Convert a list and tuple into arrays
- Find common values between two arrays

Week 5:

- Implement palindrome(), is_sorted(), has_duplicates(), remove_duplicates().

Week 6:

- Add "I", "a", and empty string to word list
- Invert dictionary (swap keys and values)
- Add commas between characters of a string (e.g. 'Apple' → 'A,p,p,l,e')
- Remove a given word from all places in a string

Week 7:

- Capitalize first letter of each word without using built-in functions
- Recursive function to generate binary strings of n-bit length

Week 8:

- Define/print matrix, multiply two square matrices.

Week 9:

- Create a module using different geometrical shapes
- Use exception handling for general-purpose exceptions

Week 10:

- draw_rectangle() function with Canvas and Rectangle
- Add color attribute to Rectangle and modify drawing function
- draw_point() function

Week 11:

- Define Circle class and draw_circle() function.

Week 12:

- Validate phone/email, merge contents of two files into a third

Week 13:

- Check for presence of specific words in a file
- Find word with the most occurrences in a file
- Display counts: words, vowels, spaces, lowercase, and uppercase letters

Week 14:

- Import NumPy, Plotpy, SciPy and explore their functionalities
- Install NumPy using pip and explore it

Week 15:

- Implement AND/OR/NOT/XOR gates,
- Build a GUI with labels, text fields, submit & reset buttons.

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



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CIVIL ENGINEERING



B.Tech. I Year II Semester

L/T/P C

0/0/2 1

ENGINEERING WORKSHOP

Prerequisites: Practical skill

Course Objectives:

1. To introduce students to basic manufacturing processes and workshop practices.
2. To provide hands-on training in carpentry, fitting, welding, sheet metal, and machining
3. To develop skills in using hand tools and measuring instruments.
4. To enhance safety awareness and proper handling of workshop equipment.
5. To build a foundational understanding of industrial production and fabrication.

Course Outcomes:

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

1. Understand the basic manufacturing processes and operations.
2. Use hand tools and equipment safely and efficiently.
3. Perform basic operations in carpentry, fitting, welding, sheet metal work, and machining
4. Read and interpret workshop drawings
5. Develop teamwork, time management, and quality awareness in a workshop environment.

1. TRADES FOR EXERCISES: At least two exercises from each trade:

- i. **Carpentry:** T- Lap Joint, Dovetail Joint, Mortise and Tenon Joint
- ii. **Fitting:** V- Fit, Dovetail Fit and Semi- circular fit
- iii. **Tin Smithy:** Square Tin, Rectangular Tray 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 AND EXPOSURE: Plumbing, Machine Shop, Metal Cutting (Water Plasma), Power tools in construction and Wood Working

Text Books:

1. Workshop Practice, B. L. Juneja, Cengage Learning India, 1st edition, 2015.
2. Workshop Practice Manual, K. Venkata Reddy, BS Publication, 6th Edition, Rpt.2025.

Reference Book:

1. Workshop Manual, K. Venugopal, Anuradha Publications, 2012th edition, 2012.