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.tkrcet.ac.in

B.TECH – ELECTRICAL & ELECTRONICS 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	ES	EESPPS1	Programming for Problem Solving	3	0	0	3	40	60	100
4	ES	EESEC1	Electrical Circuits-I	2	0	0	2	40	60	100
5	ES	EESED1	Engineering Drawing and Computer Aided Drafting	2	0	2	3	40	60	100
6	HS	EHSE1	English for Skill Enhancement	3	0	0	3	40	60	100
7	ES	EBSC2	Engineering Chemistry Lab	0	0	2	1	40	60	100
8	ES	EESPPS2	Programming for Problem Solving Lab	0	0	2	1	40	60	100
9	HS	EHSE2	English Language and Communication Skills Lab	0	0	2	1	40	60	100
10			Induction Program							
			Total Credits	**16**	**1**	**8**	**21**	**360**	**540**	**900**

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	ES	EBSP1	Advanced Engineering Physics	3	0	0	3	40	60	100
3	ES	EESPP2	Python Programming	3	0	0	3	40	60	100
4	ES	EESDS1	Data Structures	3	0	0	3	40	60	100
5	ES	EESEC2	Electrical Circuits- II	3	0	0	3	40	60	100
6	BS	EBSP2	Advanced Engineering Physics Lab	0	0	2	1	40	60	100
7	ES	EESPP1	Python Programming Lab	0	0	2	1	40	60	100
8	ES	EESDS2	Data Structures Lab	0	0	2	1	40	60	100
9	ES	EESEC3	Electrical Circuits Lab	0	0	2	1	40	60	100
10	ES	EESEW1	Engineering Workshop	0	0	2	1	40	60	100
			Total Credits	**15**	**0**	**10**	**20**	**400**	**600**	**1000**

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ELECTRICAL AND ELECTRONICS ENGINEERING

I Year B.Tech. 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 Editon, 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, 9thEdition, 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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ELECTRICAL AND ELECTRONICS ENGINEERING

I Year B.Tech. 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.

Referencetext 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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ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech. I Year I Semester **L/T/P C**
3/0/0 3

PROGRAMMING FOR PROBLEM SOLVING

Course Objectives:

- To learn the fundamentals of computers.
- To understand the various steps in program development.
- To learn the syntax and semantics of the C programming language.
- To learn the usage of structured programming approaches in solving problems.

Course Outcomes:

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

- Demonstrate foundational knowledge of computer systems and algorithms, and implement decision-making and looping constructs in C.
- Design and manipulate arrays and strings using index-based and pointer-based techniques with dynamic memory management.
- Develop modular C programs employing functions, recursion, and user-defined composite data types for structured problem solving.
- Implement recursive algorithms and manage persistent data using file operations in C for text and binary processing.
- Employ formatted and stream-based input/output along with basic searching and sorting algorithms to efficiently handle and organize data in C programs.

CO-PO Mapping

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

UNIT -I:

Introduction to Computers:

Computer Systems, Computer Languages, Creating and running Programs, System Development: Algorithm, Pseudocode, Flowchart, Number Systems.

Introduction to C Language: Structure of a C Program, Preprocessor commands, Identifiers, Variables , Constants, Input/Output, Formatted I/O, Standard I/O Streams, Operators, Expressions**,** Precedence and Associativity, Expression evaluation, Storage classes, type conversion.

Selection statements (decision making): if, if-else, switch-case, ternary operator

UNIT - II:

Repetition statements (loops):

for, while, do-while, break, continue.

Arrays: Declaration, Definition of arrays, creating, accessing elements in arrays.

Strings: Introduction to strings, C strings, String manipulation functions. Arrays of strings.

UNIT - III:

Pointers:

Introduction, pointers to pointers, arrays and pointers, pointer arithmetic, enumerated data types. Memory allocation Functions, Array of Pointers.

Functions: Designing structured programs, Functions in C, User defined functions, Declaring a function, Signature of a function, Inter Function communication: Parameters and return type of a function, passing parameters to functions, call by value, Passing arrays to functions, passing pointers to functions, idea of call by reference, scope, Standard functions , Pointers for inter-function communication, Command Line Arguments

UNIT - IV:

Recursion:

Definition, The Nature of Recursion, Designing Recursive Functions, Tracing a Recursive Function, Recursive Functions with Array and String Parameters,

Structures& Unions: User-Defined Structure Types, Structure Type Data as Input and Output Parameters, Functions with Structured Result Values, Self-referential structures, Union Types.

