GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

LINEAR ALGEBRA AND FUNCTION APPROXIMATION

Course Code: GR25A1001 **L/T/P/C:3/1/0/4**
I Year I Sem

COURSE OUTCOMES

1. Recognize Rank of the matrix and write the matrix representation of a set of linear equations and to analyze the solution of the linear system of equations.
2. Discovery the Eigen values and Eigen vectors, Reduce the quadratic form to canonical form using orthogonal transformations.
3. Identify the geometrical interpretation of mean value theorems and discovery points in an interval that satisfy the mean value theorem for a given function.
4. Estimate 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
Operations on vectors and matrices - Vector norms- Rank of a matrix by Echelon form – Linear dependence and independence of vectors. System of linear equations: Solution of a linear algebraic system of equations (homogeneous and non-homogeneous) using Gauss elimination.

UNIT II
EIGEN VALUES AND EIGEN VECTORS
Eigen values – Eigen vectors and their properties – Diagonalization of a matrix – Orthogonal diagonalization of a symmetric matrix- Definiteness of a symmetric matrix
. Quadratic forms and Nature of the Quadratic Forms – Reduction of Quadratic form to canonical form by Orthogonal Transformation.

UNIT III
SINGLE VARIABLE CALCULUS
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). Approximation off a function by Taylor's series

UNIT IV
MULTIVARIABLE CALCULUS (PARTIAL DIFFERENTIATION AND APPLICATIONS)
Partial Differentiation: Total derivative – Jacobian – Functional dependence & independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.
Curve Tracing: Curve tracing in cartesian coordinates

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.

TEXTBOOKS

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.

REFERENCES

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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING CHEMISTRY

(Common to all Branches)

Course Code: GR25A1004 **L/T/P/C:3/0/0/3**
I Year I Sem

COURSE OUTCOMES

1. Understand the specifications, water quality and treatment methods for domestic & Industrial needs.
2. Apply electrochemical concepts and analyze corrosion processes with suitable control measures.
3. Distinguish various energy sources to prioritize eco-friendly fuels for environmental sustainable development.
4. Analyse the efficacy of polymers in diverse applications
5. Interpret the role of engineering materials and emphasize the scope of spectroscopic techniques in various sectors.

UNITI
WATER AND ITS TREATMENT

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 breakpoint 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

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: 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: Definition – 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 Hydrogen –Oxygen Fuel Cell. **Fuels:** Definition and characteristics of a good fuel, Calorific value – Units

- HCV, LCV- Dulongs formula - Numerical problems. **Fossil fuels:** Classification, Petroleum - Refining of Crude oil, Cracking - Types of cracking - Moving bed catalytic cracking. LPG and CNG composition and uses. Synthetic Fuels: Fischer Tropschs Process, Introduction and applications of Hythane and Green Hydrogen.

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 and Fibers**: Definition and applications (PVC, Nylon-6,6). Differences between themoplastics and thermo setting plastics, Fiber reinforced plastics (FRP). **Conducting polymers**: Definition and Classification with examples - Mechanism of conduction in transpoly-acetylene and applications of conducting polymers. **Biodegradable polymers**: Polylactic acid and its applications.

UNIT V
ENGINEERING MATERIALS

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

TEXTBOOKS

1. Engineering Chemistry 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.

REFERENCES

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. E-books: https://archive.org/details/EngineeringChemistryByShashiChawla/page/n11/mode/2u

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

FUNDAMENTALS OF ELECTRICAL AND ELECTRONICS ENGINEERING

Course Code: GR25A1010 **L/T/P/C:2/0/0/2**
I Year I Semester

COURSE OUTCOMES

1. Summarize the basic fundamental laws of electric circuits.
2. Distinguish the single phase and three phase circuits.
3. Analyze the basics and principle of PN junction diode.
4. Illustrate the principle and operation of BJT and MOSFET transistors
5. Outline the protection principles using Switchgear components.

UNIT I
DC FUNDAMENTALS
Passive components, Voltage and Current sources, dependent and independent sources, fundamentals of circuit Laws, Source Transformation, Passive components in series and parallel, Delta – star conversion, Nodal and Mesh Analysis.

UNIT II
AC FUNDAMENTALS
Representation of sinusoidal waveforms, average and rms values, phasor representation, real power, reactive power, apparent power, power factor, impedance, Admittance. Introduction to three-phase circuits, types of connection. voltage and current relations in star and delta connections, analysis of balanced and unbalanced circuits, measurement of power by three- and two-wattmeter methods, measurement of reactive power by single wattmeter.

UNIT III
DIODE CIRCUITS
P-N junction diode, biasing, V-I characteristics of a diode, diode equivalent circuits, static resistance, dynamic resistance, Zener breakdown, & Avalanche breakdown. Working principle of Half-wave and full-wave rectifiers.

UNIT IV
TRANSISTORS
BJT Structure, construction, Principle and Operation of BJT, Types NPN, PNP, Common Emitter, Common Base and Common Collector Configurations, Input characteristics and Output Characteristics of a BJT.
MOSFET: Construction, Principle and Operation of Enhancement mode, Depletion mode devices, NMOS, PMOS, CMOS transistors, CMOS Inverter, Inverter characteristics.

UNIT V
ELECTRICAL INSTALLATION COMPONENTS
Components of LT Switchgear: Switch Fuse Unit (SFU), MCB (Miniature Circuit Breaker), ELCB (Earth Leakage Circuit Breaker), MCCB (Moulded Case Circuit Breaker),RCCB, Earthing: Plate and pipe earthing ,Types of batteries: Primary and secondary, UPS(Uninterrupted power supply):Components, Calculation of ratings for UPS components to specific load, power factor improvement methods.

TEXTBOOKS

1. "Basic Electrical Engineering",D.P. Kothari and I.J. Nagrath, Third edition 2010, Tata McGraw Hill.
2. "Electrical Engineering Fundamentals", Vincent Deltoro, Second Edition, Prentice Hall India, 1989.

REFERENCES

1. "A Textbook of Electrical Technology",-BL Theraja volume-I, S.Chand Publications.
2. "Electronic Devices and circuits" by Jacob Milliman, McGraw-Hill, 1967
3. "Electrical and Electronics Technology", E. Hughes, 10th Edition, Pearson, 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY
PROGRAMMING FOR PROBLEM SOLVING

Course Code: GR25A1006 **L/T/P/C: 2/0/0/2**
I Year I Semester

Course Outcomes:
1. Design algorithms and flowcharts for problem solving and apply the basic elements of C programming to solve simple computational problems.
2. Illustrate decision-making control structures and use functions, including recursion, to develop modular C programs.
3. Discover the need for arrays, searching, sorting, and strings in problem-solving and apply them.
4. Summarize pointer operations and implement structures and unions to solve programming problems.
5. Demonstrate file handling mechanisms, preprocessor directives, and command line arguments in C.

UNIT I
INTRODUCTION TO PROGRAMMING
Introduction to Algorithms: Representation of Algorithm, Flowchart, Pseudo code with examples, compiling and executing programs, syntax, and logical errors.
Introduction to C Programming Language: General Form of a C Program, C Language Elements, operators, precedence and associativity, expression evaluation, implicit and explicit type conversion, Formatting Numbers in Program Output.

UNIT II
DECISION MAKING AND FUNCTIONS
Branching and Loops: Conditional branching with simple if, if-else, nested if-else, else if ladder, switch-case, loops: for, while, do-while, jumping statements: goto, break, continue, exit.

Functions: Top-Down Design and Structure Charts, function declaration, signature of a function, parameters and return type of a function, categories of functions, parameter passing techniques, passing arrays and strings to functions, recursion, merits and demerits of recursive functions, Scope of Names.

UNIT III
ARRAYS AND STRINGS
Arrays: One and two-dimensional arrays, creating, accessing, and manipulating elements of arrays.

Searching and sorting: Introduction, Linear search, and Binary search. Bubble Sort, Insertion Sort, Selection Sort.

Strings: Introduction to strings, operations on characters, basic string functions available in C - strlen, strcat, strcpy, strrev, strcmp, String operations without string handling functions, arrays of strings.

UNIT IV

POINTERS AND STRUCTURES

Pointers: Pointers and the Indirection Operator, declaration and initialization of pointers, pointer to pointer, void pointer, null pointer, pointers to arrays, function pointer.

Structures and Unions: Defining structures, declaring and initializing structures, arrays within structures, arrays of structures, nested structures, pointers to structures, passing structures to functions, unions, and typedef.

UNIT V

FILE HANDLING AND PREPROCESSOR IN C

Files: Text and binary files, creating, reading, and writing text and binary files, random access to files, and error handling in files.

Preprocessor: Commonly used preprocessor commands like include, define, undef, if, ifdef, ifndef , elif, command line arguments and enumeration data type.

Teaching methodologies:

PowerPoint Presentations
Tutorial Sheets
Assignments

TEXTBOOKS

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

REFERENCES

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education
4. Herbert Schildt, C: The Complete Reference, McGraw-Hill, 4th Edition

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

INNOVATION AND DESIGN THINKING

Course Code: GR25A1027 **L/T/P/C:1/0/0/1**

I Year I Semester

COURSE OUTCOMES

1. Explain the concepts and importance of innovation and design thinking.
2. Apply industry analysis tools and ideation techniques to identify problems and opportunities.
3. Develop prototypes and assess market potential for innovative ideas.
4. Demonstrate understanding of sustainable design models and their applications.
5. Describe the basics of IPR and apply them in protecting and managing innovations.

UNIT I

FUNDAMENTALS OF DESIGN THINKING AND INNOVATION

Design Thinking: Meaning and definition of Design Thinking, Nature, features, and importance of Design Thinking. **Principles of Design Thinking** (Empathy, Define, Ideate, Prototype, Test) Design Thinking mind set and skills required. Difference between Design Thinking and traditional problem-solving. Applications of Design Thinking in business.

Innovation: Introduction, need for innovation, Features, Types of innovations, innovations in manufacturing and service sectors, fostering a culture of innovation, planning for innovation.

Core Teaching Tool: Simulation, Game, Industry Case Studies (Personalized for students – 16 industries to choose from).

UNIT II

INNOVATION THROUGH OPPORTUNITY MAPPING AND DESIGN THINKING

Competition and Industry trends mapping and assessing initial opportunity, Porter's Five Force Model. Identification of gap, problem, analysing the problem from an industry perspective. Idea generation, **Ideation techniques**: Brainstorming, Brain writing, Round robin, and SCAMPE. Mapping of solution to problem: Problem–Solution Fit, Steps in Mapping, **Tools and Techniques of mapping** (Value Proposition Canvas, Problem–Solution Matrix, User Journey Mapping, Prototyping and testing for validation).

Core Teaching Tool: Several types of activities including Class, game, Gen AI, Journey Mapping Exercise (Pick a common activity (e.g., ordering food online, booking tickets, paying college fees) Students map the customer journey step by step, highlighting touchpoints and problems faced at each stage.

