



SPHOORTHY

ENGINEERING COLLEGE

(UGC AUTONOMOUS)

B.Tech. I Year COURSE STRUCTURE (SR25 Regulations)

B.Tech. in CIVIL ENGINEERING

Applicable from the Academic Year 2025-26

I Year I Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1	S25MA101BS	Matrices and Calculus	3	1	0	4
2	S25CH102BS	Engineering Chemistry	3	0	0	3
3	S25EN103HS	English for Skill Enhancement	3	0	0	3
4	S25CE104ES	Elements of Electrical and Electronics Engineering	3	0	0	3
5	S25CE105ES	C Programming and Data Structures	3	0	0	3
6	S25CH106BS	Engineering Chemistry Lab	0	0	2	1
7	S25CE107ES	C Programming and Data Structures Laboratory	0	0	2	1
8	S25EN108HS	English Language and Communication Skills Laboratory	0	0	2	1
9	S25CE109ES	Elements of Electrical and Electronics Engineering Lab	0	0	2	1
10	S25MC110	YOGA/NSS/NCC				
		Induction Program				
		Total Credits	15	01	8	20

I Year II Semester

S. No.	Course Code	Course Title	L	T	P	Credits
1	S25MA201BS	Ordinary Differential Equations and Vector Calculus	3	0	0	3
2	S25ME202ES	Engineering Drawing and Computer Aided Drafting	2	0	2	3
3	S25PH203BS	Advanced Engineering Physics	3	0	0	3
4	S25CS204ES	Python Programming	3	0	0	3
5	S25PH205PC	Building Planning and Construction	3	0	0	3
6	S25PH206BS	Advanced Engineering Physics Laboratory	0	0	2	1
7	S25CE207PC	Engineering Mechanics for Civil Engineers	3	0	0	3
8	S25CS208ES	Python Programming Laboratory	0	0	2	1
9	S25ME209ES	Engineering Workshop	0	0	2	1
		Total Credits	15	2	8	21

**S25MA101BS: Matrices and Calculus**

B.Tech. in CIVIL ENGINEERING

Applicable from AY 2025-26

B.Tech. I Year I Sem.

L	T	P	C
3	1	0	4

Course Objectives: To learn

1. Applying basic operations on matrices and their properties.
2. Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
3. Concept of eigen values and eigen vectors and to reduce the quadratic form to canonical Form.
4. Geometrical approach to the mean value theorems and their application to the mathematical problems.
5. Finding maxima and minima of functions of two and three variables.
6. Evaluation of multiple integrals and their applications.

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

1. Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations.
2. Find the Eigen values and Eigen vectors and reduce the quadratic form to canonical form using orthogonal transformations.
3. Solve the applications of the mean value theorems.
4. Find the extreme values of functions of two variables with/ without constraints.
5. Evaluate the multiple integrals and apply the concept to find areas, volumes.

UNIT - I: Matrices**8L**

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**10L**

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**10L**

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)****10L**

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)

10L

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form), Evaluation of Triple Integrals, Change of variables (Cartesian to polar) for double

Applications: Areas and volumes by double 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.



SPHOORTHY
ENGINEERING COLLEGE
(UGC AUTONOMOUS)

S25 CH102BS: ENGINEERING CHEMISTRY
B.Tech. in CIVIL ENGINEERING
Applicable from AY 2025-26

B.Tech. I Year I Sem.

L T P C
3 0 0 3

Course Objectives:

1. To develop adaptability to new advances in Engineering Chemistry and acquire the essential skills to become a competent engineering professional.
2. To understand the industrial significance of water treatment, fundamental principles of battery chemistry, and the impact of corrosion along with its control methods for structural protection.
3. To impart foundational knowledge of various energy sources and their practical applications in engineering.
4. To equip students with an understanding of smart materials, biosensors, and analytical techniques applicable in engineering, industrial, environmental, and biomedical fields.

Course Outcomes:

1. Students will be able to understand the fundamental properties of water and its applications in both domestic and industrial purposes.
2. Students will gain basic knowledge of electrochemical processes and their relevance to corrosion and its control methods.
3. Students will comprehend the significance and practical applications of batteries and various energy sources, enhancing their potential as future engineers and entrepreneurs.
4. Students will learn the basic concepts and properties of polymers and other engineering materials.
5. Students will be able to apply the principles of UV-Visible, IR spectroscopy in analyzing pollutants in dye industries and biomedical applications.

