



MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)

Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act, 1956

B. Tech - Mechanical Engineering

1st Year (R24) Course Structure and Syllabus

Applicable From 2024-25 Admitted Batch

I SEMESTER

| S. No. | Course Code | Course Title | Course Area | Hours Per Week | | | Credits | Scheme of Examination Maximum Marks | | |
|----------------------|-------------|--|-------------|----------------|----------|-----------|-----------|-------------------------------------|----------------|------------|
| | | | | L | T | P | | Internal (CIA) | External (SEE) | Total |
| | | Theory | | | | | | | | |
| 1 | 2410001 | Matrices and Calculus | BS | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 2 | 2410008 | Applied Physics | BS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 2410501 | Problem Solving using C and C++ | ES | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 2410010 | English for Skill Enhancement | HS MC | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| | | Laboratory | | | | | | | | |
| 1 | 2410372 | Engineering Workshop | ES | 0 | 1 | 4 | 3 | 40 | 60 | 100 |
| 2 | 2410071 | Applied Physics Laboratory | BS | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 3 | 2410571 | Problem Solving Using C and C++ Laboratory | ES | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 4 | 2410073 | English Language and Communication Skills Laboratory | HSMC | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| | | Skill Development Course | | | | | | | | |
| 1 | 2410596 | Web Application Development | SDC | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| | | Mandatory Course | | | | | | | | |
| 1 | | Foreign Language | *MC | 0 | 0 | 0 | 0 | - | - | - |
| | | Induction Programme | - | - | - | - | - | - | - | - |
| Total Credits | | | | 12 | 2 | 12 | 20 | 360 | 540 | 900 |

*MC - Satisfied/Unsatisfied

Students can choose any one of the foreign language from the given list

- i) 24X0FL1 French
- ii) 24X0FL2 German
- iii) 24X0FL3 Spanish
- iv) 24X0FL4 Korean

II SEMESTER

| S. No. | Course Code | Course Title | Course Area | Hours Per Week | | | Credits | Scheme of Examination Maximum Marks | | |
|----------------------|-------------|---|-------------|----------------|----------|-----------|-----------|-------------------------------------|----------------|------------|
| | | | | L | T | P | | Internal (CIA) | External (SEE) | Total |
| | | Theory | | | | | | | | |
| 1 | 2420002 | Differential Equations and Vector Calculus | BS | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 2 | 2420009 | Engineering Chemistry | BS | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 3 | 2420321 | Applied Mechanics | ES | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 4 | 2420502 | Essentials of Problem Solving using Python | ES | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| | | Laboratory | | | | | | | | |
| 1 | 2420371 | Computer Aided Engineering Graphics | ES | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| 2 | 2420072 | Engineering Chemistry Laboratory | BS | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 3 | 2420373 | Fuels& lubricants Laboratory | ES | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| 4 | 2420572 | Essentials of Problem Solving Using Python Laboratory | ES | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| | | Skill Development Course | | | | | | | | |
| 1 | 2420027 | Public Speaking Skills | SDC | 0 | 0 | 2 | 1 | 40 | 60 | 100 |
| | | Mandatory Course | | | | | | | | |
| 1 | 2420026 | Yoga & Inner Engineering | *MC | 0 | 0 | 0 | 0 | - | - | - |
| Total Credits | | | | 13 | 1 | 12 | 20 | 360 | 540 | 900 |

***MC - Satisfied/Unsatisfied**

I-I

2410001: MATRICES AND CALCULUS (CSE, CSD, CSM, ECE, EEE, MECH, CIVIL)

B.Tech. I Year I Sem

L T P C

3 1 0 4

Course Overview:

Matrix algebra and calculus are essential for understanding and solving complex problems in many scientific and engineering fields. This course provides the mathematical foundation for advanced topics and applications. This course covers matrix theory, linear algebra and calculus. Linear algebra is a branch of mathematics that studies system of linear equations and the properties of matrices. The calculus part of the course typically covers differential and its applications, and integration techniques. Matrix algebra allows us to think of a matrix holistically, generalize and compute derivatives important matrix factorizations, understand how differentiation formulas must be reimaged in large scale computing. Calculus is used to model and solve real- world problems.

Pre-requisites: Mathematics courses of 10+2 year of study.

Course Objectives: The student will try to learn

- Types of matrices and their properties, concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of eigen values, eigenvectors and reduction of quadratic form to canonical form by orthogonal transformation.
- Geometrical approach to the mean value theorems and their application to the mathematical problems. Evaluation of improper integrals using Beta and Gamma functions.
- Partial differentiation, concept of total derivative and finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications.

Course outcomes: After successful completion of the course, students should be able to

CO1: Write the matrix representation of a set of linear equations and to analyses the solution of the system of equations.

CO2: Find the Eigen values and Eigenvectors and reduce the quadratic form to canonical form using orthogonal transformations.

CO3: Solve the applications on mean value theorems and evaluate improper integrals using Beta and Gamma functions.

CO4: Find the extreme values of functions of two variables with/ without constraints.

CO5: Evaluate the multiple integrals and apply the concept to find areas, volumes.

UNIT-I: Matrices

10 L

Rank of a matrix by Echelon form and Normal form, Inverse of Non-singular matrices by Gauss-Jordan method, System of linear equations: Solving system of Homogeneous and Non-Homogeneous equations, L-U decomposition method.

UNIT-II: Eigen values and Eigenvectors

10 L

Eigen values, Eigen vectors and their properties (without proof), Diagonalization of a matrix, Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-

Hamilton Theorem, Quadratic forms and Nature of the Quadratic Forms, Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

UNIT-III: Calculus

8 L

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 (without proofs).

Beta and Gamma functions and their applications (properties without proof).

UNIT-IV: Multivariable Calculus (Partial Differentiation and applications)

10 L

Partial Differentiation: Euler's Theorem, Total derivative, Jacobian, Functional dependence-

independence. Applications: Maxima and minima of functions of two variables and three variables using method of Lagrange multipliers.

UNIT-V: Multivariable Calculus (Integration)

10 L

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

Applications: Areas (by double integrals) and volumes (by triple integral).

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

2420008: APPLIED PHYSICS

B.Tech. I Year II. Sem.

L T P C

3 1 0 4

Course Overview

Applied Physics is the application of the Physics to solve Scientific or Engineering Problems. It is considered as bridge between Physics and Engineering.

Applied Physics under graduate program stress the basic Physics that underlies most developments in engineering and mathematical tools that are important to engineers.

Prerequisites: 10 + 2 Physics

Course Objectives: The student will try to learn :

1. Understand the basic principles of quantum physics and band theory of solids.
2. Understand the underlying mechanism involved in construction and working principles of various semiconductor devices.
2. Study the fundamental concepts related to the dielectric, magnetic materials.
3. Identify the importance of nanoscale, quantum confinement and various fabrications techniques.
5. Study the characteristics of lasers and optical fibers.

Course Outcomes: After successful completion of the Course the students should be able to

1. Understand physical world from fundamental point of view by the concepts of Quantum mechanics and visualize the difference between conductor, semiconductor, and an insulator by classification of solids.
2. Identify the role of semiconductor devices in science and engineering Applications.
3. Explore the fundamental properties of dielectric, magnetic materials and their applications.
4. Appreciate the features and applications of Nano materials.
5. Understand various aspects of Lasers and Optical fiber and their applications in diverse fields.

UNIT - I: QUANTUM PHYSICS AND SOLIDS

Quantum Mechanics: Introduction to quantum physics, Blackbody radiation, Photoelectric effect, de-Broglie Hypothesis and matter waves, Davisson and Germer experiment, Heisenberg uncertainty principle, Born interpretation of the wave function, Time independent Schrodinger wave equation, Particle in one dimensional potential box.

Solids: Free electron theory (Drude & Lorentz, Sommerfeld), Bloch's theorem -Kronig-Penney model, Effective mass of electron, Origin of energy bands, Classification of solids.

UNIT - II: SEMICONDUCTORS AND DEVICES

Intrinsic and extrinsic semiconductors, Hall effect, Direct and Indirect band gap semiconductors, Construction, principle of operation and characteristics of P-N Junction diode, Zener diode and Bipolar junction transistor (BJT)

Opto-devices- Light emitting diode (LED), PIN diode, and Solar cell, their structure, materials, working principle and characteristics, Solar cell application- Space craft.

UNIT - III: DIELECTRIC AND MAGNETIC MATERIALS

Dielectric Materials: Introduction to dielectrics, Polarization, Permittivity, Dielectric constant, Types of polarizations (Qualitative), Internal field in Solids, Clausius-Mossotti equation, Ferroelectric, Piezoelectric and Pyroelectric materials, Applications.

Magnetic Materials: Introduction to Magnetism, Magnetization, Permeability, Susceptibility, Classification of Magnetic Materials, Hysteresis curve, Soft and Hard magnetic materials, Magnetostriction, Magneto resistance, Magnetic field sensors and bubble memory devices.

UNIT - IV: NANOTECHNOLOGY

Nanoscale, Quantum confinement, Surface to volume ratio, Bottom-up fabrication: Sol-gel, Precipitation methods, Top-down fabrication: Ball milling, Physical Vapor Deposition (PVD), Characterization techniques - XRD, SEM and TEM, Applications of nanomaterials.

UNIT - V: LASER AND FIBER OPTICS

Lasers: Laser beam characteristics-three quantum processes-Einstein coefficients and their relations, Lasing action, Population inversion, Pumping methods, Ruby laser, He-Ne laser, CO₂ laser, Applications of laser- Medical and Military.

Fiber Optics: Introduction to optical fiber, Total internal reflection, Construction of optical fiber, Acceptance angle, Numerical aperture, Classification of optical fibers, Losses in optical fiber, Optical fiber for communication system, Applications of optical fiber-Endoscopy.

TEXT BOOKS:

1. M. N. Avadhanulu, P.G. Kshirsagar & TVS Arun Murthy "A Text book of Engineering Physics", S. Chand Publications, 11th Edition 2019.
2. Engineering Physics by Shatendra Sharma and Jyotsna Sharma, Pearson Publication, 2019
3. Semiconductor Physics and Devices- Basic Principle – Donald A. Neamen, McGraw Hill, 4th Edition, 2021.
4. B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning, 2nd Edition, 2022.
5. Essentials of Nanoscience & Nanotechnology by Narasimha Reddy Katta, Typical Creatives NANO DIGEST, 1st Edition, 2021.

REFERENCE BOOKS:

1. Quantum Physics, H.C. Verma, TBS Publication, 2nd Edition 2012.
2. Fundamentals of Physics – Halliday, Resnick and Walker, John Wiley & Sons, 11th Edition, 2018.
3. Introduction to Solid State Physics, Charles Kittel, Wiley Eastern, 2019.
4. Elementary Solid State Physics, S.L. Gupta and V. Kumar, Pragathi Prakashan, 2019.
5. A.K. Bhandhopadhyaya - Nano Materials, New Age International, 1st Edition, 2007.

24X0501:Problem Solving Using C and C++

IB.Tech.I–Sem.

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

Course Overview:

The Course Provides good foundation in procedural oriented and object-oriented programming concepts. It provides overview on basic building blocks of procedural oriented concepts like arrays, pointers, structures, strings. It comprises object-oriented concepts such as information hiding, encapsulation, inheritance and polymorphism. C programming is used in operating systems, embedded devices, OS kernels, drivers, IoT applications. C++ is widely used for creating graphics-heavy software, game engines, VR applications, and web browsers.

Prerequisites: Nil

Course Objectives: The students will try to learn

- Using of structured programming approach in solving problems
- How to use arrays ,pointers, strings and structures in solving problems
- Defining of structures in C and classes in C++
- Importance of inheritance in object-oriented programming
- Handling of exceptions in programs

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

- Develop programs using Control statements and Repetitive statements
- Modularize the code with functions so that they can be reused
- Learn about Object oriented concepts
- Design programs by using Inheritance concepts
- Implement polymorphism and Exception Handling

Module-I:Introductiontoprogramming

[10]

Introduction Procedure Oriented and Object-Oriented Programming. Algorithm, Flowchart, Pseudo code. Creating and Running of C Program. Structure of C program – C character set, C Tokens: Constants, Variables, Keywords, Identifiers, C data types, C operators. Standard I/O in C (scanf, printf), Conditional Control statements (if and Switch) Statements. Repetitive statements: While, Do While and For Loops - Use of Break and Continue Statements.

Module-II: Functions, Arrays, Strings and Pointers

[12]

Arrays:Introduction,Declaration,CreatingandAccessingofOne-Dimensional Arrays, Two- Dimensional Arrays.

StringsandPointers:Introductiontostrings,stringhandlingfunctions,Arraysof strings, Introduction to pointers, Dynamic Memory allocation.

Functions: Defining Functions – User Defined Functions, Storage Classes, passing parameters:CallByValue,CallByReference,Recursion,Command-lineArguments.

Module-III: Structures and Classes

[8]

Structures: Defining structures, initializing structures, unions, Array of structures
OOPS Concepts: Class, Object, Abstraction, Encapsulation, Inheritance and Polymorphism.

C++ Classes and Data Abstraction: Class definition, Class structure, Class objects, Class scope, this pointer, Friends to a class, Static class members, Constant member functions, Constructors and Destructors, Dynamic creation and destruction of objects, Data abstraction.

Module-IV: Inheritance

[7]

Inheritance: Defining a class hierarchy, Different forms of inheritance, Defining the Base and Derived classes, Access to the base class members, Base and Derived class construction, Destructors, Virtual base class.

Module-V: Polymorphism and ExceptionHandling

[8]

Virtual Functions and Polymorphism: Static and Dynamic binding, virtual functions, Dynamic binding through virtual functions, Virtual function call mechanism, Pure virtual functions, Abstract classes, Implications of polymorphic use of classes, Virtual destructors.

Exception handling: Try, throw and catch.

TEXTBOOKS:

1. Forouzan B.A&RichardF.Gilberg,AStructuredProgrammingApproach using C,3rd Edition(2013), Cengage Learning.
2. Jeri R. Hanly and Elliot B.Koffman, Problem solving and Program Designin C 7th Edition,Pearson
3. ANSlandTurboC++byAshokeN.Kamthane,PearsonEducation
4. RobertLaforeC++

REFERENCES:

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India
2. E.Balagurusamy,ComputerfundamentalsandC,2ndEdition,McGraw-Hill
3. YashavantKanetkar,LetUsC,18thEdition,BPB
4. E.Balagurusamy, Object Oriented Programming using C++,2ndEdition, McGraw-Hill

24X0010: ENGLISH FOR SKILL ENHANCEMENT

B.Tech. I Year. I Sem.

L T P C

3 0 0 3

Course Overview:

1. The English language plays a vital role in engineering education. Acquiring LSRW skills has become a prerequisite to learning about different technologies and their intricacies.
2. All these extracts are fascinating, thought-provoking, and contextual to engineering students. The authors have sincerely tried connecting every lesson with the modules of vocabulary, grammar, reading comprehension and writing tasks stipulated under each module. The textbook includes several exercises and activities involving the student's language skills practice. They are extremely encouraging and motivational and cater to a group of students with mixed abilities.
3. Each module starts with the preparatory task which can stimulate an interesting discussion among the students in the classroom. Adequate explanations and more examples are provided in vocabulary and grammar sections to enable students to work independently in and outside the classroom. The reading part suggests improving students' reading skills and provides reading comprehension exercises. The writing module aims at developing the learner's writing skills by providing conceptual discussions and exercises in different forms of written communication such as formal letters, CV/ résumé and job application letters, e-mails, reports, etc.

Prerequisites: Language Comprehension

Course Objectives: The students will try to learn:

1. Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
2. Develop study skills and communication skills in various professional situations.
3. Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

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

1. Understand the importance of vocabulary and sentence structures.

2. Choose appropriate vocabulary and sentence structures for their oral and written communication.
3. Demonstrate their understanding of the rules of functional grammar.
4. Develop comprehension skills from the known and unknown passages.
5. Take an active part in drafting paragraphs, letters, essays, abstracts, précis and reports in various contexts.

MODULE – I (No of Hours = 7)

Chapter entitled ‘*Toasted English*’ by R.K. Narayan from “*English: Language, Context and Culture*” published by Orient BlackSwan, Hyderabad.

Vocabulary: The Concept of Word Formation -The Use of Prefixes and Suffixes - Acquaintance with Prefixes and Suffixes from Foreign Languages to Form Derivatives - Synonyms and Antonyms

Grammar: Identifying Common Errors in Writing concerning Articles and Prepositions.

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

Writing: 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.

MODULE – II (No of Hours = 6)

Chapter entitled ‘*Appro JRD*’ by Sudha Murthy from “*English: Language, Context and Culture*” published by Orient BlackSwan, Hyderabad.

Vocabulary: Words Often Misspelt - Homophones, Homonyms and Homographs

Grammar: Identifying Common Errors in Writing concerning Noun-pronoun Agreement and Subject-verb Agreement.

Reading: Sub-Skills of Reading – Skimming and Scanning – Exercises for Practice

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

MODULE – III (No of Hours = 7)

The chapter entitled ‘*Lessons from Online Learning*’ by F.Haider Alvi, Deborah Hurst et al from

“*English: Language, Context and Culture*” published by Orient BlackSwan,

Hyderabad. **Vocabulary:** Words Often Confused - Words from Foreign Languages and their Use in English. **Grammar:** Identifying Common Errors in Writing Concerning Misplaced Modifiers and Tenses.

Reading: Sub-Skills of Reading – Intensive Reading and Extensive Reading – Exercises for Practice **Writing:** Format of a Formal Letter-Writing Formal Letters E.g., Letter of Complaint, Letter of Requisition, Email Etiquette, Job Application with CV/Resume.

MODULE – IV (No of Hours = 6)

Chapter entitled ‘**Art and Literature**’ by **Abdul Kalam** from “*English: Language, Context and Culture*” published by Orient BlackSwan, Hyderabad.

Vocabulary: Standard Abbreviations in English

Grammar: Redundancies and Clichés in Oral and Written Communication.

Reading: Survey, Question, Read, Recite and Review (SQ3R Method) - Exercises for Practice

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

MODULE – V (No of Hours = 6)

Chapter entitled ‘**Go, Kiss the World**’ by **Subroto Bagchi** from “*English: Language, Context and Culture*” published by Orient BlackSwan, Hyderabad.

Vocabulary: Technical Vocabulary and their Usage

Grammar: Common Errors in English (*Covering all the other aspects of grammar which were not covered in the previous modules*)

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.

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

- **Note:** 1. 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 **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.

- **Note: 2.** Based on the recommendations of NEP2020, teachers are requested to be flexible in adopting Blended Learning in dealing with the course contents. They are advised to teach 40 per cent of each topic from the syllabus in blended mode.

TEXTBOOK:

1. “English: Language, Context and Culture” by Orient BlackSwan Pvt. Ltd, Hyderabad. 2022. Print.

REFERENCE BOOKS:

1. Effective Academic Writing by Liss and Davis (OUP)
2. Richards, Jack C. (2022) Interchange Series. Introduction, 1,2,3. Cambridge University Press
3. Wood, F.T. (2007). Remedial English Grammar. Macmillan.
4. Chaudhuri, Santanu Sinha. (2018). Learn English: A Fun Book of Functional Language, Grammar, and Vocabulary. (2nd ed.,). Sage Publications India Pvt. Ltd.
5. (2019). Technical Communication. Wiley India Pvt. Ltd.
6. Vishwamohan, Aysha. (2013). English for Technical Communication for Engineering Students. Mc Graw-Hill Education India Pvt. Ltd.
7. Swan, Michael. (2016). Practical English Usage. Oxford University Press. Fourth Edition.

24X0372: ENGINEERING WORK SHOP

(Common to all branches)

B.Tech.I Year.I Semester

| L | T | P | C |
|---|---|---|---|
| 0 | 1 | 4 | 3 |

Course Overview: After successful completion of the course, students should able to learn.

Engineering Workshops: A foundational course aimed at introducing first-year students to a variety of tools, equipment, and techniques essential for creating physical objects and mechanisms using different materials. This course provides an opportunity for students to build confidence and gain practical experience in carpentry, fitting, house wiring, tin-smithy, black smithy, welding, and principles of modern manufacturing processes.

Prerequisite: NIL

Course Objective: The student will able to

1. To gain good basic working knowledge required for the production of various engineering products.
2. To study different tools uses and their demonstration.
3. To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in engineering field.
4. To develop a right attitude, team working, precision and safety at work place.
5. It explains the construction, function use and application different working tools and equipments.

Course outcomes: At the end of the course students should able to

1. Explain the design and model different prototype in the trade of carpentry such as Cross lap joint, Dove tail joint.
2. Demonstrate the design and model various basic prototypes in the trade of fitting such as straight fit and V-fit.
3. Understand to make various basic prototypes in the trade of tin smithy such as rectangular tray and open cylinder.
4. Demonstrate the design and model various basic prototype in welding and black smithy.
5. Understand to perform various basic house wiring techniques such as connecting one lamp with one switch, connecting two lamps with one switch.

Course content:

Module -I: CARPENTRY AND FITTING

- Carpentry – Introduction, Carpentry tools, sequence of operations and applications (T-Lap Joint, Dovetail Joint, Mortise & Tenon Joint)
- Fitting – Introduction, fitting tools, sequence of operations and applications (V-Fit, Dovetail Fit & Semi-circular fit)

Module -II: TIN SMITHY AND BLACKSMITHY

- Tin-Smithy – Introduction, Tin smithy tools, sequence of operations and applications (Square Tin, Rectangular Tray & Conical Funnel).
- Blacksmithy- Introduction, Blacksmithy tools, sequence of operations and applications (Round to Square, Fan Hook and S-Hook)

Module -III: HOUSE WIRING AND WELDING

- House-wiring – Introduction, Electrical wiring tools, sequence of Operations and applications (Parallel & Series, Two-way Switch and Tube Light)
- Welding Practice – Introduction, electrode, welding tools, and sequence of Operations. Advantages and applications (Arc Welding).

Text Book:

1. Workshop practice/B.L. Juneja/ Cengage
2. Workshop manual/K.Venugopal/ Anuradha

Reference:

1. Work shop manual /P.Kannaiah/K.L. Narayana
2. Work shop Manual /Venkat Reddy /BSP

24X00071: APPLIED PHYSICS LAB

B.Tech. I Year I Sem.

| | | | |
|----------|----------|----------|------------|
| L | T | P | C |
| 0 | 0 | 3 | 1.5 |

Course Objectives: The objectives of this course for the student to

1. Capable of handling instruments related to the Hall effect and photoelectric effect
Experiment understands their measurements.
2. Understand the characteristics of various devices such as PN junction diode, Zener diode, BJT, LED, solar cell, lasers and optical fiber and measurement of energy gap.
3. Apply the analytical techniques & graphical analysis for Stewart Gees , LCR & RC .
4. Understanding the method of least squares fitting.
5. To develop intellectual communication skills through discussion on basic principles of scientific concepts in a group.

Course Outcomes: The students will be able to:

1. Know the determination of the Planck's constant using Photo electric effect and identify the material whether it is n-type or p-type by Hall experiment.
2. Appreciate quantum physics in semiconductor devices and optoelectronics.
3. Gain the knowledge in calculating the quality factor and time constant of LCR and RC circuits.
4. Understand the variation of magnetic field at various points.
5. Carried out data analysis.

LIST OF EXPERIMENTS:

1. Determination of work function and Planck's constant using photoelectric effect.
2. Determination of Hall co-efficient and carrier concentration of a given semiconductor.
3. Characteristics of series and parallel LCR circuits.
4. V-I characteristics of a p-n junction diode and Zener diode.
5. Input and output characteristics of BJT (CE, CB & CC configurations).
6. V-I and L-I characteristics of light emitting diode (LED) and LASER.
7. V-I Characteristics of solar cell.
8. Determination of Energy gap of a semiconductor.
9. To determine the time constant of R-C circuit.
10. Determination of Acceptance Angle and Numerical Aperture of an optical fiber.
11. Understanding the method of least squares – Torsional pendulum as an example.
12. Determination of magnetic field induction along the axis of a current carrying coil.

REFERENCE BOOK:

1. S. Balasubramanian, M.N. Srinivasan "A Text book of Practical Physics"- S Chand Publishers,2017.

24X0571: Problem Solving Using C and C++ Laboratory

B.Tech. I Year. I Sem

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

Course Overview:

The Course Provides good foundation in procedural oriented and object-oriented programming concepts. It provides overview on basic building blocks of procedural oriented concepts like arrays, pointers, structures, strings. It comprises object-oriented concepts such as information hiding, encapsulation, inheritance and polymorphism. C programming is used in operating systems, embedded devices, OS kernels, drivers, IoT applications. C++ is widely used for creating graphics-heavy software, game engines, VR applications, and web browsers.

Prerequisites: Nil

Course Objectives: The students will try to learn

- Using of structured programming approach in solving problems
- How to use arrays, pointers, strings and structures in solving problems
- Defining of structures in C and classes in C++
- Importance of inheritance in object-oriented programming
- Handling of exceptions in programs

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

- Develop programs using Control statements and Repetitive statements
- Modularize the code with functions so that they can be reused
- Learn about Object oriented concepts
- Design programs by using Inheritance concepts
- Implement polymorphism and Exception Handling

Week1: Algorithm and Flowchart

1. You are designing a flowchart and algorithm for a distance and speed calculator. The flowchart should prompt the user to input the distance traveled and the time taken and calculate the speed using the formula: **Speed = Distance / Time**.
2. You are developing an algorithm and flow chart for a circle area calculator. The flowchart should prompt the user to input the radius of a circle and calculate the area using the formula: **Area = πr^2**
3. You are designing an algorithm and flowchart for a fuel efficiency calculator in a car rental app. The flowchart should prompt the user to input the distance traveled and the amount of fuel consumed and calculate the fuel efficiency in miles per gallon (MPG) using the formula **MPG = Distance / Fuel Consumption**.
4. You are developing an algorithm and flowchart for a discount calculator in an online shopping app. The flowchart should prompt the user to input the original price and the discount percentage and calculate the discounted price using the formula: **Discounted Price = Original Price - (Original Price * Discount Percentage / 100)**.

5. You are developing a flowchart and algorithm for a monthly budget tracker. The flowchart should prompt the user to input their income and expenses and calculate the total savings using the formula **Total Savings = Income - Total Expenses**.
6. You are designing a flowchart for a loan amortization calculator. The flowchart should prompt the user to input the loan amount, interest rate, and duration, and calculate the monthly payment using the formula $\text{Monthly Payment} = (\text{Loan Amount} * \text{Interest Rate} * (1 + \text{Interest Rate})^{\text{Duration}}) / ((1 + \text{Interest Rate})^{\text{Duration}} - 1)$.
7. You are developing a flowchart and algorithm for a construction materials calculator. The Flow chart should guide the user through the process of inputting the dimensions of a room, including the length, width, and height. The goal is to calculate the surface area of the room using the provided formula:
 $\text{Surface Area} = 2 * (\text{Length} * \text{Width} + \text{Length} * \text{Height} + \text{Width} * \text{Height})$.
8. Develop a flowchart and an algorithm to convert a given time in hours and minutes to minutes only. Prompt the user to input the time in hours and minutes and display the converted time in minutes.

Skill Oriented Exercise

9. Farmer Thimmayya bought some mules at Rs. 50 each, sheep at Rs. 40 each, goats at Rs. 25 each, and pigs at Rs. 10 each. The average price of the animals per head worked to Rs. 30. What is the minimum number of animals of each kind did he buy?
10. **A Matter of Rupees and Paisa:** I have money pouch containing Rs. 700. There are equal number of 25 paise coins, 50 paise coins and 1 rupee coins. How many of each are there.
11. Develop an algorithm and flowchart that prompts the user to input the initial velocity, acceleration, and time. Calculate and display the final velocity using the formula $\text{Final Velocity} = \text{Initial Velocity} + (\text{Acceleration} * \text{Time})$.
12. Develop an algorithm and flowchart that prompts the user to input the lengths of the three sides of a triangle. Calculate and display the area of the triangle using Heron's formula: $\text{Area} = \sqrt{s * (s - \text{Side1}) * (s - \text{Side2}) * (s - \text{Side3})}$, where $s = (\text{Side1} + \text{Side2} + \text{Side3}) / 2$.

Week2: Algorithm and Flowchart

1. ABC Company wants to calculate the monthly salary for its employees based on various components such as basic pay, DA, HRA, and deductions for taxes and provident fund.
 The company follows the following rules for salary calculation:
 - The basic pay is a fixed amount each employee receives.
 - DA is calculated as 20 percentage of the basic pay.
 - HRA is calculated as 10 percentage of the basic pay.
 - The gross salary is the sum of the basic pay, DA, and HRA.
 - The net salary is the gross salary minus deductions for taxes and provident fund.
 Develop an algorithm and flow chart to calculate the gross and net salary of the employee. Include the necessary steps to calculate the net salary.
2. Sarah, a dedicated student, wants to calculate her average grade for a semester. She has received marks in four different subjects and seeks assistance in creating an algorithm to determine her average grade based on these marks. Develop an

algorithm and flowchart to help Sarah calculate her average grade for the semester using the marks obtained in these four subjects. Ensure that the algorithm includes the necessary steps to compute the average grade accurately.

3. John is a programmer who wants to convert a given temperature in Celsius to Fahrenheit. Help John in developing an algorithm and flowchart to perform this conversion. Design an algorithm for John to convert a given temperature in Celsius to Fahrenheit. Provide step-by-step instructions for performing the conversion.
4. **The Tall Men Next Door:** Next door to me live four brothers of different heights. Their average height is 74 inches, and the difference in height among the first three men is two inches. The difference between the third and the fourth man is six inches. Can you tell how tall each brother is?
5. **Driving Through the Country:** I decided to travel through the country leisurely and on the first day I did only 7 miles. On the last day I did 51 miles, increasing my journey by 4 miles per day. How many days did I travel and how far?
6. There is a beautiful pond in a park, filled with clear water. The park management wants to monitor the water level in the pond regularly to ensure it remains at an optimal level. They have asked you to create an algorithm to help them with this task. Develop an algorithm and flow chart to monitor the water level in the pond and notify the park management if it falls below a certain threshold. (Note: You can assume that the input for the current water level and threshold level is obtained from a monitoring device or sensor).
7. If a participant can make one submission every 45 seconds, and a contest lasts for Y minutes, create an algorithm and flowchart to find the maximum number of submissions that the participant can make during the contest? Assume the participant is allowed to make submissions until the last second of the contest.

Skill Oriented Exercise

8. Michael wants to find the largest number among a set of given numbers. Help Michael write an algorithm to determine the largest number from the given inputs. Create an algorithm and flowchart for Michael to find the largest number among a set of given inputs. Provide step-by-step instructions to identify the largest number.
9. A construction worker needs to paint the exterior walls of a rectangular building. The dimensions of the walls are L meters in length, H meters in height, and W meters in width. If the cost of painting is Rs. 20 per square meter, what will be the total cost of painting the walls? Prepare an algorithm and flowchart to calculate the total cost of painting.
10. An ice cream vendor brings 'i' litre of ice cream to a fair. Each cone requires 0.25 liters of ice cream. If the vendor sells 80 cones, Develop an algorithm and flowchart to find the number of liters of ice cream left with the vendor.
11. Amanda is planning a party and wants to determine the total number of guests attending. Assist Amanda by writing an algorithm to calculate the total number of guests based on the number of adults and children invited. Create an algorithm and flowchart for Amanda to calculate the total number of guests attending her

party, considering the number of adults and children invited. Include the necessary steps to calculate the total number of guests.

Week: 3 Data Types, Console I/O, Operators Storage Classes

1. You are working as a financial analyst at a bank. As part of your job, you need to calculate the maturity amount for fixed deposits (FD) based on the principal amount, interest rate, and duration. For that help me to write a C program that takes the principal amount, interest rate, and duration(in years)as input from the user. Calculate and display the maturity amount using the simple interest formula: $\text{Maturity Amount} = \text{Principal} + (\text{Principal} * \text{Interest Rate} * \text{Duration})$.
2. Jenny, a budding mathematician, was studying the concept of area and perimeter. She was given a rectangular garden with a known length and width. Jenny wondered if she could find the area without knowing the width. Can you help Jenny derive a formula to calculate the area of a rectangle using only the length and perimeter?
3. Develop a C program that computes the hypotenuse of a right-angled triangle given the lengths of its two perpendicular sides. Prompt the user to enter the lengths and display the result. (Pythagorean theorem: $\text{Hypotenuse}^2 = \text{Side1}^2 + \text{Side2}^2$)
4. Once upon a time, there was a mathematician named Alex. Alex loved solving mathematical problems and puzzles. One day, Alex came across an ancient scroll that contained a secret formula to calculate the sum of the first n natural numbers. The scroll mentioned that by using the formula, one could find the sum of any given number of natural numbers without having to manually add them up. Alex was intrigued and decided to test the formula. Can you help Alex implement a C program that uses the formula to calculate the sum of the first n natural numbers?

Instructions:

Write a C program that takes an input integer n from the user and calculates the sum of the first n natural numbers using the formula: $\text{sum} = (n * (n + 1)) / 2$

5. Once upon a time in a small town, there were two friends, Kavi and Jei, who were fascinated by the concept of slopes in mathematics. They loved exploring the hills and valleys around their town and wondered how they could calculate the slope of any given landscape. One sunny day, while hiking up a hill, Kavi and Jei discovered an ancient map that had the secret to finding the slope of a line between two points. The map indicated that by using the coordinates of two points, they could determine the slope of the line connecting them. Excited about their discovery, Kavi and Jei decided to create a C program that could calculate the slope for any two points. They wanted to share their program with others so that everyone could explore the slopes of various land scapes. Can you help Kavi and Jei bring their idea to life by implementing a C program that calculates the slope of a line?

Instructions:

Write a C program that prompts the user to enter the coordinates of two points:(x1,y1)and (x2, y2). The program should then

Calculate ,the slope of the line connecting these points using the formula: $\text{slope} = (y2 - y1) / (x2 - x1)$

Finally, the program should display the calculated slope to the user.

6. Ravi and Kavi are on an exciting treasure hunt adventure, following a map with hidden treasures located at different coordinates. They want to calculate the distance between two treasures to determine how far apart they are. Can you help them by writing a C program that performs this calculation?

Instructions:

Write a C program that prompts the user to enter the coordinates of two treasures: Treasure A and Treasure B. The coordinates should be in the form (x, y). Calculate the distance between the treasures using the distance formula:

distance = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Finally, output a message indicating how far apart the treasures are.

7. Imagine a scenario where there is a coconut tree with multiple coconuts hanging from it. There is a person standing at a distance of "D" meters away from the tree. The coconuts are positioned at a height of "H" meters from the ground. Could you please help write a C program that calculates the angle at which the person should aim in order to hit the coconuts? (Hint: you can use the inverse tangent function (atan() in C) to determine the angle based on the ratio of the height of the coconuts to the distance from the tree.)

Skill Oriented Exercise

8. In a faraway kingdom, two treasure hunters named Alex and Bella embarked on a daring quest to find valuable treasures. While exploring a mysterious cave, they stumbled upon two treasure chests, each containing a unique gemstone. Curiosity took over, and they decided to swap the gemstones inside the chests. However, a magical enchantment prevented them from directly swapping the gemstones. To fulfill their quest and restore the treasures to their rightful chests, Alex and Bella realized they could use a third variable and arithmetic operations. Can you help them by writing a C program that takes the values of the gemstones as input, and swap their values.
9. Emily, a young architect, was working on designing a cylindrical water tank for a new building. As she was finalizing the plans, she needed to calculate the surface area of the cylinder to determine the amount of material required for its construction. However, she was unsure of the exact formula and the steps involved in the calculation. Can you help Emily by writing a C program that assists her in calculating the surface area of a cylinder? (Surface Area = $2\pi r^2 + 2\pi rh$)
10. Hemanth is an architect who wants to design a garden with a beautiful polygon-shaped fountain at its center. He needs to calculate the area of the polygon so that he can determine the appropriate size for the fountain. Help Hemanth by writing a C program that calculates the area of a regular polygon when given the number of sides and the length of each side.

Area = $(\text{num Sides} * \text{side Length} * \text{side Length}) / (4 * \tan(\pi / \text{num Sides}))$

11. Prathima loves ice cream cones and wants to decorate the surface of her favorite ice cream cone with colorful stickers. To know how many stickers she needs, she wants to calculate the surface area of the cone. Help Prathima by writing a C program that calculates the surface area of a cone when given the radius of the base and the slant height, (Surface Area = $\pi * r * (r + l)$)

12. **RIGHT FOOT FORWARD:** A short man takes three steps to a tall man's two steps. They both start out on the left foot. How many steps do they have to take before they are both stepping out on the right foot together?

Week: 4DataTypes, Console I/O, Operators Storage Classes

PREDICTTHEOUTPUT:

1. #include<stdio.h> **Output:**

```
int main()
{
    inta=5;floatb=3.5;
    intresult=a+b;printf("%d\n",result);return0;
}
```
2. #include<stdio.h> **Output:**

```
intmain(){ inta=10;intb=20;
intresult=a*b/4%3;printf("%d\n",result);return0;
}
```
3. #include<stdio.h> **Output:**

```
intmain(){ inta=15;intb= 10;
intresult=(a>b)&&(b!=0);printf("%d\n", result); return0;
}
```
4. #include<stdio.h> **Output:**

```
intmain(){ inta=10;intb= 5;
intresult=(a>b)|| (a==10);printf("%d\n",result);
return0;
}
```
5. #include<stdio.h> **Output:**

```
int main(){
int x=3,y=2;
intresult=x*y-y/x%y;printf("%d\n", result);return 0;
}
```
6. #include<stdio.h>
Output:

```
intmain(){ intx=5;
int *ptr1 = &x;
int**ptr2=&ptr1;printf("%d\n",**ptr2);return0;
}
```
7. #include<stdio.h>
Output:

```
int main(){ intx=5;
int*ptr1,*ptr2;ptr1 =&x;
ptr2=ptr1;printf("%d\n",*ptr2);return0;
}
```
8. #include<stdio.h>
Output:

```
int main(){ intx=51;
int*ptr=&x; printf("%d\n",*ptr);x=15;
printf("%d\n",*ptr); return 0;
}
```

9.

```
intmain(){float*ptr;
printf("Sizeofptr:%lubytes\n",sizeof(ptr));return0;
}
```

#include<stdio.h>

Output:

10.

```
intmain(){doublearr[5];
printf("Sizeofarr:%lubytes\n",sizeof(arr));return0;
}
```

#include<stdio.h> **Output:**

11.

```
intmain(){
intx=10;if(x>5){
printf("Hello\n");
}
printf("Goodbye\n");return0;
}
```

#include<stdio.h> **Output:**

Skill Oriented Exercise

Find the syntax error, logical errors if any in the following code snippet:

1. #include<stdio.h>

Errors:

```
int main(){
printf("Hello,KLUFamily!\n")return0;
}
```

2. #Include<stdio.h>

Errors:

```
intmain(){
int x = 5, y= 0;
intresult=x/y;printf("Theresultis:%d\n",result);
return0;
}
```

3. #include<stdio.h>

Errors:

```
intmain(){intx=5;int*ptr;
*ptr=&x;printf("%d\n",*ptr);return0;
}
```

4. #include<stdio.h>

Errors:

```
intmain(){intx=-5;if(x){
printf("xisnotzero\n");
}else
{
printf("xiszero\n");
}
return0;
}
```

Week5:If else and Ternary Operator

1. Chef and Chefina are playing with dice. In one turn, both of them roll their dice at

once. They consider a turn to be good if the sum of the numbers on their dice is greater than

6. Given that in a particular turn Chef and Chefina got X and Y on their respective dice, find whether the turn was good.

2. Chef has been working hard to compete in MasterChef. He is ranked X out of all contestants. However, only 10 contestants would be selected for the finals. Check whether Chef made it to the top 10 or not?
3. Apple considers any iPhone with a battery health of 80% or above, to be in *optimal* condition. Given that your iPhone has $X\%$ battery health, find whether it is in *optimal* condition.
4. In a classic chase, Tom is running after Jerry as Jerry has eaten Tom's favorite food. Jerry is running at a speed of X metres per second while Tom is chasing him at a speed of Y metres per second. Determine whether Tom will be able to catch Jerry.
Note that initially Jerry is not at the same position as Tom.
5. Chef has started studying for the upcoming test. The textbook has N pages in total. Chef wants to read at most X pages a day for Y days. Find out whether it is possible for Chef to complete the whole book.
6. Chef has finally got the chance of his lifetime to drive in the $F1$ tournament. But, there is one problem. Chef did not know about the 107% rule and now he is worried whether he will be allowed to race in the main event or not.
Given the fastest finish time as X seconds and Chef's finish time as Y seconds, determine whether Chef will be allowed to race in the main event or not.
Note that, Chef will only be allowed to race if his finish time is within **107%** of the fastest finish time.

Skill Oriented Exercise

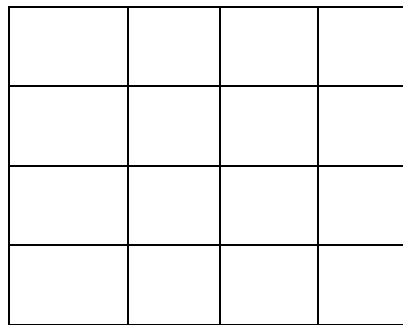
7. Chef wants to host a party with a total of N people. However, the party hall has a capacity of X people. Find whether Chef can host the party.
8. Chef has to attend an exam that starts in X minutes, but of course, watching shows takes priority. Every episode of the show that Chef is watching, is 24 minutes long. If he starts watching a new episode now, will he finish watching it **strictly before** the exam starts?
9. Chef has to travel to another place. For this, he can avail any one of two cab services.
 - The first cab service charges X rupees.
 - The second cab service charges Y rupees.Chef wants to spend the **minimum** amount of money. Which cab service should Chef take?
10. Chef categorizes an Instagram account as *spam*, if, the *following* count of the account is more than 10 times the count of *followers*.
Given the *following* and *follower* count of an account as X and Y respectively, find whether it is a *spam* account.
11. Chef is watching TV. The current volume of the TV is X . Pressing the volume up button of the

TV remote increases the volume by 11 while pressing the volume down button decreases the volume by 11. Chef wants to change the volume from X to Y . Find the minimum number of button presses required to do so.

12. Cities on a map are connected by a number of roads. The number of roads between each city is in an array and city 0 is the starting location. The number of roads from city 0 to city 1 is the first value in the array, from city 1 to city 2 in the second, and so on. How many paths are there from city 0 to the last city in the list, modulo 1234567?

13. Square within Square

Write a C program to determine the number of squares in the given illustration below



Week 6: Loops, Increment and Decrement operator

1. Sum of digits of five digit number.

Given the five digit number print the sum of its digits.

Input

10564

Output

16

2. Write a program that takes two integers as input, start and end. The program should use for loop to iterate from start to end (both inclusive).

3. Write a C program that takes the input for multiple test cases. For each test case, the program should receive two integers, E and K , representing the energy at the lowest trophic level and the energy reduction factor, respectively. The program should calculate and output the maximum length of the food chain for each test case.

4. Write a program in C that takes an integer, n , as input, representing the number of multiplication tables to be generated. The program should output the multiplication table for each number from 1 to n , up to a multiple of 10.

5. Alice, Bob, and Charlie have different preferences for numbers. Alice likes numbers that are even and multiples of 7, while Bob prefers numbers that are odd and multiples of 9. They have found a number, A , and the task is to determine who takes it home.

Write a program that takes an integer, A , as input and outputs the person who takes the number home based on their preferences. If A is an even multiple of 7, Alice takes it home. If A is an odd multiple of 9, Bob takes it home. If neither Alice nor Bob likes the number, Charlie takes it home.

6. Chef owns a car that can run 15 kilometers using 1 litre of petrol. He wants to attend a programming camp at DAICT, which is a distance of Y kilometers from his house. Chef

currently has X litres of petrol in his car. The task is to determine whether Chef can attend the event at DAICT and return to his home with the given amount of petrol. Write a program that takes two integers, X and Y , as input and outputs whether Chef can complete the round trip with the available petrol.

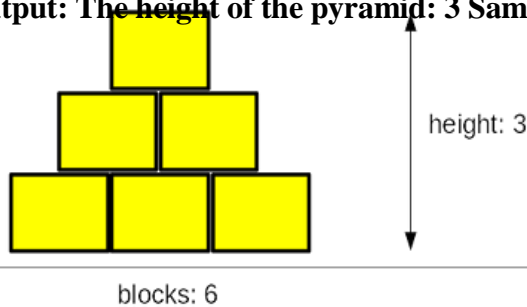
Skill Oriented Exercise

- Listen to this story: a boy and his father, a computer programmer, are playing with wooden blocks. They are building a pyramid. Their pyramid is a bit weird, as it is actually a pyramid-shaped wall - it's flat. The pyramid is stacked according to one simple principle: each lower layer contains one block more than the layer above. The figure illustrates the rule used by the builders:

Note: the height is measured by the number of fully completed layers –if the builders don't have a sufficient number of blocks and cannot complete the next layer, they finish their work immediately.

Sample input: 6

Expected output: The height of the pyramid: 3 **Sample input: 1000**



Expected output: The height of the pyramid: 44

8. The Special Number

There is a number whose double is greater than its half by 45. Can you find this number?

- Chef is a student at a university, and the university has a requirement that students must be present for at least 75% of the working days in a semester to pass. This semester has a total of 120 working days. Chef has been taking a lot of holidays and is worried about meeting the attendance requirement. The information about the days Chef has attended or been absent is given as a sequence of N bits: B_1, B_2, \dots, B_N . If $B_i = 0$, it means Chef was absent on the i th day, and if $B_i = 1$, it means Chef was present on that day. The task is to determine if Chef can pass the attendance requirement by the end of the semester. Write a program that takes an integer N as input, followed by a sequence of N bits, and outputs whether Chef can hope to pass the attendance requirement or not.
- There are N piles where the i^{th} pile consists of A_i stones. Chef and Chefina are playing a game taking alternate turns with Chef starting first. In his/her turn, a player can choose any non-empty pile and remove exactly 1 stone from it. The game ends when exactly 1 pile becomes empty. The player who made the last move wins. Determine the winner if both players play optimally.

11. Write the c program for following pattern
12. Write a program to obtain a number N and increment its value by 1 if the number is divisible

```

1 2 3 4 5
1 2 3 4
1 2 3
1 2
1

```

by 4 otherwise decrement its value by 1.

Week7: Arrays

1. