

# **I Year Syllabus**



## GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

### LINEAR ALGEBRA AND DIFFERENTIAL CALCULUS

Course code: GR18A1001

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

#### Course Objectives:

- The ideas of linearity and linear systems, which lie at the core of many engineering concepts
- The concept of latent values of a matrix which is critical in many engineering applications
- The ideas of function approximation using the tools of mean value theorems
- The skill of using a definite integral for various geometrical applications
- The skill of finding the optimal values of multi-variable functions

#### Course Outcomes:

- Compute the rank of a matrix to determine the existence of solutions of a linear algebraic system
- Determine the eigenvalues and eigenvectors of a square matrix which arise in several engineering applications
- Determine approximate solution of over determined systems using the pseudo inverse
- Apply the definite integral for various computational problems in geometry and Evaluate some improper integrals using special functions
- Develop the skill of determining optimal values of multivariable functions using classical methods

#### Unit I: VECTOR AND MATRIX ALGEBRA

Vector space (definition and examples), linear independence of vectors, orthogonality of vectors, projection of vectors, Gram-Schmidt orthonormalization of vectors, Symmetric, Hermitian, skew-symmetric, skew-Hermitian, orthogonal and UNITary matrices; Rank of a matrix by echelon reduction, Solution of a linear algebraic system of equations (homogeneous and non-homogeneous).

#### Unit II: MATRIX EIGENVALUE PROBLEM AND QUADRATIC FORMS

Determination of eigenvalues and eigenvectors of a matrix, properties of eigenvalues and eigenvectors (without proof), diagonalization of a matrix, orthogonal diagonalization of symmetric matrices, Similarity of matrices, Quadratic Forms: Definiteness and nature of a quadratic form, reduction of quadratic form to canonical forms by orthogonal transformation.

#### Unit III: MATRIX DECOMPOSITION AND PSEUDO INVERSE OF A MATRIX

Spectral decomposition of a symmetric matrix, L-U decomposition, Q-R factorization, Singular value decomposition, Moore-Penrose pseudo inverse of a matrix, least squares solution of an over determined system of equations using pseudo inverse.

#### Unit IV: SINGLE VARIABLE CALCULUS

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem and Taylor's theorem (without proof), their geometrical interpretation and applications, approximation of a function by Taylor's series, Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (only in Cartesian coordinates), Evaluation of improper integral using Beta and Gamma functions.

#### Unit V: MULTIVARIABLE DIFFERENTIAL CALCULUS AND FUNCTION OPTIMIZATION

Partial Differentiation: Total derivative; Jacobian; Functional dependence, unconstrained optimization of functions using the Hessian matrix, constrained optimization using Lagrange multiplier method

**Text/Reference Books:**

1. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa publishing house,
2. Fourth edition 2014
3. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup>edition,Pearson, Reprint,
5. 2002.
6. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006
7. GRIET reference manual.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.



GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## CHEMISTRY

**Course Code: GR18A1005**

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

### Course Objectives:

- To relate how the basic concepts and principles of chemistry can be applied to practical utility in a broader perspective of the society.
- To distinguish the ranges of electromagnetic spectrum and its interaction with matter and to develop knowledge of various spectroscopic techniques at atomic and molecular levels.
- To identify and apply various principles of electrochemistry, corrosion and water treatment which are essential for an engineer in industry
- To acquire knowledge of existence of different organic molecules in different stereo chemical orientations useful for understanding reaction path ways.
- To bring adaptability to the concepts of
- chemistry and to acquire the required skills to become a perfect engineer.

### Course Outcomes:

- Analyze microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Relate electromagnetic spectra used for exciting different molecular energy levels in various spectroscopic techniques and their application in medicine and other fields.
- Recognise various problems related to electrochemistry and corrosion in industry and is able to explain different prevention techniques and apply concepts of chemistry in Engineering.
- Know the origin of different types of engineering materials used in modern technology and Interpret different problems involved in industrial utilization of water.
- Understand the processing of fossil fuels for the effective utilization of chemical energy.

### Unit I: ATOMIC AND MOLECULAR STRUCTURE

Atomic and molecular orbitals, Linear Combination of Atomic Orbitals (LCAO), Molecular orbitals of homo-nuclear diatomic molecules, MO energy diagrams of  $N_2$  and  $O_2$ . Metallic bonding, Valence Bond Theory, Crystal Field Theory, Crystal Field Splitting of transition metal ion d-orbitals in tetrahedral, octahedral, and square planar geometries.

### Unit II: SPECTROSCOPIC TECHNIQUES AND APPLICATIONS

Regions of electromagnetic spectrum, Molecular spectroscopy Rotational Spectroscopy: Rotation of molecules, rotational spectra of rigid diatomic molecules, selection rules.

Vibrational Spectroscopy: The vibrating diatomic molecule, simple and anharmonic oscillators of a diatomic molecule, selection rules, applications of IR spectroscopy.

Nuclear Magnetic Resonance: Basic concepts of NMR, Chemical shift. Magnetic resonance Imaging.

### Unit III: ELECTROCHEMISTRY AND CORROSION

Electrochemistry: Electrode potential, types of electrodes: calomel and glass electrodes- construction and working, electrochemical series and applications, electrochemical cells: Galvanic & electrolytic cells, Nernst equation- applications, numerical problems, Batteries: primary and secondary types, lithium metal, lithium ion and lead acid batteries. Fuel cells: hydrogen-oxygen fuel cell - applications and advantages.