UNIT-I: Water and its treatment: [8]

Introduction- Hardness, types, degree 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. 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.

UNIT-II: Electrochemistry and Corrosion: [8]

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: [8]

Batteries: Introduction – Classification of batteries - Primary, secondary batteries with examples. Construction, working and applications of 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- Dulong's formula - 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 Green Hydrogen.

UNIT - IV: Polymers: [8]

Definition - Classification of polymers: Based on origin and tacticity with examples – Types of polymerization - Addition (free radical addition mechanism) and condensation polymerization-preparation properties and applications of Bakelite

Plastics, Elastomers and Fibers: Definition and applications (PVC, Buna-S, Nylon-6,6). Differences between thermoplastics and thermosetting plastics.

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

Biodegradable polymers: Polylactic acid and its applications.

UNIT-V- Advanced Functional Materials: [8]

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

Smart materials: Introduction, Classification with examples - Shape Memory Alloys – Nitinol,

Piezoelectric materials: Classification with examples, properties and applications.

Interpretative spectroscopic applications: Introduction- principle of spectroscopy-EMR - types of spectroscopy-applications of UV-Visible spectroscopy for Analysis of pollutants in dye industry -applications of IR spectroscopy in night vision-security.

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 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://archive.org/details/EngineeringChemistryByShashiChawla/page/n11/mode/2u>

NPTEL Courses <https://nptel.ac.in/courses/122101001>

<https://nptel.ac.in/courses/104103069>

<https://nptel.ac.in/courses/104103071>

<https://nptel.ac.in/courses/104106137>

Animated videos.

<https://www.youtube.com/watch?v=Pu7g3ulG6Zo>

https://www.youtube.com/watch?v=qpFC_Ecu_yQ

https://www.youtube.com/watch?v=4RDA_B_dRQ0

<https://www.youtube.com/watch?v=cZg4bfEnLcU>

<https://www.youtube.com/watch?v=4vGjHU2YsYM>

<https://www.youtube.com/watch?v=Tn6xKhQ61Vs>

**B.Tech. in CIVIL ENGINEERING****Applicable from AY 2025-26****S25EN103HS : ENGLISH FOR SKILL ENHANCEMENT****B.Tech. I Year I Sem.**

L	T	P	C
3	0	0	3

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:

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.

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



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S25CE104ES: ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING Syllabus

B.Tech. in CIVIL ENGINEERING Applicable from AY 2025-26

B.Tech. I Year I Sem.

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 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:

1. To analyze and solve electrical circuits using network laws and theorems.
2. To understand and analyze basic Electric and Magnetic circuits
3. To study the working principles of Electrical Machines
4. To introduce components of Low Voltage Electrical Installations
5. To identify and characterize diodes and various types of transistors.

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.

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. 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, 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

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.



S25CS105ES: C PROGRAMMING AND DATA STRUCTURES
B.Tech. in CIVIL ENGINEERING
Applicable from AY 2025-26

B.Tech. I Year I Sem.

L	T	P	C
3	0	0	3

Course Objectives:

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

Course Outcomes:

1. Understand the various steps in Program development.
2. Explore the basic concepts in C Programming Language.
3. Develop modular and readable C Programs
4. Understand the basic concepts such as Abstract Data Types, Linear and Non Linear Data structures.
5. Apply data structures such as stacks, queues in problem solving
6. To understand and analyze various searching and sorting algorithms.

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. R25 B.Tech. Civil Engineering

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.



S25 CH106BS: ENGINEERING CHEMISTRY LAB
B.Tech. in CIVIL ENGINEERING
Applicable from AY 2025-26

B.Tech. I Year I Sem.

L	T	P	C
0	0	2	1

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. Students will understand and perform experiments based on core chemical principles relevant to engineering applications.
2. Students will learn to estimate the hardness of water to assess its suitability for drinking purposes.
3. Students will acquire the ability to perform acid-base titrations using instrumental methods such as conductometry, potentiometry, and pH metry.
4. Students will gain hands-on experience in synthesizing polymers like Bakelite in the laboratory.
5. Students will learn to determine the strength of sulphuric acid in batteries.
6. Students will understand and perform pH testing for beverages
7. Students will acquire the knowledge about the softwares used to draw chemical structures

Course Outcomes:

1. Students will develop practical skills through hands-on chemistry experiments relevant to engineering.
2. Students will learn to determine important parameters such as water hardness and the corrosion rate of mild steel under various conditions.
3. Students will be able to apply techniques like conductometry, potentiometry, and pH metry to determine concentrations or equivalence points in acid-base reactions.
4. Students will gain experience in synthesizing polymers such as Bakelite
5. Students are able to determine the strength of sulphuric acid in acid batteries.
6. Students are able to perform pH testing for beverages
7. Students will be able to draw the chemical structures using chemdraw/chemsketch softwares which are generally employing in chemical field.