UNIT - V:

Files:

Streams, Text and Binary files, Creating, Reading and writing text and binary files, Standard Library I/O Functions, Appending data to existing files, Random access using fseek, ftell and rewind functions.

Searching and Sorting: Basic searching in an array of elements (linear and binary search techniques), Basic algorithms to sort array of elements (Bubble, Insertion and Selection sort algorithms)

Text Books:

1. Computer Science: A Structured Programming Approach Using C, B. A. Forouzan and R. F. Gilberg, Third Edition, Cengage Learning.
2. Jeri R. Hanly and Elliot B. Koffman, Problem solving and Program Design in C 7th Edition, Pearson.
3. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition).

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB

4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

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ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech. I Year I Semester **L/T/P C**
2/0/0 2

ELECTRICAL CIRCUITS – I

Prerequisites: Mathematics

Course Objectives:

1. To introduce fundamental concepts of active and passive network elements and the Application of basic circuit laws.
2. To understand the single-phase AC circuits using phasor concepts and study resonance Characteristics.
3. To understand balanced and unbalanced three-phase circuits and evaluate power in three-Phase systems.
4. To learn network theorems to simplify and analyze DC and AC electrical networks.
5. To gain knowledge in magnetic coupled circuits and their applications in practical Systems.

Course Outcomes:

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

1. Apply Kirchhoff's laws, source transformations, star-delta conversions, and network Reduction methods to analyze DC circuits.L3
2. Analyze single-phase AC circuits, calculate power, and study resonance phenomena. L4
3. Evaluate balanced and unbalanced three-phase circuits and determine three-phase power.L5
4. Apply network theorems for the analysis and simplification of electrical circuits (AC & DC).L3
5. Analyze magnetic coupled circuits using the concepts of mutual inductance, dot convention, and coefficient of coupling.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**	**1**	-	-	-	-	-	-	**1**
CO2	**3**	**3**	**2**	**2**	**1**	-	-	-	-	-	-	**1**
CO3	**3**	**3**	**2**	**2**	**1**	-	-	-	-	-	-	**1**
CO4	**3**	**3**	**2**	**2**	**2**	-	-	-	-	-	-	**1**
CO5	**3**	**3**	**2**	**2**	**1**	-	-	-	-	-	-	**1**

UNIT-I:

Network Elements & Laws: Active elements- Independent and dependent sources, Passive elements- R, L and C, Energy stored in Inductance and Capacitance, Kirchhoff's laws, Source transformation, Star-Delta transformation, Node voltage method, and Mesh current method.

UNIT-II:

Single-Phase Circuits: RMS and average values of periodic sinusoidal and non-sinusoidal waveforms, Phasor representation, j-Notation, Steady-state analysis of series, parallel circuits. Impedance, Admittance, Active and Reactive Powers, Complex Power.

Resonance: Series and parallel circuits, Bandwidth and Q-factor.

UNIT-III:

Three-phase Circuits: Analysis of balanced and unbalanced three-phase circuits, Star and delta connections, Measurement of three-phase power for balanced and unbalanced loads.

UNIT-IV:

Network theorems: Superposition theorem, Thevenin's theorem, Norton's theorems, Maximum power transfer theorem, Tellegen's theorem, Compensation theorem, Millman's theorem and Reciprocity theorem. (AC & DC).

UNIT-V:

Magnetic Coupled circuits: Concept of self and mutual inductance, Dot convention, Coefficient ofcoupling, Analysis of circuits with mutual inductance.

Text Books:

1. Van Valkenburg M.E, "Network Analysis", Prentice Hall of India, 3rd Edition, 2000.
2. Ravish R Singh, "Network Analysis and Synthesis", McGrawHill, 2nd Edition, 2019.

Reference Books:

1. B. Subramanyam, "Electric Circuit Analysis", Dreamtech Press & Wiley, 2021.
2. James W.Nilsson, Susan A.Riedel, "Electric Circuits", Pearson, 11th Edition, 2020.
3. A Sudhakar, Shyammohan S Palli, "Circuits and Networks: Analysis and Synthesis", McGrawHill, 5th Edition, 2017.
4. Jagan N.C, Lakshrninarayana C., "Network Analysis", B.S. Publications, 3rd Edition, 2014.
5. William Hayt H, Kimmerly Jack E. and Steven Durbin M, "Engineering Circuit Analysis", McGrawHill, 6th Edition, 2002.
6. Chakravarthy A., "Circuit Theory", Dhanpat Rai & Co., First Edition, 1999.

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ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech. I Year I 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. Chandand 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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ELECTRICAL AND ELECTRONICS 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:

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

Course Outcomes:

Students will be able to:

a. Choose appropriate vocabulary in their oral and written communication.
b. Demonstrate their understanding of the rules of functional grammar and sentence structures.
c. Develop comprehension skills from known and unknown passages.
d. Write paragraphs, essays, précis and draft letters.
e. 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.***

<u>Note</u>: ***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.)

1

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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ELECTRICAL AND ELECTRONICS ENGINEERING

I Year B.Tech. 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 Stalagnometer.

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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ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech. I Year I Semester **L/T/P C**
0/0/2 1

PROGRAMMING FOR PROBLEM SOLVING LAB

Course Objective:

- **To familiarize students with the syntax and semantics of the C programming language** and enable them to solve simple mathematical and logical problems using basic programming constructs.
- **To develop problem-solving skills** by applying control structures, arrays, strings, functions, and pointers in writing modular and efficient programs.
- **To introduce the concepts of recursion, searching, and sorting techniques** and analyze their role in solving computational problems.
- **To provide hands-on experience with macros, file handling, and command-line arguments** for data processing and manipulation in C.
- **To cultivate the ability to design, implement, test, and debug C programs** for real-world problem solving through structured programming methodologies.

Course Outcomes:

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

- Develop foundational C programs utilizing operators, expression evaluation, and control-flow constructs including selection and repetition statements.
- Design and manipulate data collections using one- and two-dimensional arrays, and perform string operations both with and without standard library functions.
- Employ pointers, dynamic memory allocation, and command-line arguments to build flexible and efficient C applications.
- Create modular, reusable code by implementing functions (with variables, arrays, and pointers), recursion, and user-defined types such as structures and unions.
- Perform advanced file handling (text, binary, random access) and apply core searching and sorting algorithms to organize, retrieve, and process data.

CO-PO Mapping

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

List of Concepts to be practiced week wise:

Week 1: Develop basic programs utilizing operators.
Week 2: Implement programs for expression evaluation.
Week 3: Design programs using various Selection statements.
Week 4: Design programs using various Repetition statements.
Week 5-6: Develop programs to implement one-dimensional and two-dimensional arrays.
Week 7: Develop programs on string operations, both with and without string handling Functions.
Weeks 8: Create programs using pointers and dynamic memory allocation functions.
Week – 9: implement programs using command-line arguments to accept integer, float, and String parameters.
Weeks 10: Write programs using functions by passing variables, arrays, and pointers as Parameters.
Week 11: Implement recursive functions through program development.
Week 12: Develop programs to implement structures and unions.
Week 13: Create programs to access and manipulate different types of files
Weeks 14: Implement file operations and apply random access functions on files.
Weeks 15: Write programs applying different searching and sorting techniques

Programs for practice:

1. **Develop a C program to calculate Simple Interest and Compound Interest.**
2. **Write a C program to swap two numbers using only two variables.**
3. **Design a C program to find the roots of a quadratic equation.**
4. **Implement a C program to display the multiplication table for a given number.**
5. **Write a C program to determine whether a given number is prime.**
6. **Develop a C program to check whether a given number is a palindrome.**
7. **Write a C program to display the binary equivalent of a positive number (0–255).**
8. **Implement a C program to calculate the sum of elements in an array.**
9. **Write a C program to find the largest element in an array.**
10. **Develop a C program using functions to perform matrix operations:**
    a) Addition of two matrices
    b) Multiplication of two matrices
11. **Develop a C program to convert numbers (1–50) into their Roman numeral equivalents.**
12. **Write a C program using functions to perform string operations:**
    a) Insert a substring into a given string at a specified position
    b) Delete *n* characters from a specified position in a given string
13. **Develop a C program to check whether a given string is a palindrome.**
14. **Implement a C program to compute the sum of array elements using pointers.**
15. **Write a C program to display array elements in reverse order using pointers.**
16. **Write C programs using both recursive and non-recursive approaches to:**
    a) Find the GCD (Greatest Common Divisor) of two integers
    b) Compute the factorial of a positive integer
17. **Implement a C program using recursion to generate the Fibonacci series up to a given range.**
18. **Write a C program using recursion to find the sum of the digits of a given number.**
19. **Develop a C program to count the number of lines, words, and characters in a text.**
20. **Write a C program to display the contents of a file on the standard output device.**
21. **Develop a C program to copy one file into another, converting all lowercase characters into uppercase.**

22. **Write a C program to count the occurrences of a character in a text file (file name and character provided via command-line arguments).**
23. **Implement a C program to merge the contents of two files into a third file.**
24. **Develop a C program (non-recursive) to perform Linear Search on an integer list.**
25. **Develop a C program (non-recursive) to perform Binary Search on a sorted integer list.**
26. **Write a C program to implement Bubble Sort to arrange integers in ascending order.**
27. **Write a C program to implement Selection Sort to arrange integers in descending order.**
28. **Write a C program to implement Insertion Sort to arrange integers in ascending order.**

Text Books:

1. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Design in C 7th Edition, Pearson
2. B.A. Forouzan and R.F. Gilberg C Programming and Data Structures, Cengage Learning, (3rd Edition)

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PHI
2. E. Balagurusamy, Computer fundamentals and C, 2nd Edition, McGraw-Hill
3. Yashavant Kanetkar, Let Us C, 18th Edition, BPB
4. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition
7. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill

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ELECTRICAL AND ELECTRONICS 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'**

1

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.

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ELECTRICAL AND ELECTRONICS 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 , cos ax, polynomials in x, $e^{ax}V(x)$ and $x\,V(x)$ – Method of variation of parameters.

UNIT-III:

Laplace Transforms

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

UNIT-IV:

Vector Differentiation

Vector point functions and scalar point functions — Gradient — Divergence and Curl — Directional derivatives – Vector Identities – Scalar potential functions – Solenoidal and Irrotational vectors.

UNIT-V:

Vector Integration

Line, Surface and Volume Integrals. Theorems of Green, Gauss and Stokes (without proofs) and their applications

Text Books:

1. 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, 9thEdition, 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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ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech. I Year II Semester **L/T/P C**
3/0/0 3

ADVANCED ENGINEERING 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, CO_2 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://profmcruz.wordpress.com/wp-content/uploads/2017/08/quantum-computation-and- quantum-information-nielsen-chuang.pd

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ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech. I Year II Semester. **L/T/P C**
3/0/0 3

PYTHON PROGRAMMING

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.

CO-PO Mapping

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

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 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.

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ELECTRICAL AND ELECTRONICS ENGINEERING

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DATA STRUCTURES

Prerequisites: A course on "Programming for Problem Solving"

Course Objectives:

- Exploring basic data structures such as stacks and queues.
- Introduces a variety of data structures such as hash tables, search trees, tries, heaps, graphs.
- Introduces sorting and pattern matching algorithms.

Course Outcomes:

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

- Apply fundamental concepts of linear data structures including stacks, queues, and linked lists to design and implement efficient solutions for basic computational problems.
- Demonstrate proficiency in implementing and analysing tree-based data structures such as binary search trees, AVL trees, and red-black trees for effective data storage and retrieval.
- Apply advanced multiway search tree structures and heap variants to solve problems requiring optimized data organization and priority-based processing.
- Utilize graph representations and traversal algorithms along with advanced sorting techniques to solve real-world computational and optimization problems.
- Design and implement efficient storage and retrieval mechanisms using hashing techniques, collision resolution strategies, and file organization methods.

CO-PO Mapping

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

UNIT-I

Introduction to Data Structures:

Basic Terminology, Classification of Data Structures, Introduction to Non Linear data structures, Operation on Data Structures, Abstract Data Types, Selecting a Data Structure, Stacks-Operations, Stack algorithm, Stack applications, Queues- operations, Queue Algorithm, Queue Applications. Linear list - Introduction, Singly Linked List, Stack ADT, Queue ADT, Doubly Linked List, Circular Linked Lists

UNIT -II

Trees:

Introduction, Types of Trees, creating a Binary Tree from a General Tree, traversing a Binary Tree, Binary Search Trees (BST), BST Operations- Searching, Insertion and Deletion, BST ADT, BST Applications, Threaded Binary Trees, AVL Trees, Red -Black Trees, Splay Trees

UNIT- III

Multi way Search Trees:

Introduction, B Trees, B Trees ADT, 2-3 Trees, B* Tree, B+ Trees Heaps: Binary Heaps, Binomial heaps, Fibonacci heaps, Comparison of Various Heaps

UNIT-IV

Graphs:

Introduction, Directed Graphs, Representation of Graphs, Graph Traversal Algorithms, Graph ADT, Applications of Graphs, Bi connected Components.
Sorting: Quick sort , Merge sort, Radix Sort, Heap sort

UNIT-V

Hashing and Collision:

Introduction, Hash Tables, Hash Functions, Different Hash Functions: Division Method, Multiplication Method, Mid-square Method, Folding Method; collisions: Collision Resolution by Open Addressing, Collision Resolution by Chaining
Files and their Organization: Introduction, Data hierarchy, File Attributes, Text and Binary Files, Basic File Operations, File Organization, Indexing

Text Books:

1. Data Structure using C- Reema Thareja, 3rd Edition, Oxford University Press.
2. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B.A.Forouzan, Cengage Learning

Reference:

1. Data Structures using C - A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.
2. An Introduction to Data Structures with Applications, 2nd Edition, Jean Paul tremblay, paul G Sorenson, TMH.

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ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech. I Year II Semester **L /T /P C**
3/0/0 3

ELECTRICAL CIRCUITS – II

Prerequisites: Mathematics

Course Objectives:
1. To understand transient behavior of RLC networks with DC and AC excitations.
2. To study Laplace Transform techniques for transient analysis of electrical circuits.
3. To study the graph theory approach and network topology methods in circuit analysis.
4. To-gain knowledge two-port network parameters and their interrelationships.
5. To learn the fundamentals of electronic filters and their frequency-selective characteristics.

Course Outcomes:
After learning the contents of this course the student must be able to
1. Analyze the transient response of RL, RC, and RLC circuits for DC and sinusoidal excitations using integro-differential approach.L4
2. Apply Laplace Transform methods to determine transient response of electrical networks.L3
3. Apply graph theory concepts such as trees, tie-sets, and cut-sets for network analysis.L3
4. Determine two-port network parameters and analyze interconnections of two-port networks.L3
5. Classify different filters and analyze the characteristics of constant-k and m-derived filters.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**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO2	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO3	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO4	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO5	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**

UNIT-I:
Transient analysis:
Significance of Initial conditions of R, L and C elements Transient response of series RL,

RC and RLC circuits using integro- differential approach for DC and Sinusoidal excitations. Transient response of parallel RL, RC and RLC circuits using integro-differential approach for DC and Sinusoidal excitations.

UNIT-II:

Transient analysis using Laplace Transforms:

Laplace Transforms of step, ramp, exponential, impulse functions (inputs)

Transient response of series RL, RC and RLC circuits using Laplace Transforms approach for DC and Sinusoidal excitations.

Transient response of parallel RL, RC and RLC circuits using Laplace Transforms approach for DC.

UNIT-III:

Network Topology:

Graph, tree, chord, Tie-set, cut-set, incident matrices, Problems on Tie-set and cut-set matrices.

UNIT-IV:

Two port network parameters:

Open circuit impedance, short-circuit admittance, Transmission, Hybrid parameters & inter-relationships, Series, parallel and cascade connection of two port networks.

UNIT-V:

Filters:

Classification of filters – Low pass, High pass, Band pass and Band Elimination, Elementary treatment of Constant-k and M-derived filters-Low pass and High pass Filters, Band pass and Band elimination filters

Text Books:

1. Van Valkenburg M.E, “Network Analysis”, Prentice Hall of India, 3rd Edition, 2000.
2. Ravish R Singh, “Network Analysis and Synthesis”, McGraw Hill, 2nd Edition, 2019.

Reference Books:

1. B. Subramanyam, “Electric Circuit Analysis”, Dreamtech Press & Wiley, 2021.
2. James W. Nilsson, Susan A.Riedel, “Electric Circuits”, Pearson, 11th Edition, 2020.
3. A Sudhakar, Shyammohan S Palli, “Circuits and Networks: Analysis and Synthesis”, McGraw Hill, 5th Edition, 2017.
4. Jagan N.C, Lakshrninarayana C., “Network Analysis”, B.S. Publications, 3rd Edition, 2014.
5. William Hayt H, Kimmerly Jack E. and Steven Durbin M, “Engineering Circuit Analysis”, McGraw Hill, 6 th Edition, 2002.
6. Chakravarthy A., “Circuit Theory”, Dhanpat Rai & Co., First Edition, 1999.

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ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech. I Year II Semester **L /T /P C**
0/0/2 1

ADVANCED ENGINEERING PHYSICS LAB

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 gameasurements.
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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ELECTRICAL AND ELECTRONICS ENGINEERING

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0/0/2 1

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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ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech. I Year II Semester **L/T/P C**
0/0/2 1

DATA STRUCTURES LAB

Prerequisites: A Course on "Programming for problem solving".

Course Objectives:
- It covers various concepts of C programming language
- It introduces searching and sorting algorithms
- It provides an understanding of data structures such as stacks and queues.

Course Outcomes:
Upon successful completion of this course, students will be able to:
- Develop and implement fundamental programs on basic data structures, including stacks and queues using both arrays and pointers.
- Apply stack-based algorithms to solve expression conversion and evaluation problems, and implement linear linked list operations including singly, doubly, and circular linked lists.
- Design and implement tree-based data structures, including binary and advanced trees, and apply recursive and non-recursive traversal techniques.
- Utilize graph data structures and apply traversal techniques to solve connectivity and path-finding problems in both recursive and iterative approaches.
- Implement efficient searching, sorting, and hashing techniques to organize, retrieve, and process data for computational problem-solving.

CO-PO Mapping

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

List of concepts to be practiced week wise:
Week 01: Develop basic programs on fundamental data structures.
Week 02-3: Develop programs to implement stacks and queues operations using arrays
Week 04: Design programs to convert infix, prefix, and postfix expressions into one another using stacks.
Week 05: Implement programs to perform operations on singly linked lists.

Week 06: Develop programs to implement stacks and queues operations using pointers
Week 07: Implement programs to perform operations on doubly linked lists.
Week 08: Implement programs on circular linked lists
Weeks 09–10: Develop programs to implement various types of trees.
Weeks 11–12: Write programs to implement tree traversals using both recursive and non-Recursive methods.
Week 13: Implement programs to perform graph traversals using recursive and non-recursive Methods.
Week 14: Implement programs to perform different sorting techniques.
Week 15: Design programs to implement hashing with different hash functions.

Programs for Practice.

1. **Implement a C program for Stack operations** using Arrays
2. **Implement a C program for Queue operations** using Arrays
3. **Develop a C program using functions to perform operations on a Singly Linked List,** including**:**
   i) Creation ii) Insertion iii) Deletion iv) Traversal
4. **Implement a C program for Stack operations** using Pointers
5. **Implement a C program for Queue operations** using Pointers
6. **Develop a C program using functions to perform operations on a Doubly Linked List,** including**:**
   i) Creation ii) Insertion iii) Deletion iv) Traversal
7. **Develop a C program using functions to perform operations on a Circular Linked List,** including**:**
   i) Creation ii) Insertion iii) Deletion iv) Traversal
8. **Design a C program to convert an Infix expression to Postfix expression using a Stack.**
9. **Design a C program to convert an Infix expression to Prefix expression using a Stack.**
10. **Design a C program to convert a Prefix expression to Postfix expression using a Stack.**
11. **Develop a C program to implement Quick Sort.**
12. **Develop a C program to implement Merge Sort.**
13. **Develop a C program to implement Radix Sort.**
14. **Develop a C program to implement Heap Sort.**
15. **Implement a C program to perform Tree Traversals (**Recursive and Non-Recursive methods).
16. **Design and implement C programs for different types of Trees,** including:
    i) Binary Search Tree ii) B-Tree iii) B+ Tree iv) AVL Tree v) Red–Black Tree
17. **Implement a C program to perform Graph Traversals.**
18. **Develop a C program to implement Hashing using appropriate hash functions.**
19. **Generate a C program to demonstrate an application of Stack.**
20. **Generate a C program to demonstrate an application of Queue.**
21. **Generate a C program to demonstrate an application of Binary Search Tree.**

Text Books:

1. Fundamentals of Data Structures in C, 2nd Edition, E. Horowitz, S. Sahni and Susan Anderson Freed, Universities Press.
2. Data Structures using C - A. S. Tanenbaum, Y. Langsam, and M. J. Augenstein, PHI/Pearson Education.

Reference Book:

1. Data Structures: A Pseudocode Approach with C, 2nd Edition, R. F. Gilberg and B. A. Forouzan, Cengage Learning.
2. An Introduction to Data Structures with Applications, 2nd Edition, Jean Paul Tremblay, paul G Sorenson, TMH.

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ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech I Year II Semester **L/T/P C**
0/0/2 1

ELECTRICAL CIRCUITS LAB

Prerequisites: Electrical Circuits - I

Course Objectives:
1. To **study** the fundamental electrical circuit laws such as KVL and KCL, and basic Network analysis methods
2. To **learn** the concepts of resonance in series and parallel circuits and the measurement of three-phase power using the two- watt meter method.
3. To **understand** various network theorems for electrical networks.
4. To **measure** time constants, steady-state errors, and other dynamic characteristics of RL and RC circuits
5. To **explain** the frequency-domain behavior of electrical networks through the study of Low-pass and high-pass filters.

Course Outcomes:
After successful completion of the course, the student will be able to:
1. **Apply** KVL and KCL laws to solve electrical circuits L3
2. **Analyze** the behavior of series and parallel resonance circuits and measure three-phase power L4
3. **Analyze** network theorems to simplify and solve complex circuits.L4
4. Assess the dynamic response of RL and RC and two-port network parameters. L4
5. Implement low-pass and high-pass filters for frequency-domain performance 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)											
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO1	3	3	2	2	1	–	–	–	–	–	–	2
CO2	3	3	2	3	2	–	–	–	–	–	–	2
CO3	3	3	3	3	2	–	–	–	–	–	–	2
CO4	3	3	3	3	3	–	–	–	–	–	–	2
CO5	3	3	3	3	3	–	–	–	–	–	–	2

The following experiments are required to be conducted compulsorily:

1. Verification of Series and Parallel Resonance using any circuit simulation software (MATLAB or LT Spice etc...).
2. Determination of Time response of first order RL and RC circuit for periodic non – Sinusoidal Inputs – Time Constant and Steady-state error using any circuit simulation Software (MATLAB or LT Spice etc...).
3. Determination of Two port network parameters – Z, Y, Transmission and Hybrid parameters.
3. Measurement of 3-phase power in Balanced Star connected load using Two-Watt meter method.
5. Determination of Co-efficient of coupling, self and mutual inductance in magnetic Coupled Circuits.
6. Verification of Millman's theorem and Compensation theorem.
7. Verification of Superposition and Maximum Power Transfer theorem.
8. Verification of Thevenin's and Norton's theorems using any circuit simulation software (MATLAB or LT Spice etc...).

In addition to the above eight experiments, at least any two of the experiments from the
Following list are required to be conducted

1. Measurement of Active Power for Delta connected balanced loads.
2. Measurement of Reactive Power for Star and Delta connected balanced loads.
3. Frequency domain analysis of Band-pass filters.
4. Frequency domain analysis of Band-stop filters
5. Determination of Time response of first order RL, RC circuit for periodic non – Sinusoidal inputs – Time Constant and Steady state error.
6. Frequency domain analysis of Low-pass filter and High-pass filters using circuit Simulation software

Text Books:

1. Van Valkenburg M.E, "Network Analysis", Prentice Hall of India, 3rd Edition, 2000.
2. Ravish R Singh, "Network Analysis and Synthesis", McGraw Hill, 2nd Edition, 2019.

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Reference Books:

1. B. Subramanyam, “Electric Circuit Analysis”, Dreamtech Press & Wiley, 2021.
2. James W.Nilsson, Susan A. Riedel, “Electric Circuits”, Pearson, 11th Edition, 2020.
3. A Sudhakar, Shyammohan S Palli, “Circuits and Networks: Analysis and Synthesis”, McGraw Hill, 5th Edition, 2017.
4. Jagan N.C, Lakshrninarayana C., “Network Analysis”, B.S. Publications, 3rd Edition, 2014.
5. William Hayt H, Kimmerly Jack E. and Steven Durbin M, “Engineering Circuit Analysis”, McGraw Hill, 6 th Edition, 2002.
6. Chakravarthy A., “Circuit Theory”, Dhanpat Rai & Co., First Edition, 1999.

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ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech. I Year II Semester **L/T/P C**
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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.