Corrosion: Definition, causes and effects of corrosion, Theories of chemical and electro chemical corrosion with mechanism, Types of corrosion - Galvanic, concentration cell and pitting corrosions, factors affecting corrosion (Nature of metal & Nature of Environment), corrosion control methods: Proper designing, cathodic protection (sacrificial anodic and impressed current cathodic protection), Metallic coatings: Hot dipping- Galvanization and tinning, electroplating, electroless plating of nickel.

#### **Unit IV: ENGINEERING MATERIALS AND WATER TECHNOLOGY**

Semiconductors: Si and Ge, preparation, purification and crystal growth by zone refining and Czochralski pulling methods, doping.

Polymeric Materials: plastics-classification, types of polymerization, properties of polymers-crystallinity, melting and boiling points, glass transition temperature, viscoelasticity. Compounding and fabrication by compression moulding and injection moulding, conducting polymers – definition, classification, application.

Water: impurities, hardness- causes of hardness, types, UNITs. Boiler troubles- scales and sludges, caustic embrittlement, water purification by reverse osmosis (RO) method.

#### **Unit V: STEREOCHEMISTRY AND ENERGY RESOURCES**

Stereo chemistry: Structural isomers and stereoisomers, representations of 3D structures, configurations and symmetry, chirality, enantiomers, diastereomers, optical activity, conformational analysis of n-butane. Structure, synthesis and pharmaceutical applications of paracetamol and aspirin.

Energy sources: Fossil Fuels: Coal –types, analysis of coal- proximate and ultimate analysis and their significance, Petroleum-its composition-synthetic petrol – Fischer Tropsch's process, cracking - Definition and its significance, knocking and its mechanism in Internal Combustion engines, Octane rating and cetane number. Composition and Uses of Natural gas, LPG and CNG.

#### **Text/Reference Books:**

1. Engineering Chemistry by P.C. Jain and M. Jain; Dhanpat Rai Publishing Company (P) Ltd., New Delhi.
2. Engineering Chemistry by Prasanta Rath, B. Rama Devi, Ch. Venkata Ramana reddy, S. Chakroborty. Cengage publications, 2018.
3. University Chemistry, by B.H. Mahan.
4. Engineering Chemistry by B. Siva Sankar, Mc Graw Hill Publication.
5. Fundamentals of Molecular Spectroscopy, by C.N. Banwell. Mc Graw Hill Publication
6. A Text book of Engineering Chemistry by Shashi Chawla, Dhanpat Rai Publishing Company (P) Ltd., New Delhi.



GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## BASIC ELECTRICAL ENGINEERING

**Course Code: GR18A1008**

**L/ T/ P/ C: 3/0/0/3**

### **Course Objectives:**

- To introduce the fundamentals of Electrical Engineering.
- To Solve problems in AC circuits.
- To provide foundation in theory and applications of Transformers and DC machines
- Understand the basic principles of AC Electrical machinery and their applications.
- To import the knowledge of Electrical Installations.

### **Course Outcomes:**

- To understand and analyze basic electric circuits with suitable theorems.
- To solve 1-phase and 3-phase balanced sinusoidal systems.
- To interpret the working principle of Electrical machines.
- To appraise the applications of Induction motors and synchronous generators used in Industries.
- To identify the components of Low Voltage Electrical Installations.

### **Unit I: D.C. CIRCUITS**

Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems.

Time-domain analysis of first-order RL and RC circuits.

### **UnitII:A.C. CIRCUITS**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series RLC circuit.

Three-phase balanced circuits, voltage and current relations in star and delta connections.

### **Unit III: TRANSFORMERS**

Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

### **Unit IV: ELECTRICAL MACHINES**

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

### **UnitV:ELECTRICAL INSTALLATIONS**

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

**Text/Reference Books:**

1. Basic Electrical Engineering - D.P. Kothari and I.J. Nagrath, 3rd edition 2010, Tata McGraw Hill.
2. D.C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L.S. Bobrow, Fundamentals of Electrical Engineering", Oxford University Press, 2011
4. Electrical and Electronics Technology, E. Hughes, 10th Edition, Pearson, 2010
5. Electrical Engineering Fundamentals, Vincent Deltoro, Second Edition, Prentice Hall India, 1989



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**ENGLISH**

**Course Code: GR18A1006**

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

**INTRODUCTION**

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, communicative and critical thinking competencies of Engineering students.

In English classes, the focus should be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers should use the prescribed text for detailed study. The students should be encouraged to read the texts leading to reading comprehension and different passages may be given for practice in the class. 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 etc. *The focus in this syllabus is on skill development, fostering ideas and practice of language skills in various contexts and cultures.*

**Course Objectives:** The course will help to

- Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- Equip students to study academic subjects more effectively and critically using the theoretical and practical components of English syllabus.
- Develop study skills and communication skills in formal and informal situations.
- Understand the importance of defining, classifying and practice the unique qualities of professional writing style.
- Employ the acquired knowledge in classroom with reference to various social and professional spheres thus leading to a life-long learning process.

**Course Outcomes:** Students should be able to

- Use English Language effectively in spoken and written forms.
- Comprehend the given texts and respond appropriately.
- Communicate confidently in various contexts and different cultures.
- Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.
- Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively by listening carefully and respect others point of view.

**Unit I**



**‘The Raman Effect’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.**

**Vocabulary Building:** The Concept of Word Formation--The Use of Prefixes and Suffixes. **Grammar:** Identifying Common Errors in Writing with Reference to Articles and Prepositions.

**Reading:** Reading and Its Importance- Techniques for Effective Reading.

**Basic Writing Skills:** Sentence Structures -Use of Phrases and Clauses in Sentences-Importance of Proper Punctuation- Techniques for writing precisely – **Paragraph writing** – Types, Structures and Features of a Paragraph - Creating Coherence-Organizing Principles of Paragraphs in Documents.

## **Unit II**

### **Letter Writing**

**Vocabulary:** Synonyms and Antonyms. Use of phrases for formal and informal letter writing. Eg., I would like to apply, I regret to inform, This is to bring to your kind notice... etc.

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

**Reading:** Improving Comprehension Skills – Techniques for Good Comprehension, Read a letter

**Writing:** Format of a Formal Letter-**Writing Formal Letters** E.g., Letter of Complaint, Letter of Requisition, Job Application with Resume. Reorganising of sentences /paragraphs in a letter.

## **Unit III**

**‘Blue Jeans’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.**

**Vocabulary:** Acquaintance with Prefixes and Suffixes from Foreign Languages in English to form Derivatives- 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- Skimming and Scanning

**Writing:** Nature and Style of Sensible Writing- **Defining- Describing** Objects, Places and Events – **Classifying-** Providing Examples or Evidence.

## **Unit IV**

**‘What Should You Be Eating’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press.**

**Vocabulary:** Standard Abbreviations in English

**Grammar:** Redundancies and Clichés in Oral and Written Communication.

**Reading:** Comprehension- Intensive Reading and Extensive Reading

**Writing: Writing Practices--** Writing Introduction and Conclusion - Essay Writing- Précis Writing.

## Unit V

**‘How a Chinese Billionaire Built Her Fortune’ from the prescribed textbook ‘English for Engineers’ published by Cambridge University Press. Vocabulary:** Technical Vocabulary and their usage

**Grammar:** Common Errors in English

**Reading:** Reading Comprehension-Exercises for Practice

**Writing: Technical Reports-** Introduction – Characteristics of a Report – Categories of Reports

Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

### **Text/Reference Books:**

1. Sudarshana, N.P. and Savitha, C. (2018). English for Engineers. Cambridge University Press.
2. Swan, M. (2016). Practical English Usage. Oxford University Press.
3. Kumar, S and Lata, P.(2018). Communication Skills. Oxford University Press.
4. Wood, F.T. (2007).Remedial English Grammar. Macmillan.
5. Zinsser, William. (2001). On Writing Well. Harper Resource Book.
6. Hamp-Lyons, L. (2006).Study Writing. Cambridge University Press.
7. Exercises in Spoken English. Parts I –III. CIEFL, Hyderabad. Oxford University Press.



GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

**ENGINEERING CHEMISTRY LAB**

**Course code: GR18A1013**

**L/T/P/C: 0/0/3/1.5**

**Course Objectives:**

- Introduce practical applications of chemistry concepts to engineering problems.
- To determine the rate constant of reactions from concentrations as a function of time.
- Measure the molecular or ionic properties such as conductance, redox potentials
- Synthesize a drug molecule to learn how organic compounds are prepared in industry.
- Know the laboratory practices implemented in a research and industrial chemistry laboratory setting.

**Course Outcomes:**

- Ability to perform experiments illustrating the principles of chemistry relevant to the study of science and engineering.
- Determination of parameters like hardness and chloride content in water.
- Understand the kinetics of a reactions from a change in concentrations of reactants or products as a function of time.
- Synthesize a drug molecule as an example of organic synthesis methods widely used in industry.
- Determination of physical properties like adsorption and viscosity.

**List of Experiments: (any 12 experiments out of 14)**

**TASK 1:** Determination total hardness of water by complexometric method using EDTA.

**TASK 2:** Determination of chloride content of water by Argentometry.

**TASK 3:** Redox titration: Estimation of ferrous iron using standard  $\text{KMnO}_4$

**TASK 4:** Estimation of HCl by Conductometric titrations

**TASK 5:** Estimation of Acetic acid by Conductometric titrations

**TASK 6:** Estimation of Ferrous iron by Potentiometry using dichromate

**TASK 7:** Determination of rate constant of acid catalyzed reaction of methyl acetate

**TASK 8:** Determination of acid value of coconut oil.

**TASK 9:** Adsorption of acetic acid by charcoal

**TASK 10:** Determination of surface tension of liquid by using stalagmometer

**TASK 11:** Determination of viscosity of liquid by using Ostwald's viscometer.

**TASK 12:** Determination of partition coefficient of acetic acid between n-butanol and water.

**TASK 13:** Synthesis of Aspirin

## **TASK 14:** Synthesis of Paracetamol.

### **Text/Reference Books:**

1. Vogel's text book of Practical Organic Chemistry, 5<sup>th</sup> Edition.
2. Senior Practical Physical Chemistry, B.D. Khosala, A. Gulati and V. Garg (R. Chand & Co., Delhi)
3. Text book on Experiments and Calculations in Engineering Chemistry- S.S.Dara.
4. An Introduction to Practical Chemistry, K.K. Sharma and D.S. Sharma (Vikas Publications, New Delhi)



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**BASIC ELECTRICAL ENGINEERING LAB**

**Course Code: GR18A1016**

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

**Course Objectives:**

- To introduce the use of measuring instruments.
- To analyze a given network by applying various electrical laws
- To calculate, measure and know the relation between basic electrical parameters.
- To know the response of electrical circuits for different excitations
- To summarize the performance characteristics of electrical machines.

**Course Outcomes:**

- Get an exposure to common electrical components and their ratings.
- Get an exposure to basic electrical laws.
- Understand the measurement, calculation and relation between the basic electrical parameters
- Understand the response of different types of electrical circuits to different excitations.
- Compare the basic characteristics of Electrical machines

**TASK 1:** Verification of Ohms Law

**TASK2:** Verification of KVL and KCL

**TASK3:** Transient Response of Series RL and RC circuits using DC excitation

**TASK4:** Transient Response of RLC Series circuit using DC excitation

**TASK5:** Resonance in series RLC circuit

**TASK6:** Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits

**TASK7:** Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single Phase Transformer

**TASK8:** Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)

**TASK9:** Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)

**TASK10:** Measurement of Active and Reactive Power in a balanced Three-phase circuit

**TASK11:** Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor

**TASK 12:** Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor

**TASK13:** Performance Characteristics of a Three-phase Induction Motor

**TASK14:** Torque-Speed Characteristics of a Three-phase Induction Motor

**TASK15:**No-Load Characteristics of a Three-phase Alternator



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**ENGLISH LANGUAGE AND COMMUNICATION SKILLS LAB**

**Course code: GR18A1014**

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

The **Language Lab** focuses 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.

**Course Objectives:**

- To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning.
- To sensitize students to the nuances of English speech sounds, word accent, intonation rhythm and Neutralization of accent for intelligibility
- To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- To improve the fluency of students in spoken English and neutralize their mother tongue influence
- To train students to use language appropriately for public speaking and interviews

**Course Outcomes:**

- Interpret the role and importance of various forms of communication skills.
- Demonstrate the skills needed to participate in a conversation that builds knowledge collaboratively by listening carefully and respect others point of view.
- Utilize various media of verbal and non-verbal communication with reference to various professional contexts.
- Recognise the need to work in teams with appropriate ethical, social and professional responsibilities.
- Evaluate and use a neutral and correct form of English.

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

- a. Computer Assisted Language Learning (CALL) Lab**
- b. Interactive Communication Skills (ICS) Lab**

**Listening Skills Objectives:**

1. To enable students, develop their listening skills so that they may appreciate its role in the LSRW skills approach to language and improve their pronunciation

2. To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions

- Listening for general content
- Listening for specific information

### **Speaking Skills Objectives:**

- To involve students in speaking activities in various contexts
- To enable students express themselves fluently and appropriately in social and professional contexts
- Oral practice: Just A Minute (JAM) Sessions
- Describing objects/situations/people
- Role play – Individual/Group activities

### **Exercise – I**

#### **CALL Lab:**

*Understand:* Listening Skill- Its importance – Purpose- Process- Types- Barriers of Listening.

*Practice:* Introduction to Phonetics – Speech Sounds – Vowels and Consonants.

#### **ICS Lab:**

*Understand:* Communication at Work Place- Spoken vs. Written language.

*Practice:* Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings –Taking Leave – Introducing Oneself and Others.

### **Exercise – II**

#### **CALL Lab:**

*Understand:* Structure of Syllables – Word Stress and Rhythm– Weak Forms and StrongForms in Context.

*Practice:* Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms in Context.

#### **ICS Lab:**

*Understand:* Features of Good Conversation – Non-verbal Communication.

*Practice:* Situational Dialogues – Role-Play- Expressions in Various Situations –MakingRequests and Seeking Permissions - Telephone Etiquette.

### **Exercise-III:**

#### **CALL Lab:**

*Understand:* Intonation-Errors in Pronunciation-the Influence of Mother Tongue (MTI).

*Practice:* Common Indian Variants in Pronunciation – Differences in British and American Pronunciation.

#### **ICS Lab:**

*Understand:* How to make Formal Presentations.

*Practice:* Formal Presentations.

**Exercise – IV:**

**CALL Lab:**

*Understand:* Listening for General Details.

*Practice:* Listening Comprehension Tests.

**ICS Lab:**

*Understand:* Public Speaking – Exposure to Structured Talks.

*Practice:* Making a Short Speech – Extempore.

**Exercise – V:**

**CALL Lab:**

*Understand:* Listening for Specific Details.

*Practice:* Listening Comprehension Tests.

**ICS Lab:**

*Understand:* Interview Skills.

*Practice:* Mock Interviews.

**Minimum Requirement of infrastructural facilities for ELCS Lab:**

**1. Computer Assisted Language Learning (CALL) Lab**

Computer systems, headphones and English language learning software for self- study by students.

**2. Interactive Communication Skills (ICS) Lab:**

**The Interactive Communication Skills Lab:** A Spacious room with movable chairs, audio-visual aids with a Podium, LCD and a projector





**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**  
**ENGINEERING WORKSHOP**

**Course Code: GR18A1017**

**L/T/P/C: 1/0/3/2.5**

**Course objectives :**

- To prepare and practice of scientific principles underlying the art of manufacturing in workshop/manufacturing practices.
- To Demonstrate basic knowledge of various tools and their use in different sections.
- To make students to execute applications of various tools in carpentry.
- To make students recognize applications of manufacturing methods casting, forming machining, joining and advanced manufacturing methods.
- To develop generate safety rules, safe practices and workshop dress code.

**Course Outcomes:**

- Develop various trades applicable to industries / Manufacturing practices.
- Create Hands on experience for common trades.
- Improve to fabricate components with their own hands.
- Develop practical knowledge on the dimensional accuracies and dimensional tolerances possible with various manufacturing processes
- To build the requirement of quality of work life on safety and organizational needs.

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

- i. Carpentry
- ii. Fitting Shop
- iii. Tin-Smithy
- iv. Casting
- v. Welding Practice
- vi. House-wiring
- vii. Black Smithy

**2. VIDEO LECTURES:** Carpentry, Fitting operations, Tin-Smithy, Casting, Welding, Electrical and Electronics, Black Smithy, Plumbing, Power tools in construction and Wood Working, Manufacturing Methods,

**Text/ Reference Books:**

1. Workshop Practice /B. L. Juneja / Cengage
2. Workshop Manual / K. Venugopal / Anuradha.
3. Work shop Manual - P. Kannaiah/ K. L. Narayana/ SciTech
4. Workshop Manual / Venkat Reddy/ BSP



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS**

**Course Code : GR18A1002**

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

**Course Objectives:**

- The knowledge to visualize solutions to engineering problems governed by differential equations
- The skill of evaluating multiple integrals needed for applications in mechanics and electro-magnetic field theory
- The knowledge to visualize the functions arising in vector field theory and use mathematical tools for some computations
- The skill of calculating work done by a field and flux across a surface
- The skill of using specialized theorems for fast computation of work and flux

**Course Outcomes:**

- Classify the differential equations of first order and solve them analytically by suggested methods
- Solve linear differential equations of higher order under various forcing functions
- Evaluate double and triple integrals and apply them to some problems in geometry and mechanics
- Perform vector differential operations on scalar and vector fields and apply them to solve some field related problems
- Apply classical vector integral theorems for fast computation of work done around closed curves and flux across closed surfaces

**UnitI: FIRST ORDER ODE**

LDE of the first order: Solution of Exact, linear and Bernoulli equations, modeling of Newton's law of cooling, growth and decay models, modeling an R-L circuit

Non - linear differential equations of the first order: Equations solvable for  $p$ , equations solvable for  $x$ , equations solvable for  $y$

**UnitII: ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER**

LDE with constant coefficients: Complementary function, over damping, under damping and critical damping of a system, Particular integrals for  $f(x)$  of the form  $e^{ax}$ ,  $x^n$ ,  $\cos ax$ ,  $\sin ax$ ,  $e^{ax}V(x)$  and  $xV(x)$  where  $V(x) \equiv \cos ax$  and  $\sin ax$ , the method of variation of parameters LDE with variable coefficients: Cauchy's homogeneous equation, Legendre's homogeneous equations

**UnitIII: MULTIPLE INTEGRALS**

Double integrals: Evaluation of Double Integrals, change of order of integration (only Cartesian form), change of variables (Cartesian and polar coordinates)

Triple Integrals: Evaluation of triple integrals, Change of variables (Cartesian to Spherical and Cylindrical polar coordinates)

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals), Centre of mass and Gravity (constant and variable densities) by double and triple integrals (applications involving cubes, sphere and rectangular parallelepipeds)

#### **UnitIV: VECTOR DIFFERENTIATION AND LINE INTEGRATION**

Vector differentiation: Scalar and vector point functions, Concepts of gradient, divergence and curl of functions in cartesian framework, solenoidal fields, irrotational fields, potentials

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

#### **UnitV: 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 proofs) and their applications

#### **Text/Reference Books**

1. R.K.Jain and S.R.K.Iyengar, Advanced Engineering Mathematics, Narosa publishing house, Fourth edition 2014
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010
3. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006
4. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
5. GRIET reference manual
6. Paras Ram, Engineering Mathematics, 2nd Edition, CBS Publishes
7. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

## **APPLIED PHYSICS**

**Course Code: GR18A1003**

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

### **Course Objectives:**

- Demonstrate skills in scientific inquiry and problem solving techniques.
- Identify the role of quantum mechanics and its applications on physical system.
- Summarize the use of semiconductors and optoelectronics devices.
- Interpret the properties of Laser light and its uses in optical fiber communication.
- Outline the properties of electric and magnetic materials.

### **Course Outcomes:**

- Outline the development of quantum mechanics and solve Schrodinger equation for simple potentials.
- Demonstrate the operation mechanism of electronic devices such as transistors and diodes.
- Explain the development and applications of optoelectronic devices.
- Analyze the properties of Laser and its propagation in optical fibers.
- Evaluate the properties of dielectric and magnetic materials for various applications

### **UnitI: QUANTUM MECHANICS**

Introduction to quantum physics, Black body radiation, Planck's law, photoelectric effect Compton effect, wave-particle duality, de Broglie hypothesis, Davisson and Germer experiment, Heisenberg's uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, particle in one dimensional box, potential barrier.

### **UnitII: SEMICONDUCTOR PHYSICS**

Intrinsic and extrinsic semiconductors: Estimation of carrier-concentration, Dependence of Fermi level on carrier-concentration and variation with temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall Effect, p-n junction diode: I-V Characteristics, Zener diode: I-V Characteristics, Bipolar Junction Transistor (BJT): Construction, Principle of operation and characteristics.

### **Unit III: OPTOELECTRONICS**

Radiative, Non-radiative transitions and recombination mechanism in semiconductors, LED and Semiconductor lasers: Device structure, materials, Characteristics, Semiconductor photo-detectors: PIN and Avalanche detectors and their structure, Materials, Working principle and Characteristics, Solar cell: structure and Characteristics.

#### **Unit IV: LASERS AND FIBER OPTICS**

Lasers: Introduction, Interaction of radiation with matter: Absorption, Spontaneous and Stimulated emission, Einstein coefficients, Characteristics of lasers: Resonating cavity, Active medium, pumping, population inversion, Construction and working of laser: Ruby laser, He-Ne laser, application of lasers. Fiber Optics: Introduction, Principle and Construction of an optical fiber, Acceptance angle, Numerical aperture, Types of Fibers, losses associated with optical fibers, Basic components in optical fiber communication system, Application of optical fibers.

#### **Unit V: DIELECTRIC AND MAGNETIC PROPERTIES OF MATERIALS**

Dielectrics: Introduction, Types of polarizations (Electronic, Ionic and Orientation Polarizations) and calculation of Electronic, Ionic polarizability, internal fields in a solid, Clausius-Mossotti relation. Magnetism: Introduction, Bohr magneton, classification of dia, para and ferro magnetic materials on the basis of magnetic moment, Hysteresis curve based on domain theory, Soft and hard magnetic materials, Properties of anti-ferro and ferri magnetic materials.

#### **Text/ References Books:**

1. Engineering Physics, B.K. Pandey, S. Chaturvedi - Cengage Learning.
2. Halliday and Resnick, Physics - Wiley.
3. Engineering Physics, P.K Palanisamy, Scitech Publishers.
4. A textbook of Engineering Physics, Dr. M. N. Avadhanulu, Dr. P.G. Kshirsagar - S. Chand.
5. Applied Physics, T. Bhīma Sankaram, BSP Publishers.
6. Richard Robinett, Quantum Mechanics
7. Fundamentals of Semiconductor Devices, Second Edition, Anderson and Anderson, McGraw Hill.
8. J. Singh, Semiconductor Optoelectronics: Physics and Technology, McGraw- Hill Inc.(1995)
9. Semiconductor Physics and Devices, 4e, Neamen and Biswas, McGraw Hill.
10. Online Course: "Optoelectronic Materials and Devices" by Monica Katiyar and Deepak Gupta on NPTEL



GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## PROGRAMMING FOR PROBLEM SOLVING

Course Code: GR18A1007

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

**Prerequisite:** Knowledge of Mathematics required.

### Course Objectives:

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

### Course Outcomes:

The Student will learn:

- To write algorithms and to draw flowcharts for solving problems.
- To convert the algorithms/flowcharts to C programs.
- To code and test a given logic in C programming language.
- To decompose a problem into functions and to develop modular reusable code.
- To use arrays, pointers, strings and structures to write C programs.

## Unit I: INTRODUCTION TO PROGRAMMING

**Introduction to components of a computer system:** disks, primary and secondary memory, processor, operating system, compilers, creating, compiling and executing a program, Number systems

**Introduction to Algorithms:** steps to solve logical and numerical problems. Representation of Algorithm, Flowchart/Pseudo code with examples, Program design and structured programming

**Introduction to C Programming Language:** variables (with data types and space requirements), Syntax and Logical Errors in compilation, object and executable code, Operators, expressions and precedence, Expression evaluation, Storage classes (auto, extern, static and register), type conversion, The main method and command line arguments Bitwise operations: Bitwise AND, OR, XOR and NOT operators

**Conditional Branching and Loops:** Writing and evaluation of conditionals and consequent branching with if, if-else, switch-case, ternary operator, goto, Iteration with for, while, do-while loops

**I/O:** Simple input and output with scanf and printf, formatted I/O.

## Unit II: ARRAYS, STRINGS, STRUCTURES AND POINTERS

**Arrays:** one and two dimensional arrays, creating, accessing and manipulating elements of arrays

**Strings:** Introduction to strings, handling strings as array of characters, basic string functions available in C (strlen, strcat, strcpy, strstr), arrays of strings

**Structures:** Defining structures, initializing structures, unions, Array of structures.

**Pointers:** Idea of pointers, Defining pointers, Pointers to Arrays and Structures, Use of Pointers in self-referential structures, usage of self referential structures in linked list (no implementation) Enumeration data type

### **Unit III: PREPROCESSOR AND FILE HANDLING IN C**

**Preprocessor:** Commonly used Preprocessor commands like include, define, undef, if, ifdef, ifndef  
**Files:** Text and Binary files, Creating and Reading and writing text and binary files, Appending data to existing files, Writing and reading structures using binary files, Random access using fseek, ftell and rewind functions. Introduction to stdin, stdout and stderr.