List of Experiments:

- I. **Volumetric Analysis:** Estimation of Hardness of water by EDTA Complexometry 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. **Estimation** of KMnO_4 using std. oxalic acid by titrimetric method.
- IV. **Potentiometry:** Estimation of concentration of Fe^{+2} ion by Potentiometry using KMnO_4 .
- V. **pH Metry:** Determination of an acid concentration using pH meter.
- VI. **Preparations:** Preparation of Bakelite.
- VII. **Battery:** Determination of strength of sulphuric acid in Lead-acid battery by acid-base titration.
- VIII. **Food analysis:** Determination of pH of mineral water, soft drinks and fruit juice a comparative method using universal indicator, universal pH paper and pH-meter

Computer based lab (virtual lab):

Draw the following chemical structures using Chemdraw / Chems sketch softwares.
i. EDTA ii. EBT iii. M-EDTA iv. M-EBT

REFERENCE BOOKS:

1. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
2. Vogel's text book 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).
5. <https://www.acdlabs.com/resources/free-chemistry-software-apps/chemsketch-freeware/>

<https://www.youtube.com/watch?v=JXBU1qMyO0A>

**S25EC107ES:C PROGRAMMING & DATA STRUCTURES LAB****B.Tech. in CIVIL ENGINEERING**

Applicable from AY 2025-26

B.Tech. I Year I Sem.

L	T	P	C
0	0	2	1

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

Course Outcomes:

1. Develop modular and readable C Programs
2. Solve problems using strings, functions
3. Handle data in files
4. Implement stacks, queues using arrays, linked lists.
5. To understand and analyze various searching and sorting algorithms.

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:
 - i) Addition of Two Matrices
 - ii) Multiplication of Two Matrices
 11. Write a C program that uses functions to perform the following operations:
 - i) To insert a sub-string in to a given main string from a given position.
 - ii) 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:
 - i) Reading a complex number
 - ii) Writing a complex number
 - iii) Addition of two complex numbers
 - iv) Multiplication of two complex numbers
- (Note: represent complex number using a structure.)

18.

- i. Write a C program which copies one file to another.
 - ii. 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.)

19.

- i. Write a C program to display the contents of a file. R25 B.Tech. Civil Engineering JNTUH Hyderabad
 - ii. 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)
20. Write a C program that uses functions to perform the following operations on singly linked list.:
i) Creation ii) Insertion iii) Deletion iv) Traversal
21. Write C programs that implement stack (its operations) using
i) Arrays ii) Pointers
22. Write C programs that implement Queue (its operations) using
i) Arrays ii) Pointers
23. 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
24. 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.

**B.Tech. in CIVIL ENGINEERING****S25EN108HS : ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB****B.Tech. I Year I Sem.**

L	T	P	C
0	02	1	

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 Press.



SPHOORTHY

ENGINEERING COLLEGE

(UGC AUTONOMOUS)

S25CE109ES: ELEMENTS OF ELECTRICAL AND ELECTRONICS

ENGINEERING LAB

B.Tech. CIVIL ENGINEERING

Applicable from AY 2025-26

B.Tech. I Year I Sem.

L	T	P	C
0	0	2	1

Prerequisites: 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 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.
7. To impart the knowledge of various configurations, characteristics and applications.

Course Outcomes:

1. To analyze and solve electrical circuits using network laws and theorems.
2. To understand and analyze basic Electric and Magnetic circuits.
3. To study the working principles of Electrical Machines.
4. To introduce components of Low Voltage Electrical Installations.
5. To identify and characterize diodes and various types of transistors.