UNIT III

OPPORTUNITY ASSESSMENT AND PROTOTYPE DEVELOPMENT

Identify and map global competitors, review industry trends, and **understand market sizing**: TAM (Total Addressable Market), SAM (Serviceable Available Market) and SOM (Serviceable Obtainable Market). Assessing scope and potential scale for the opportunity. Understanding prototyping and Minimum Viable Product (MVP). **Developing a prototype: Testing, and**

validation.
Core Teaching Tool: Venture Activity for prototype, no-code Innovation tools, Class activity

UNIT IV
SUSTAINABLE DESIGN APPROACHES / MODELS
Introduction to Sustainable Design – Meaning, importance, and role in today's context. **Principles of Sustainable Design** (Reduce, Reuse, Recycle, Circular Economy, Cradle-to-Cradle approach). **Models of Sustainable Design:** Product Life Cycle Design (from raw material to disposal), Eco-Design Model, Systems Thinking Approach. **Strategies for Sustainable Design**: Green materials, energy efficiency, waste reduction, ethical sourcing. Applications – Sustainable product and service design.
Core Teaching Tool: Case Studies – Examples from industries adopting sustainable design

UNIT V
IPR MANAGEMENT
Meaning and importance of Intellectual Property (IP), **Types of Intellectual Property**: Patents, Trademarks, Copyrights, Industrial Designs, Trade Secrets, Geographical Indications. Role of IPR in innovation and technology development. **Patents and Patent System:** Scope and criteria for patentability (novelty, utility, non-obviousness), Procedure for grants of patents. Indian Scenario of Patenting.
IPR Management in Engineering: Protecting innovations: Licensing, Technology transfer, Commercialization, infringement issues. Emerging issues: IPR in Artificial Intelligence, Biotechnology, Software, and Digital Platforms.
Core Teaching Tool: Expert talks; Cases; Class activity and discussions; Venture Activities.

TEXTBOOKS

1. A Textbook on Design Thinking: Principles, Processes & Applications – Srinivasan R., Mohammed Ismail, and Arulmozhi Srinivasan, S. Chand Publishing, 2025.
2. Design Thinking: A Comprehensive Textbook – Shalini Rahul Tiwari and Rohit Rajendra Swarup, Wiley India, 2024.
3. Design Thinking for Engineering: A Practical Guide – Edited by Iñigo Cuiñas and Manuel José Fernández Iglesias, Institution of Engineering and Technology (IET), 2023.
4. Management of Innovation and Product Development: Integrating Business and Technological Perspectives – Marco Cantamessa and Francesca Montagna, Springer London, 2023.
5. Managing Innovation: Integrating Technological, Market and Organizational Change (8th Edition) – Joe Tidd and John Bessant, Wiley, Latest Edition.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING WORKSHOP

Course Code: GR25A1024 **L/T/P/C:1/0/3/2.5**
I Year I Semester

COURSE OUTCOMES

1. Identify workshop tools and their operational capabilities.
2. Practice on manufacturing components using workshop trades including Carpentry, Fitting, Tin Smithy, Welding, Foundry and Black Smithy
3. Apply basic electrical engineering knowledge for House Wiring Practice
4. Develop various trades applicable to industries.
5. Create hands on experience for common trades with taking safety precautions.

TRADES FOR EXERCISES: At least two tasks from each trade

1. **Carpentry:** Demonstration and practice of carpentry tools
   Task 1: Preparation of T- Lap Joint
   Task 2: Preparation of Dove Tail Joint.

2. **Fitting -** Demonstration and practice of fitting tools
   Task 3: Preparation of Straight Fit
   Task 4: Preparation of V-Fit

3. **Tin-Smithy -** Demonstration and practice of Tin Smithy tools
   Task 5: Preparation of Rectangular Tray
   Task 6: Preparation of Open Scoop

4. **Welding :** Demonstration and practice on Arc Welding tools
   Task 7: Preparation of Lap joint,
   Task 8: Preparation of Butt Joint

5. **House-wiring:** Demonstration and practice on House Wiring tools
   Task 9: Exercise on One way switch controlled two bulbs in series one bulb in Parallel.
   Task 10: Exercise on Staircase connection.

6. **Foundry :** Demonstration and practice on Foundry tools
   Task 11: Preparation of Mould using Single Piece Pattern.
   Task 12: Preparation of Mould using Split Piece Pattern.

7. **Black Smithy:** Demonstration and practice on Black Smithy tools
   Task 13: Preparation of U-Hook
   Task 14: Preparation of S-Hook

TRADES FOR DEMONSTRATION: Plumbing, Machine Shop, Power tools in construction and Wood Working

Preparation of a prototype model of any trade under G-LOB activity

TEXTBOOKS

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

REFERENCES

1. Elements of Workshop Technology, Vol. I by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 14th edition
2. Elements of Workshop Technology, Vol. II by S. K. Hajra Choudhury & Others, Media Promoters and Publishers, Mumbai. 2007, 12th edition
3. Workshop Practice by H. S. Bawa, Tata-McGraw Hill, 2004.
4. Technology of machine tools, Steve F. Krar, Arthur R. Gill and Peter Smid, McGraw Hill Education (India) Pt. Ltd., 2013.
5. Engineering Practices Laboratory Manual, Ramesh Babu.V., VRB Publishers Private Limited, Chennai, Revised edition, 2013 – 2014.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

GRAPHICS FOR ENGINEERS

Course Code: GR25A1015 **L/T/P/C:1/0/4/3**
I Year I Semester

COURSE OUTCOMES

1. Generate two dimensional drawings and curves by using AutoCAD commands.
2. Interpret projection methods and draw projections of a line or point objects located in different positions.
3. Imagine and generate multi-view projections of planes and solid objects located in different positions
4. Construct and interpret sectional views of an object and develop its solid surfaces.
5. Create isometric drawings from given orthographic views and familiar with isometric to orthographic transformations.

UNIT I
INTRODUCTION TO AUTOCAD SOFTWARE

User interface, tool bar -draw, modify, dimension, layers, setting drawing area, status bar, print setup, generation of two-dimensional drawings.
Engineering curves- Conic sections – ellipse, parabola and hyperbola- general method only; Cycloidal curves- Cycloid, epi-cycloid and Hypocycloid.

UNIT II
ORTHOGRAPHIC PROJECTION

Introduction, definition, and classification of projections; pictorial and multi-view, significance of first and third angle methods of projections;
Projections of points -a point situated in the first, second, third and fourth quadrants.
Projections of straight lines – Line inclined to one reference plane and parallel to the other.

UNIT III
PROJECTIONS OF PLANES

Definition and types of regular plane figures like triangle, square, pentagon, hexagon, and circle; projections of planes -a plane inclined to one reference plane and perpendicular to the other.
Projections of solids - definition and types of right regular solids objects like prism, cylinder, pyramid, and cone; Projections of Solids -with an axis inclined to one reference plane and parallel to the other.

UNIT IV
SECTIONS OF SOLIDS

Section and sectional views of regular solids- Prisms, Cylinders, Pyramids and Cone – concept of Auxiliary Views.
Development of surfaces- Development of lateral surfaces of right regular solids - Prisms, Pyramids, Cylinders and Cone.

UNIT V
ISOMETRIC VIEWS

Isomeric views of lines, planes (polygons) and solids (Prisms, Cylinders, Pyramids, and Cone); compound solids, generation of Isometric line diagrams. Introduction to World Coordinate

System and User Coordinate System.
Conversion of views - Isometric Views to Orthographic Views and Vice-versa, and Conventions.

TEXTBOOKS

1. Engineering Drawing by N. D. Bhatt, Fiftieth Revised and Enlarged Edition:2011, Charotar Publishing House Pvt. Ltd.
2. Engineering Graphics by Basant Agrawal and C M Agrawal, fifth re-print 2011, Tata McGraw Hill Education Private Limited, New Delhi.

REFERENCES

1. Engineering Graphics with AutoCAD 2020 by James D. Bethune, Copyright © 2020 by Pearson Education, Inc. All rights reserved.
2 Engineering Graphics by M. B. Shah, B. C. Rana, S. N. Varma, Copyright © 2011 Dorling Kindersley (India) Pvt. Ltd, Licensees of Pearson Education in South Asia.
3. Engineering Drawing and Graphics by K Venu Gopal /New Age International Pvt. Ltd, Publishers, fifth edition, 2002.
4. Engineering Graphics by Koushik Kumar, Apurba Kumar Roy, Chikesh Ranjan, S Chand and Company limited, first edition 2019.
5. Engineering Drawing with Auto Cad by B. V. R. Gupta, M. Raja Roy, IK International Pub., 2009.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING LAB

Course Code: GR25A1011 **L/T/P/C:0/0/2/1**
I Year I Semester

COURSE OUTCOMES

1. Demonstrate the common electrical components and their ratings.
2. Summarize the basic fundamental laws of electric circuits.
3. Distinguish the measurement and relation between the basic electrical parameters
4. Examine the response of different types of electrical circuit connections with three phase excitation.
5. Illustrate the characteristics of BJT and MOSFET.

LIST OF EXPERIMENTS

Any ten experiments should be conducted.

1. Verification of Ohms Law, KVL and KCL
2. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits.
3. Verification of relationship between three phase voltages and currents in star and delta connection.
4. Measurement of Active & Reactive Power for star and delta connected balanced loads.
5. Power factor improvement by using capacitor bank in parallel with inductive load.
6. Measurement of Earth Electrode Resistance.
7. Volt ampere Characteristics of a PN Junction Diode.
8. Single Phase Half & Full wave diode Rectifier**.**
9. Input & Output Characteristics of NPN Bipolar Junction Transistor.
10. Drain Characteristics of MOSFET.
11. Breakdown Characteristics of a Zener Diode.
12. Transfer Characteristics of MOSFET.

TEXTBOOKS

1. "Basic Electrical Engineering", D.P. Kothari and I.J. Nagrath, Third edition 2010, Tata McGraw Hill.
2. "Electrical Engineering Fundamentals", Vincent Deltoro, Second Edition, Prentice Hall India, 1989.

REFERENCES

1. "A Textbook of Electrical Technology", -BL Theraja volume-I, S.Chand Publications.
2. "Electronic Devices and circuits" by Jacob Milliman, McGraw-Hill, 1967
3. "Electrical and Electronics Technology", E. Hughes, 10th Edition, Pearson, 2010.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGINEERING CHEMISTRY LAB
(Common to all Branches)

Course Code: GR25A1018 **L/T/P/C:0/0/2/1**
I Year I Semester

COURSE OUTCOMES

1. Identify key water quality parameters such as hardness, chloride by volumetric analysis.
2. Apply analytical techniques such as conductometry to estimate acids, and colorimetry to validate theoretical principles like Beer–Lambert's law.
3. Determine the concentrations of acids, base, and ferrous ions by potentiometric titration.
4. Synthesize polymers like Bakelite and Nylon-6,6 to gain practical experience.
5. Estimate the physicochemical properties of materials such as viscosity, acid value, and corrosion rate.