### **Unit IV: FUNCTION AND DYNAMIC MEMORY ALLOCATION**

**Functions:** Designing structured programs, Declaring a function, Signature of a function, 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, Some C standard functions and libraries

**Recursion:** Simple programs, such as Finding Factorial, Fibonacci series , Limitations of Recursive functions

**Dynamic memory allocation:** Allocating and freeing memory, Allocating memory for arrays of different data types

### **Unit V: INTRODUCTION TO ALGORITHMS**

Algorithms for finding roots of a quadratic equations, finding minimum and maximum numbers of a given set, finding if a number is prime number, 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), Basic concept of order of complexity through the example programs

#### **Text/ Reference 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, Cengage Learning, (3<sup>rd</sup> Edition):
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice
4. Hall of India
5. R.G. Dromey, How to solve it by Computer, Pearson (16<sup>th</sup> Impression)
6. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
7. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4<sup>th</sup> Edition



GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## ENGINEERING GRAPHICS

**Course Code: GR18A1010**

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

### **Course Objectives:**

- Provide basic conventions and standards used in Engineering Graphics
- Impart knowledge on various Engineering curves and their significance
- To draw orthographic, sectional and pictorial views of a given solid.
- To develop skills in three dimensional visualization of engineering components
- To inculcate CAD packages on modelling and drafting

### **Course Outcomes:**

- Familiarize with BIS standards and conventions used in engineering graphics.
- Draw various engineering curves e.g ellipse, parabola, cycloids and involutes etc and construct various reduced scales e.g plain, diagonal and vernier scales
- Differentiate between first angle and third angle methods of projection and distinguish parallel and perspective projection.
- Visualize different views like elevation and plan for a given line, plane figures or solid objects.
- Apply drafting techniques and use 2D software e.g AutoCAD to sketch 2D plane figures.

### **Unit I: INTRODUCTION TO ENGINEERING DRAWING**

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

### **Unit II: ORTHOGRAPHIC PROJECTIONS**

Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures-Auxiliary Planes.

### **Unit III: PROJECTIONS OF REGULAR SOLIDS**

Auxiliary Views - Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere

### **Unit IV: DEVELOPMENT OF SURFACES OF RIGHT REGULAR SOLIDS**



Prism, Cylinder, Pyramid and Cone, Intersection of Solids: Intersection of – Prism vs Prism- cylinder vs cylinder

### **Unit V: ISOMETRIC PROJECTIONS**

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

**Introduction to CAD: (For Internal Evaluation Weightage only):** Introduction to CAD Software Package Commands.- Free Hand Sketches of 2D- Creation of 2D Sketches by CAD Package

### **Text /Reference Books:**

1. Engineering Drawing by N.D. Bhatt/Charotar
2. Engineering Drawing/ N.S.Parthasarathy and Vela Murali/Oxford
3. EngineeringGraphics.ByBasantAgrawal/CMAgrawal/McGrawHillEducation
4. EngineeringDrawingbyK.VenuGopal/NewAgePublications.
5. Computer Aided Engineering Drawing / K Balaveerareddy et al-CBS publishers
6. Engineering Graphics and Design by Kaushik Kumar / Apurbakumar Roy / Chikesh Ranjan



GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY

## APPLIED PHYSICS LAB

Course Code: GR18A1011

L/T/P/C : 0/0/3/1.5

### Course Objectives:

- Compare and tabulate the characteristics of Solar cells, LED and Laser sources.
- Analyze the behavior of semiconductors in various aspects.
- Apply the theoretical concepts of optical fibers in practical applications.
- Recall the basic concepts of LCR and RC circuits through hands on experience.
- Analyze the behavioral aspects of electric and magnetic fields.

### Course Outcomes:

- Compare the behavior of p-n junction diode, Solar cells and LED.
- Analyze the behavior of magnetic and electric fields with the help of graphs.
- Determine the work function of a material through photoelectric effect.
- Asses the characteristics of Lasers and infer the losses in optical fibers.
- Estimate the time constant of RC circuit and resonance phenomenon in LCR circuit.

**TASK 1.** Energy gap of P-N junction diode: To determine the energy gap of a semiconductor diode.

**TASK 2.** Solar Cell: To study the V-I Characteristics of solar cell.

**TASK 3.** Light emitting diode: Plot V-I and P-I characteristics of light emitting diode.

**TASK 4.** Stewart – Gee’s experiment: Determination of magnetic field along the axis of a current carrying coil.

**TASK 5.** Hall effect: To determine Hall co-efficient of a given semiconductor.

**TASK 6.** Photoelectric effect: To determine work function of a given material.

**TASK 7.** LASER: To study the characteristics of LASER sources.

**TASK 8.** Optical fiber: To determine the bending losses of Optical fibers.

**TASK 9.** LCR Circuit: To determine the Quality factor of LCR Circuit.

**TASK 10.** R-C Circuit: To determine the time constant of R-C circuit.

**Note: Any 8 experiments are to be performed**



**GOKARAJU RANGARAJU INSTITUTE OF ENGINEERING AND TECHNOLOGY**

**PROGRAMMING FOR PROBLEM SOLVING LAB**

**Course Code: GR18A1015**

**L/T/P/C: 0/0/3/1.5**

**Prerequisite:** Basic operations of computer and knowledge of mathematics

**Laboratory Objectives:** The students will learn the following:

- To work with an IDE to create, edit, compile, run and debug programs
- To analyze the various steps in program development.
- To develop programs to solve basic problems by understanding basic concepts in C like operators, control statements etc.
- To develop modular, reusable and readable C Programs using the concepts like functions, arrays etc.
- To Write programs using the Dynamic Memory Allocation concept and to create, read from and write to text and binary files.

**Laboratory Outcomes** The candidate is expected to be able to:

- formulate the algorithms for simple problems and translate given algorithms to a working and correct program.
- correct syntax errors as reported by the compilers
- identify and correct logical errors encountered during execution
- represent and manipulate data with arrays, strings and structures and use pointers of different types
- create, read and write to and from simple text and binary files and modularize the code with functions so that they can be reused

**Task 1: (Practice sessions)**

- a. Write a simple program that prints the results of all the operators available in C (including pre/ post increment , bitwise and/or/not , etc.). Read required operand values from standard input.
- b. Write a simple program that converts one given data type to another using auto conversion and casting. Take the values form standard input.

**Task 2: (Simple numeric problems)**

- a. Write a program for fiend the max and min from the three numbers.
- b. Write the program for the simple, compound interest.
- c. Write program that declares Class awarded for a given percentage of marks, where mark <40%= Failed, 40% to <60% = Second class, 60% to <70%=First class, >= 70% = Distinction. Read percentage from standard input.

**Task 3: (Simple numeric problems)**

- a. Write a program that prints a multiplication table for a given number and the number of rows in the table. For example, for a number 5 and rows = 3, the output should be:
  - i.  $5 \times 1 = 5$
  - ii.  $5 \times 2 = 10$
  - iii.  $5 \times 3 = 15$
- b. Write a program that shows the binary equivalent of a given positive number between 0 to 255.

**Task 4: (Expression Evaluation)**

- a. A building has 10 floors with a floor height of 3 meters each. A ball is dropped from the top of the building. Find the time taken by the ball to reach each floor. (Use the formula  $s = ut + (1/2)at^2$  where  $u$  and  $a$  are the initial velocity in m/sec ( $= 0$ ) and acceleration in  $m/sec^2$  ( $= 9.8 m/s^2$ )).
- b. 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)
- c. Write a program that finds if a given number is a prime number

**Task 5: (Expression Evaluation)**

- a. Write a C program to find the sum of individual digits of a positive integer and test given number is palindrome.
- b. A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first  $n$  terms of the sequence.
- c. Write a C program to generate all the prime numbers between 1 and  $n$ , where  $n$  is a value supplied by the user.

**Task 6: (Expression Evaluation)**

- a. Write a C program to find the roots of a Quadratic equation.
- b. Write a C program to calculate the following, where  $x$  is a fractional value.  

$$1 - \frac{x}{2} + \frac{x^2}{4} - \frac{x^3}{6}$$
- c. Write a C program to read in two numbers,  $x$  and  $n$ , and then compute the sum of this geometric progression:  $1 + x + x^2 + x^3 + \dots + x^n$ . For example: if  $n$  is 3 and  $x$  is 5, then the program computes  $1 + 5 + 25 + 125$ .

**Task 7: (Arrays and Pointers and Functions)**

- a. Write a C program to find the minimum, maximum and average in an array of integers.
- b. Write a functions to compute mean, variance, Standard Deviation, sorting of  $n$  elements in single dimension array.
- c. Write a C program that uses functions to perform the following:
  - i. Addition of Two Matrices
  - ii. Multiplication of Two Matrices
  - iii. Transpose of a matrix
 with memory dynamically allocated for the new matrix as row and column counts may not be same.

**Task 8: (Arrays and Pointers and Functions)**

- a. Write C programs that use both recursive and non-recursive functions
  - i. To find the factorial of a given integer.
  - ii. To find the GCD (greatest common divisor) of two given integers.
  - iii. To find  $x^n$
- b. Write a program for reading elements using pointer into array and display the values using array.
- c. Write a program for display values reverse order from array using pointer.
- d. Write a program through pointer variable to sum of  $n$  elements from array.

**Task 9: (Files)**

- Write a C program to display the contents of a file to standard output device.
- Write a C program which copies one file to another, replacing all lowercase characters with their uppercase equivalents.
- Write a C program to count the number of times a character occurs in a text file. The file name and the character are supplied as command line arguments.

**Task 10: (Files)**

- Write a C program that does the following: It should first create a binary file and store 10 integers, where the file name and 10 values are given in the command line. (hint: convert the strings using atoi function) Now the program asks for an index and a value from the user and the value at that index should be changed to the new value in the file. (hint: use fseek function). The program should then read all 10 values and print them back.
- 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).

**Task 11: (Strings)**

- Write a C program to convert a Roman numeral ranging from I to L to its decimal equivalent.
- Write a C program that converts a number ranging from 1 to 50 to Roman equivalent
- Write a C program that uses functions to perform the following operations:
  - To insert a sub-string in to a given main string from a given position.
  - To delete n Characters from a given position in a given string.

**Task 12: (Strings)**

- 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.)
- Write a C program that displays the position of a character ch in the string S or - 1 if S doesn't contain ch.
- Write a C program to count the lines, words and characters in a given text.

**Task 13: (Miscellaneous)**

- Write a menu driven C program that allows a user to enter n numbers and then choose between finding the smallest, largest, sum, or average. The menu and all the choices are to be functions. Use a switch statement to determine what action to take. Display an error message if an invalid choice is entered.
- Write a C program to construct a pyramid of numbers as follows:

```

1      *      1      1      *
1 2    **    2 3    2 2    **
1 2 3  ***  4 5 6    3 3 3  ***
4 4 4 4   **
          *

```

**Task 14: (Sorting and Searching)**

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

**Task 15: (Sorting and Searching)**

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

**Text/ Reference 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, Cengage Learning, (3<sup>rd</sup> Edition)
3. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
4. R.G. Dromey, How to solve it by Computer, Pearson (16<sup>th</sup> Impression)
5. Programming in C, Stephen G. Kochan, Fourth Edition, Pearson Education.
6. Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4<sup>th</sup> Edition