List of Experiments:

PART A: ELECTRICAL

1. Verification of KVL and KCL
2. (i) Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a SinglePhase Transformer
(ii) **Verification of Relationship between Voltages and Currents (StarDelta, DeltaDelta, Delta Star, StarStar) in a Three Phase Transformer**
3. Measurement of Active and Reactive P ower in a balanced Threephase circuit
4. Performance Characteristics of a Separately Excited DC Shunt Motor
5. Performance Characteristics of a Threephase Induction Motor
6. NoLoad Characteristics of a Threephase Alternator

PART B: ELECTRONICS

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. Input and Output characteristics of Transistor in CB, CE configuration
5. Full Wave Rectifier with and without filters
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, 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.

**S25MA201BS: Ordinary Differential Equations and Vector Calculus****B.Tech. in CIVIL ENGINEERING**

Applicable from AY 2025-26

B.Tech. I Year II Sem.

L	T	P	C
3	0	0	3

Course Objectives: To learn

1. Methods of solving the differential equations of first and higher order.
2. Concept, properties of Laplace transforms.
3. Solving ordinary differential equations using Laplace transforms techniques.
4. The physical quantities involved in engineering field related to vector valued functions.
5. The basic properties of vector valued functions and their applications to line, surface and volume integrals.

Course Outcomes: After learning the content of this course, students will be able to

1. Recognise and solve first-order differential equations, and apply this to Newton's law of cooling and the Law of natural growth and decay.
2. Solve higher order linear differential equation with constant coefficients and few specific non homogeneous terms.
3. Find Laplace and Inverse Laplace transform of various functions and apply it to solve ordinary differential equations.
4. Evaluate the directional derivative and scalar potential for given vector functions.
5. Evaluate the line, surface and volume integrals and establish the relation among them.

UNIT - I: First Order Ordinary Differential Equations**8 L**

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**10L**

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**10L**

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**10L**

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

10L

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.



**S25ME202ES: ENGINEERING DRAWING AND COMPUTER
AIDED DRAFTING**

B.Tech. in CIVIL ENGINEERING

Applicable from A.Y: 2025-26

B.Tech. I Year II Sem.

L T P C
0 1 2 2

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

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

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

UNIT-III: Projections of Regular Solids

Auxiliary Views, Sections or Sectional views of Right Regular Solids, Prism, Cylinder, Pyramid, Cone, Auxiliary views, Computer aided projections of solids, sectional views

UNIT-IV: Development of Surfaces: 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.

Note: Explanation, Practice, Internal & External evaluation both are to be conducted using computer aided drafting.

TEXTBOOKS:

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.

REFERENCEBOOKS:

1. Engineering Drawing, Basant Agrawal and C.M.Agrawal, Mc GrawHill, 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.



B.Tech. in CIVIL ENGINEERING
Applicable from AY 2025-2026 Batch
S25PH203BS : ADVANCED ENGINEERING PHYSICS

L T P C
3 0 0 3

B.Tech. I Year II Sem.**Course Objectives: The course aims to:**

1. Introduce the fundamental principles of quantum mechanics and their application to physical systems.
2. Develop an understanding of semiconducting and nanomaterials with relevance to modern electronic devices.
3. Analyze the electrical behavior of semiconducting materials and interpret the characteristics and applications of diodes and solar cells.
4. Illustrate the dielectric and magnetic properties of materials and their technological applications
5. Describe the working principles of lasers and optical fibres in communication and sensing technologies

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

1. Explain the fundamental principles of quantum mechanics and apply Schrödinger's equation to simple systems such as a particle in a box and energy band formation.
2. Analyze the electrical behavior of semiconducting materials and interpret the characteristics and applications of diodes and solar cells.
3. Describe the synthesis, properties, and characterization of nanomaterials and their significance in modern technology.
4. Illustrate the concepts of Qubits, quantum gates, and evaluate the advantages of quantum computing and cryptography.
5. Explain the dielectric, magnetic, and optical properties of materials and relate them to device applications such as FeRAM, GMR, and optical fibre communication

UNIT - I: Quantum Mechanics

Introduction, 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, formation of energy bands, classification of solids, concept of discrete energy levels.

UNIT - II: Semiconducting and nanomaterials

Introduction to Semiconductors, Drift and Diffusion (qualitative), Hall effect, direct and indirect band gap semiconductors, Generation and Recombination, Construction, working principle, characteristics and applications of – P-N Junction diode, Zener diode LED, Photodiode, PIN diode and solar cell.