List of Experiments

1. Estimation of Hardness of water by EDTA Complexometric method.
2. Determination of chloride content of water by Argentometric method.
3. Estimation of the concentration of a strong acid by Conductometry.
4. Estimation of the concentration of strong and weak acids in an acid mixture by Conductometry.
5. Estimation of the concentration of Fe^{+2} ion by Potentiometry using $K_2Cr_2O_7$.
6. Estimation of the concentration of a strong acid with a strong base by Potentiometry using quinhydrone.
7. Colorimetric analysis of Potassium Permanganate: Verification of Beer–Lambert's Law.
8. Preparations:
   a. Preparation of Bakelite.
   b. Preparation Nylon – 6, 6.
9. Determination of corrosion rate of mild steel in the presence and absence of inhibitor.
10. Estimation of the acid value of the given lubricant oil.
11. Estimation of viscosity of lubricant oil using Ostwald's Viscometer.
12. **Virtual Labs:**
    a. Construction of Fuel cell and it's working.
    b. Smart materials for Biomedical applications
    c. Batteries for electrical vehicles.
    d. Functioning of solar cell and its applications.

REFERENCES

1. Vogel's text book of Practical organic chemistry, 8th Edition.
2. Lab manual for Engineering chemistry by B. Ramadevi and P. Aparna, S Chand Publications, New Delhi (2022)
3. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
4. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007)

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

PROGRAMMIN G FOR PROBLEM SOLVING LAB

Course Code: GR25A1020 **L/T/P/C:0/0/3/1.5**
I Year I Semester

COURSE OUTCOMES

1. Develop C programs from algorithms using C elements, selection constructs, and test and debug them for correctness.
2. Employ loops and functions effectively to design modular solutions for computational problems.
3. Utilize arrays and strings to organize, manipulate, and process data in problem-solving contexts.
4. Apply searching and sorting methods and structure-based representations to manage and process data efficiently.
5. Demonstrate the use of pointers and apply file handling along with preprocessor directives to enhance C program execution and management.

TASK 1

a. Write the program for the simple, compound interest.
b. Write a C program to implement relational, logical and bitwise operators.
c. Write a C program for finding the maximum, minimum of three numbers.
d. Write a C program to Convert Celsius temperature to Fahrenheit and vice versa using type conversion.

TASK 2

a. Write a C program to find the roots of a quadratic equation using if-else.
b. Write a C program to check the triangle type based on sides using nested if-else.(Equilateral, Isosceles,
Scalene, invalid).
c. 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).

TASK 3

a. Write a C program to find the sum of individual digits of a positive integer and test given number is
palindrome.
b. Write a C program check whether a given number is Armstrong number or not.
c. Write a C program check whether a given number is Strong number or not.

TASK 4

a. Write a program to display prime numbers between X to Y.
b. Write a C program to calculate the sum of following series:
(i) $S1= 1+x/1+x^2/2+ x^3/3….+x^n/n$
(ii) $S2= 1+x/1!-x^2/2!+ x^3/3!….+x^n/n!$

TASK 5

a. Write a C program to display the following patterns:

i)

```
    1
  2   3
4   5   6
7   8   9   10
```

ii)

```
1
2 2
3 3 3
4 4 4 4
```

b. Write a C program to display the following patterns:

i)

```
$
$$$
$$$$$
$$$
$
```

ii)

```
E
ED
EDC
EDCB
EDCBA
```

TASK 6

a. Write a C program to swap two numbers using parameter passing techniques.

b. Write a C program to implement factorial of a given integer using recursive and non-recursive functions.

c. Write a C program to print first 'n' terms of Fibonacci series using recursive and non-recursive functions.

TASK 7

a. Write a C program to find the minimum, maximum and average in an array of integers.

b. Write a C program to perform Addition of Two Matrices using functions.

c. Write a C program to implement Multiplication of Two Matrices

TASK 8

a. Write a C program that uses non-recursive function to search for a Key value in a given list of integers using linear search method.

b. Write a C program that uses non-recursive function to search for a Key value in a given sorted list of integers using binary search method.

TASK 9

a. Write a C program that implements the Bubble sort method to sort a given list of integers in ascending order.

b. Write a C program that sorts the given array of integers using selection sort in descending order

c. Write a C program that sorts the given array of integers using insertion sort in ascending order

TASK 10

a. Write a C program that uses functions to perform the following operations:

I. To insert a sub-string into a given main string from a given position.

II. To delete n Characters from a given position in a given string

b. Write a C program to determine if the given string is a palindrome or not (Spelled same in both directions with or without a meaning like madam, civic, noon, abcba, etc.)

TASK 11

a. Write a C program to sort the 'n' strings in the alphabetical order using functions.

b. Write a C program to count the lines, words and characters in a given text.

TASK 12

a. Write a C program to implement function pointer to find sum and product of two numbers.

b. Write a program for reading elements using a pointer into an array and display the values using the array.

c. Write a program for display values reverse order from an array using a pointer.

TASK 13

a. Define a structure Date with members day, month, and year. Create another structure Employee with members: emp_id, emp_name, and a nested structure Date for joining_date. Write a program to store details of 5 employees in an array of structures and display employees who joined after the year 2020.

b. Write a C program that uses structures and functions to perform addition and product of two complex numbers? (use structures and functions)

TASK 14

a. 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).

b. Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents

TASK 15

a. Write a C program to find sum of 'n' numbers using command line arguments.

b. Write a C program to implement following pre-processor directives:

i. define ii. undef iii. ifdef iv. ifndef.

c. Write a C program to create a user defined header file to find sum, product and greatestof two numbers.

TEXT BOOKS

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

REFERENCES

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, PrenticeHall of India
2. R.G. Dromey, How to solve it by Computer, Pearson (16th Impression)
3. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education
4. Herbert Schildt, C: The Complete Reference, McGraw Hill, 4th Edition

I YEAR II SEMESTER

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(Common to all 1st year)

Course Code: GR25A1002 **L/T/P/C:3/1/0/4**
I Year II Semester

COURSE OUTCOMES

1. Identify whether the given differential equation of first order is exact or not.
2. Solve higher differential equation and apply the concept of differential equation to real world problems.
3. Use the Laplace Transforms techniques for solving Ordinary Differential Equations.
4. Evaluate the line integrals and use them to calculate work done.
5. Evaluate surface and volume integrals and apply fundamental theorems of vector calculus to relate line integrals and surface integrals.

UNIT I
FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS

Exact differential equations – Equations reducible to exact differential equations – linear and Bernoulli's equations –Applications: Newton's law of cooling – Law of natural growth and decay - Modelling of R-L circuit and R-C Circuit

UNIT II
ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER

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

UNIT III
LAPLACE TRANSFORMS

Laplace Transforms: Laplace Transform of standard functions – First shifting theorem – Laplace transforms of functions multiplied by 't' and divided by 't' – Laplace transforms of derivatives and integrals of function – Inverse Laplace transform by different methods, Applications: solving Initial value problems by Laplace Transform method.

UNIT IV
VECTOR DIFFERENTIATION AND LINE INTEGRATION

Vector differentiation: Scalar and vector point functions, Concepts of gradient, Directional derivatives, divergence and curl of functions in cartesian framework- solenoidal field, irrotational field, scalar potential

Vector line integration**:** Evaluation of the line integral, concept of work done by a force field, Conservative fields

UNIT V
SURFACE INTEGRATION AND VECTOR INTEGRAL THEOREMS

Surface integration: Evaluation of surface and volume integrals, flux across a surface

Vector integral theorems: Green's, Gauss and Stokes theorems (without proof) and

their applications

TEXTBOOKS

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.

REFERENCES

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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED ENGINEERING PHYSICS

Course Code: GR25A1003 (Common to all branches) L/T/P/C: 3/0/0/3
I Year II Sem

COURSE OUTCOMES

1. Apply quantum mechanical principles to explain particle behaviour and energy band formation in solids.
2. Comprehend the characteristics of semiconductor devices and characterization of nanomaterials.
3. Classify magnetic and dielectric materials based on their properties for various applications.
4. Analyze the principles of Laser and fibre optics and their applications.
5. Understand quantum computing concepts and use of quantum gates.

UNIT I
QUANTUM MECHANICS

Principles of 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, Schrödinger's time independent wave equation, particle in a 1D box.

Band Theory of Solids: Blochs theorem (qualitative), Kronig-Penney model (qualitative): E-k diagram, effective mass of electron, discrete energy levels, formation of energy bands, classification of solids into metals, semiconductors and insulators.

UNIT II
SEMICONDUCTORS & NANOMATERIALS

Semiconductors: Intrinsic and extrinsic semiconductors(qualitative), Variation of Fermi level with temperature and doping(qualitative), Hall Effect and its applications, direct and indirect band gap semiconductors, Construction and principle of operation of p-n junction diode, I-V characteristics of p-n junction diode and Zener diode. Principle, Construction, Working, Characteristics and Applications: LED and Solar cell.

Nanomaterials: Introduction, quantum confinement in nanomaterials, Surface to volume ratio, Synthesis methods: Top-Down Technique: Ball milling method, Bottom-Up technique: Sol-Gel method, X-ray diffraction: Bragg's law, calculation of average crystallite size using Debye Scherrer's formula, scanning electron microscopy (SEM): block diagram, working principle.

UNIT III
MAGNETIC AND DIELECTRIC MATERIALS

Magnetic materials: Introduction to magnetic materials, origin of magnetic moment - classification of magnetic materials – Dia, Para, Ferro, Weiss domain theory of ferromagnetism, hysteresis curve based on domain theory of ferromagnetism, soft and hard magnetic materials, applications: magnetic hyperthermia for cancer treatment, magnets for EV.

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

UNIT IV

LASER AND FIBRE OPTICS

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

Fiber Optics: 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.

UNIT V

QUANTUM COMPUTING

Introduction, 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,

entanglement, quantum gates (Pauli's X,Y,Z gate, Hadamard gate), quantum computing system for information processing, evolution of quantum systems, challenges and advantages of quantum computing over classical computation.

TEXTBOOKS

1. Charles Kittel, Introduction to Solid State Physics, John Wiley & Sons, Inc.
2. Thomas G. Wong, Introduction to Classical and Quantum Computing, Rooted Grove
3. Engineering Physics, B.K. Pandey, S. Chaturvedi – Cengage Learing
4. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand.

REFERENCES

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.
4. Fundamentals of Semiconductor Devices, Second Edition, Anderson and Anderson, McGraw Hill.

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

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGLISH FOR SKILL ENHANCEMENT
(Common to all branches)

Course Code: GR25A1005 **L/T/P/C: 3/0/0/3**
I Year II Sem

COURSE OUTCOMES

1. Use English Language effectively in spoken and written forms.
2. Comprehend the given texts and respond appropriately.
3. Communicate confidently in various contexts and different cultures.
4. Acquire proficiency in English including reading and listening comprehension, writing and speaking skills.
5. Convey complex ideas clearly and accurately in academic and professional settings.

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.)

TEXTBOOKS

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

REFERENCES

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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA STRUCTURES

Course Code: GR25A1016 **L/T/P/C:2/0/0/2**
I Year II Semester

COURSE OUTCOMES

1. Analyze the computational complexity of algorithms and implement operations on stack, queue and their applications.
2. Develop algorithms for various operations on linked lists and convert them to programs.
3. Interpret operations on non-linear data structure binary tree and BST.
4. Explain the principles of balanced trees and heaps, and implement efficient sorting algorithms in C.
5. Summarize the operations on graphs and apply graph traversals techniques and interpret hashing techniques.

UNIT I

Algorithms and Complexities: Analysis of algorithms, order of complexity, Asymptotic Notations -Big Oh, Omega, Theta, little oh and little omega notation.
Stacks: Introduction to Data Structures and types, Stack – Operations: pop, push, display, peek, Representation and implementation of stack operations using arrays, stack applications-recursion, infix to postfix transformation, evaluating postfix expressions.
Queues: Queue – Operations: enqueue, dequeue, display, representation and implementation ofqueue operations using array, applications of queues, circular queues - representation and implementation.

UNIT II

LIST: Introduction, dynamic memory allocation, self-referential structures, lists vs arrays Singly linked list - operations-insertion, deletion, display, search. Circular Linked Lists-operations-insertion, deletion, display, search. Doubly Linked List operations-insertion, deletion, display, search.

UNIT III

Trees: Basic tree concepts, Binary trees**:** properties, types, representation of binary trees using arrays and linked lists, traversals of binary tree.
Binary Search Tree –Representation and implementation of operations, Binary Search Tree Traversals (recursive), creation of binary tree and BST from given traversals.

UNIT IV

Balanced Trees and Heaps: Introduction,AVL Trees and its operations (no implementation) . Binary Heaps (no implementation)
Multi way Search Trees: Introduction, B+ Trees operations. (no implementation)
Sorting : Quick Sort, Merge Sort, Radix Sort, Heap sort, Tree Sort

UNIT V

Graphs: Introduction, basic terminology, representation of graphs, graph traversal techniques – Breadth First Traversal, Depth First Traversal.
Hashing - 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 (no implementation).

Teaching methodologies:

- Power Point Presentations
- Tutorial Sheets
- Assignments

TEXTBOOKS

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

REFERENCES

1. Data Structures with C, Seymour Lipschutz, TMH
2. Classic Data Structures, 2/e, Debasis, Samanta, PHI, 2009
3. Fundamentals of Data Structures in C, 2/e, Horowitz, Sahni, Anderson Freed, University Press
4. Data Structures using C – A. S.Tanenbaum, Y. Langsam, and M.J. Augenstein, PHI/Pearson Education.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRICAL CIRCUIT ANALYSIS

Course Code: GR25A1013 **L/T/P/C:2/1/0/3**
I Year II Semester

COURSE OUTCOMES

1. Analyze the electric circuits with suitable theorems and coupled circuits.
2. Illustrate the transient response of given DC circuits.
3. Infer electrical circuit responses using Laplace and Inverse Laplace transform.
4. Summarize the concepts of Fourier Series and Fourier transforms.
5. Simplify the network by using two port parameters.

UNIT I
NETWORK THEOREMS AND COUPLED CIRCUITS

Linearity and Superposition, Thevenin's and Norton's theorems, Maximum power transfer theorem and Reciprocity theorem (DC &AC).

Coupled Circuits: Self & Mutual Inductance, Dot convention, Coefficient of Coupling, Analysis of circuits with mutual inductance.

UNIT II
DC TRANSIENTS AND RESONANCE

Solution of first and second order differential equations for Series and Parallel RL, RC, RLC circuits, time constants, steady state and transient response. Current locus diagrams of RL and RC series circuits.

Resonance: Series and parallel circuits, Bandwidth, Q-factor, initial and final conditions in network elements

UNIT III
ELECTRICAL CIRCUIT ANALYSIS USING LAPLACE TRANSFORMS

Introduction to Laplace Transform, Properties of Laplace Transforms, initial and Final value theorems, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, Inverse Laplace Transform, transformed network with initial conditions, Transfer function representation, Poles and Zeros.

UNIT IV
FOURIER SERIES AND FOURIER TRANSFORM

Representation of continuous-time periodic signals by Fourier series; Dirichlet's conditions; Symmetry conditions, Properties of Fourier series, Trigonometric and Exponential Fourier series.

Fourier transform: Fourier transform of periodic signals, Properties of Fourier transforms. Application to simple networks.

UNIT V
TWO PORT NETWORKS

Two Port Networks, terminal pairs, relationship of two port variables, impedance, admittance, hybrid and transmission parameters, condition for symmetry and reciprocity, interrelation ship between various parameters, interconnections of two port networks (series, parallel and

cascade).

TEXTBOOKS

1. "Fundamentals of Electric Circuits" by C.K.Alexander and M.N.O.Sadiku, McGraw Hill Education,2004.
2. "Engineering Circuit Analysis" by W.H.Hayt and J.E.Kemmerly, McGraw Hill Education,2013.

REFERENCES

1. "Basic Electrical Engineering" by A.Sudhakar and Shyam Mohan, McGraw Hill Education.
2. "Circuit Theory" (Analysis and Synthesis) by A.Chakrabarti, Dhanpat Rai & Co
3. "Networks and Systems" by D Roy Choudhury, New Age International Publications,1998.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ADVANCED ENGINEERING PHYSICS LAB

(Common to all branches)

Course Code: GR25A1017 **L/T/P/C:0/0/2/1**

I Year II Sem

COURSE OUTCOMES

1. Categorize semiconductors using Hall effect and energy gap measurement techniques.
2. Illustrate working of optoelectronic devices through experimental study.
3. Analyze the behavior of magnetic fields and their applications.
4. Infer the characteristics of Lasers and study of losses in optical fibers.
5. Determine the frequency of tuning fork through the phenomena of resonance.

List of Experiments:

1. Determination of energy gap of a semiconductor.
2. Determination of Hall coefficient and carrier concertation of a given semiconductor.
3. Study of V-I characteristics of pn junction diode.
4. Study of V-I characteristics of light emitting diode.
5. Study of V-I Characteristics of solar cell.
6. Determination of magnetic field along the axis of a current carrying coil.
7. a) Determination of wavelength of a laser using diffraction grating.
   b) Study of V-I & L-I characteristics of a given laser diode.
8. Determination of numerical aperture of a given optical fibre.
9. Determination of bending losses of a given optical fibre.
10. Determination of frequency of a tuning fork using Melde's arrangement.

Note: Any 8 experiments are to be performed.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

DATA STRUCTURES LAB

Course Code: GR25A1023 **L/T/P/C: 0/0/2/1**

I Year II Semester

COURSE OUTCOMES

1. Implement stack and queue data structures and their applications.
2. Interpret various linked list operations to produce executable codes.
3. Develop working procedure for operations on BST using DMA.
4. Develop executable code for heaps and sorting techniques.
5. Demonstrate graph operations and hashing techniques.

TASK 1

a. Write a C program to implement Stack operations using arrays.
b. Write a C program to implement Queue operations using arrays.
c. Write a C program to implement Circular Queue operations using arrays.

TASK 2

a. Write a C program to convert infix expression to postfix expression.
b. Write a C program to evaluate a postfix expression.

TASK 3

Implement the following operations on Single Linked List using a C program.
i. Create ii. Insert iii. Delete iv. Search v. Display

TASK 4

Write a C program to implement Circular Linked List operations –
i. Create ii. Insert iii. Delete iv. Search v. Display.

TASK 5

Write a C program to implement Double Linked List operations –
i. Create ii. Insert iii. Delete iv. Search v. Display.

TASK 6

a) Develop a C code for preorder, in-order and post-order traversals of a Binary Search Treeusing recursion.
b) Design a C program for level order traversal of a Binary Search Tree.

TASK 7

a. Implement the following operations on Binary Search Tree
i. Create ii. Insert iii. Search

b. Implement the following operations on Binary Search Tree
i. Delete ii. Display

TASK 8

a. Implement the following operations on Binary Search Tree
i. count-nodes ii. height iii. minimum node iv. maximum node

TASK 9

a. Develop a C program for Quick sort.
b. Demonstrate Merge sort using a C program.
c. Design a C program for Radix Sort.

TASK 10

a. Develop a C program for Tree sort.
b. Demonstrate Heap sort using a C program.

TASK 11

a. Implement a C program for DFS traversal on graph.
b. Implement a C program for BFS traversal on graph

TASK 12

a. Implement a C program for the following operations on Hashing:
   i. Insert ii. Delete iii.Search iv.Display
b. Write a program to implement the following Hash Functions:

i) Division Method, ii) Multiplication Method,
iii) Mid-square Method iv) Folding Method

TEXTBOOKS

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.

REFERENCES

1. Fundamentals of Data Structures in C, 2/e, Horowitz, Sahni, Anderson Freed, University Press
2. Data Structures, 2/e, Richard F, Gilberg, Forouzan, Cengage
3. Data Structures and Algorithms, 2008, G.A.V.Pai, TMH

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ENGLISH LANGUAGE AND COMMUNICATI ON SKILLS LAB
Common to all branches

Course Code: GR25A1019 **L/T/P/C: 0/0/2/1**
I Year II Semester

COURSE OUTCOMES

1. Interpret the role and importance of various forms of communication skills.
2. Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively by listening carefully and respect others point of view.
3. Utilize various media of verbal and non-verbal communication with reference to various professional contexts.
4. Recognize the need to work in teams with appropriate ethical, social and professional responsibilities.
5. Speak and pronounce English intelligibly

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).

REFERENCES

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.

GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

ELECTRICAL CIRCUIT ANALYSIS LAB

Course Code: GR25A1021 **L/T/P/C:0/0/2/1**
I Year II Semester

COURSE OUTCOMES

1. Solve the circuits using various network theorems.
2. Analyze the performance of R-L, R-C and R-L-C circuits and draw the locus diagrams.
3. Measure the self and mutual inductance and determine the coefficient of coupling.
4. Determine the two-port network parameters.
5. Examine the resonance parameters and verify them practically.

LIST OF EXPERIMENTS

Any ten experiments should be conducted.

1. Verification of Thevenin's Theorem & Norton's Theorem
2. Verification of Superposition Theorem.
3. Verification of Reciprocity Theorem.
4. Verification of Maximum Power Transfer Theorem.
5. Determination of time constant for series RL and RC circuits.
6. Draw the Locus Diagrams of RL (R-Varying) and RC (R-Varying) Series Circuits.
7. Draw the locus Diagrams of RL (L-Varying) and RC (C-Varying) Series Circuits.
8. Analysis of Series Resonant Circuit.
9. Analysis of Parallel Resonant Circuit.
10. Determination of self, mutual inductances and coefficient of coupling.
11. Determination of Z &Y parameters of a two- port network.
12. Determination of Hybrid & Transmission parameters of a two-port network.

TEXTBOOKS

1. "Fundamentals of Electric Circuits" by C.K.Alexander and M.N.O.Sadiku, McGraw Hill Education,2004.
2. "Engineering Circuit Analysis" by W.H.Hayt and J.E.Kemmerly, , McGraw Hill Education,2013.

REFERENCES

1. “Basic Electrical Engineering” by A.Sudhakar and Shyam Mohan, McGraw Hill Education.
2. “Circuit Theory” (Analysis and Synthesis) by A.Chakrabarti ,Dhanpat Rai & Co
3. “Networks and Systems” by D Roy Choudhury, New Age International Publications,1998.