Introduction to nano materials, Quantum confinement, Surface area to volume ratio, Preparation of nano materials by Sol-Gel, Ball milling, Physical vapour deposition techniques, Characterization of nano materials - XRD (calculation of average crystallite size using Debye Scherrer's formula), scanning electron microscopy (SEM), Transmission Electron Microscopy (TEM).

UNIT - III: Quantum Computing

Introduction to quantum computing, challenges and advantages of quantum computing over classical computation, linear algebra for quantum computation (qualitative), Dirac's Bra and Ket notations and their properties, Hilbert space, Bloch's sphere, concept of quantum computer, classical bits, Qubits, multiple Qubit system, entanglement, quantum gates (Basic and universal gates).

UNIT - IV: Dielectric and Magnetic materials

Dielectric Materials: Basic definitions, Types of polarizations-Electronic, Ionic and orientation polarization (qualitative), ferroelectric, piezoelectric and pyroelectric materials and their applications.

Magnetic materials: Origin of magnetic moment – Classification of magnetic materials – Weiss domain theory of ferromagnetism - Hysteresis- soft and hard magnetic materials and their applications.

UNIT - V: Laser 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, semiconductor diode laser, applications.

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.

Learning Resources:

1. Quantum Physics, H.C. Verma, 2nd Edition 2012, TBS Publication
2. Thomas G. Wong, *Introduction to Classical and Quantum Computing*, Rooted Grove
3. Donald A. Neamen, *Semiconductor Physics and Devices- Basic Principle*, Mc Graw Hill, 4th Edition 2021.
4. B.K. Pandey and S. Chaturvedi, *Engineering Physics*, Cengage Learning, 2nd Edition 2022.
5. *Essentials of Nanoscience and Nanotechnology* by Narasimha Reddy Katta, Typical Creatives Nanodigest 1st Edition 2021.

Useful Links

- <https://shijuinpallotti.wordpress.com/wp-content/uploads/2019/07/optical-fibercommunications-principles-and-pr.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://profmcruz.wordpress.com/wp-content/uploads/2017/08/quantum-computation-andquantum-information-nielsen-chuang.pdf>



S25CS204ES: PYTHON PROGRAMMING
B.Tech. in CIVIL ENGINEERING
 Applicable from AY 2025-26

B.Tech. I Year II Sem.

L	T	P	C
3	0	0	3

Prerequisites: Basic knowledge of computer fundamentals, C programming

Course Objectives:

Introduce the fundamentals of Python programming for problem-solving.

1. Develop skills to write structured, modular, and efficient Python code.
2. Enable students to use Python's built-in data structures and libraries effectively.
3. Provide knowledge on file handling, exception handling, and object-oriented programming in Python.
4. Equip students with the ability to apply Python for real-world applications including data processing and automation.

Course Outcomes:

1. Write Python programs using variables, operators, expressions, and control structures.
2. Implement Python programs using built-in data structures like lists, tuples, sets, and dictionaries.
3. Apply modular and object-oriented programming principles in Python.
4. Handle files, exceptions, and apply Python libraries for problem-solving.
5. Develop small-scale applications in Python for automation and data manipulation.

UNIT-1 – Introduction to Python and Basics of Programming

Introduction to Python: Features, Applications, Installation, IDEs, Python Syntax, Indentation, Comments, Variables, Data Types, Type Casting, Operators: Arithmetic, Relational, Logical, Assignment, Membership, Identity, Bitwise, Input/Output functions (input(), print()), Control Structures:

if, if-else, if-elif-else, Nested Conditions, Looping: for, while, Nested Loops, break, continue, pass.

UNIT-2 – Data Structures in Python

Strings: Creation, Indexing, Slicing, Methods, String Formatting, Lists: Creation, Indexing, Slicing, List Comprehension, Methods, Tuples: Properties, Indexing, Methods, Sets: Creation, Operations, Methods, Dictionaries: Creation, Access, Methods, Dictionary Comprehension, Iterating over data structures.

UNIT-3 – Functions and Modules

Functions: Defining, Calling, Parameters, Return Values, Types of Arguments: Positional, Keyword, Default, Variable Length, Scope of Variables: Local and Global, Lambda Functions, Map, Filter,

Reduce, Recursion in Python, Modules: Importing, Creating User-defined Modules, Standard Modules (math, random, datetime), Packages in Python.

UNIT-4 – File Handling and Exception Handling

File Handling: Opening, Reading, Writing, Appending, File Modes, File Methods, Working with CSV R25 B.Tech. ECE Syllabus JNTUH Hyderabad

and JSON Files, Exception Handling: try, except, else, finally, Built-in Exceptions, Raising Exceptions, Introduction to Regular Expressions (re module).

UNIT-5 – Object-Oriented Programming and Applications

OOP Basics: Classes, Objects, Attributes, Methods, Constructor (`__init__`), `self` keyword, Inheritance:

Single, Multiple, Multilevel, Hierarchical, Method Overriding, Method Overloading (conceptual), Encapsulation and Polymorphism, Application Development: Data Processing Script, Basic Calculator, File Organizer, Simple Data Analysis with pandas.

TEXT BOOKS:

1. Python Programming: Using Problem Solving Approach by Reema Thareja.
2. Python Crash Course by Eric Matthes, Learning Python by Mark Lutz.

REFERENCE BOOKS:

1. Introduction to Python Programming by Gowrishankar S., Veena A.
2. Python Cookbook by David Beazley and Brian K. Jones.
3. Fluent Python by Luciano Ramalho, Automate the Boring Stuff with Python by Al Sweigart.



B.Tech. in CIVIL ENGINEERING

Syllabus (SR25) From Academic Year 2025-26

S25CE205PC: BUILDING PLANNING AND CONSTRUCTION

B.Tech. I Year II Sem

L T P C

3 0 0 3

Course Objectives: This course is expected to enable the student to:

- Provide fundamental knowledge about buildings and the influence of climate, orientation, and landscaping on building planning and design.
- Impart understanding of planning principles
- Familiarize students with the National Building Code (NBC), its structure and guidelines for residential buildings,
- Develop knowledge of key building components
- Introduce various finishing works and temporary structures

Course Outcomes: Upon completion of this course, student should be able to

- Understand the classification of buildings, criteria for site selection, the impact of climate on building design, and the role of orientation and landscaping in planning.
- Apply the principles of planning and interpret building bye-laws to design functionally efficient, economical, and regulation-compliant buildings.
- Interpret and implement provisions of the National Building Code (NBC) related to residential buildings and understand basic construction techniques including foundations and masonry.
- Identify and analyze various types of floors, roofs, staircases, doors, windows, and lintels used in building construction and their suitability for different design conditions.
- Demonstrate knowledge of finishing works such as plastering, pointing, and floor finishes, and explain the types, design, and safety aspects of scaffolding, formwork, and centering.

UNIT - I

Fundamentals of Buildings: Building, Classification of buildings, Site selection for Residential buildings, Climate and its influence on building planning; Elements of Climate, Climatic Zone of India, Climate and comfort, Earth and its motion, Directions and their characteristics, Landscaping.

Orientation of buildings; orientation, Factors affecting orientation, Sun, Wind, Rain, CBRT suggestions orientation criteria for Indian conditions.

UNIT - II

Principles of planning and Bye Laws of buildings: Aspects, prospect, Privacy, Furniture Requirements, Roominess, Grouping, Circulation, Elegance, Economy, Practical consideration.

Buildings bye Laws; Introduction, Objective, Principles, Applicability of building bye Laws. Introduction to National building code, Objectives, Scope, Structure of NBC. General Building Requirements, Guidelines for Residential Buildings. Building Heights, Setbacks, FAR/FSI. Open Spaces, room sizes, Lighting and Ventilation, Means of Access and service ducts. Classification of buildings for fire safety.

UNIT - III

Introduction to building construction and site preparation; components of Building, Foundations: Functions & Requirements, Types of Shallow Foundations: isolated footings, combined footings, strap footings, wall footings, raft foundations, Types of Deep Foundations: driven piles (timber, precast concrete, steel), bored cast-in-situ piles. Brick masonry – types – bonds; Stone masonry – types

UNIT - IV**Floors, Roofs, Stairs, Doors, Windows:**

Types of floors – Ground and upper floors – Brick flooring, Cement concrete flooring, Stone flooring, Tiled flooring, Types of roofs – Flat, Pitched, Sloped, Curved roofs Components and classification of staircases – Straight flight, Dog-legged, Open well, Spiral staircases –Types of doors – Panelled, Flush,

Glass, PVC, Aluminum, Steel, Sliding, Revolving, Collapsible, and Rolling shutter doors – Door frame materials and fittings. Types of windows

UNIT - V**Finishing Works:**

Plastering — Purpose, types, tools and techniques — Defects in plastering. Pointing — Types and application areas – Differences between plastering and pointing.

Scaffolding, Formwork, and Centering:

Scaffolding – Definition, purpose, components – Types: Single, Double, Cantilever, Suspended, Trestle, Steel and patented scaffolds – Safety considerations. Formwork – Functions, materials (timber, steel, aluminum, plastic), formwork for slabs, beams, columns, and walls – Centering: Definition and role in arches and domes.

TEXT BOOKS:

1. Benny Raphael (2022) Building Automation from Concepts to Implementation Routledge Publications.
2. Kumara Swamy N. and Kaneswaran Rao A., *Building Planning and Drawing*, Charotar Publishing House, Revised Edition, 2020.
3. B.C. Punmia, Ashok Kumar Jain, and Arun Kumar Jain, *Building Construction*, Laxmi Publications, 11th Edition, 2022.
4. S.S. Bhavikatti, *Building Materials and Construction*, Vikas Publishing House, 4th Edition, 2020.

REFERENCE BOOKS:

1. Sushil Kumar, *Building Construction*, Standard Publishers Distributors, 21st Edition, 2022.
2. Bindu Balan and R. Sathish Kumar, *Climatology and Building Design*, McGraw Hill Education, 1st Edition, 2020.
3. Gurcharan Singh, *Building Planning, Designing and Scheduling*, Standard Book House, 6th Edition, 2019.
4. Rangwala S.C., *Building Construction*, Charotar Publishing House, 33rd Edition, 2021.
5. M. Chakraborti, *Building Planning and Drawing*, Chakraborti Publications, 9th Edition, 2021.
6. Bureau of Indian Standards, *National Building Code of India (NBC) – 2016*, SP 7, Part 1 & 2, Reprint 2021.



B.Tech. in CIVIL ENGINEERING

Applicable from AY 2025-2026 Batch

S25PH206BS : ADVANCED ENGINEERING PHYSICS LABORATORY

B.Tech. I Year II Sem.

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Course Objectives:

1. To provide practical exposure to advanced concepts in solid-state and modern physics.
2. To synthesize and study the physical properties of materials like semiconductors, ferromagnetic, and ferroelectric substances.
3. To perform semiconductor characterization using Hall effect and band gap experiments.
4. To explore the working principles of lasers and optical fibers through hands-on experiments.
5. To develop skills in data analysis, interpretation, and scientific reporting.

Course Outcomes:

1. CO1: Synthesize and analyze nanomaterials such as magnetite (Fe_3O_4) using chemical methods.
2. CO2: Determine key electrical, magnetic, and optical properties of semiconductors and other functional materials.
3. CO3: Characterize semiconductors using Hall effect and energy gap measurement techniques.
4. CO4: Demonstrate working knowledge of laser systems and optical fiber parameters through experimental study.
5. CO5: Apply scientific methods for accurate data collection, analysis, and technical report writing.

List of Experiments:

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Energy gap of a semiconductor.
3. V-I characteristics of a p-n junction diode and Zener diode.
4. V-I and L-I characteristics of light emitting diode (LED).
5. V-I Characteristics of solar cell.
6. Determination of dielectric constant of a given material.
7. Study B-H curve of a magnetic material.
8. Determination of wavelength of given laser beam using diffraction Grating
9. Determination of the beam divergence of the given LASER beam
10. a) Calculate Acceptance angle and Numerical Aperture of Optical Fiber
b) Determination of bending losses in an optical fiber.

Note: Any 8 experiments are to be performed.



B.Tech. in CIVIL ENGINEERING

Syllabus (SR25) From Academic Year 2025-26

S25CE207PC: ENGINEERING MECHANICS FOR CIVIL ENGINEERS

B.Tech. I Year II Sem.

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Course Objectives: This course is expected to enable the student to:

- Provide Knowledge of force systems and free body diagram to analyze rigid body equilibrium
- Comprehend the principles of Friction and solve engineering mechanics problems associated with frictional force
- Compute the centroid, first moment and second moment of an area
- Impart the concept of motion of particles and rigid bodies.
- 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

- Determine resultant of forces acting on a body and analyze equilibrium of a body subjected to a system of forces.
- Solve problem of bodies subjected to friction.
- Find the location of centroid and calculate moment of inertia of a given section.
- Understand the kinetics and kinematics of a body undergoing rectilinear, curvilinear, rotatory motion and rigid body motion.
- Interpret and implement work-energy principle and its applications.

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 Pappus.

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, co efficient of restitution.

TEXTBOOKS:

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. Bee r 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.
- P.C Dumiretal. “Engineering Mechanics”, University press

**S25CS208ES: PYTHON PROGRAMMING LAB****B.Tech. in CIVIL ENGINEERING****Applicable from AY 2025-26****B.Tech. I Year II Sem.**

L	T	P	C
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Course Objectives:

- ☐ To install and run the Python interpreter
- ☐ To learn control structures.
- ☐ To Understand Lists, Dictionaries in python
- ☐ To Handle Strings and Files in Python

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

- ☐ Develop the application specific codes using python.
- ☐ Understand Strings, Lists, Tuples and Dictionaries in Python
- ☐ Verify programs using modular approach, file I/O, Python standard library
- ☐ Implement Digital Systems using Python

Note: The lab experiments will be like the following experiment examples.

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.

2. Start a Python interpreter and use it as a Calculator.

3. Write a program to calculate compound interest when principal, rate and number of periods are given.

4. Read the name, address, email and phone number of a person through the keyboard and print the details.

5. Print the below triangle using for loop.

5

4 4

3 3 3

2 2 2 2

1 1 1 1 1

6. 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)

7. Python program to print all prime numbers in a given interval (use break)

8. Write a program to convert a list and tuple into arrays.

9. Write a program to find common values between two arrays.

10. 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.

11. 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.

12. Write a function called has_duplicates that takes a list and returns True if there is any element that appears more than once. It should not modify the original list.

13. 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.

14. The wordlist I provided, words.txt, doesn't contain single letter words. So you might want to add "I", "a", and the empty string. R25 CSE Syllabus JNTUH Hyderabad

15. 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.

16. Add a comma between the characters. If the given word is 'Apple', it should become 'A,p,p,l,e'

17. Remove the given word in all the places in a string?
18. 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?
19. Writes a recursive function that generates all binary strings of n-bit length
20. Write a python program that defines a matrix and prints
21. Write a python program to perform multiplication of two square matrices
22. 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.
23. Use the structure of exception handling all general-purpose exceptions.
24. 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.
25. Add an attribute named color to your Rectangle objects and modify draw_rectangle so that it uses the color attribute as the fill color.
26. 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.
27. 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.
28. Write a python code to read a phone number and email-id from the user and validate it for correctness.
29. Write a Python code to merge two given file contents into a third file.
30. 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.
31. Write a Python code to Read text from a text file, find the word with most number of occurrences
32. 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.
33. Import numpy, Plotpy and Scipy and explore their functionalities.
34. Install NumPy package with pip and explore it.
35. Write a program to implement Digital Logic Gates – AND, OR, NOT, EX-OR
36. 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



S25ME209ES: ENGINEERINGWORKSHOP
B.Tech. in CIVIL ENGINEERING
Applicable from AY 2025-26

B.Tech. I Year II Sem

L T P C
0 0 2 1

Pre requisites : 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 infusing 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 team work, time management ,and quality awareness in a workshop environment.

1. TRADES FOR EXERCISES:

At least two exercises from each trade:

- I. Carpentry – (**Planning Practice & Cutting**, T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
- II. Fitting – (**Cutting & Square Filing**-Fit, **Square Fit** & Semi-circular fit)
- III. Tin-Smithy – (Square Tin, Rectangular Tray & Cone **Making**)
- IV. Foundry – (Preparation of Green Sand Mould using Single Piece and Split Pattern)
- V. Welding Practice – (Arc Welding & **Soldering**)
- VI. House-wiring – (Parallel & Series, Two-way Switch and Tube Light)
- VII. Black Smithy – (Round to Square, Fan Hook and S-Hook)

2. TRADES FOR DEMONSTRATION & EXPOSURE :(Any Four)

Plumbing, **3-D printing, Laser cutting, Introduction to Pneumatics**, Power tools in construction and Wood Working.

TEXTBOOKS:

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

REFERENCEBOOK:

1. Work shop Manual, K. Venugopal, Anuradha Publications, 2012 the edition, 2012.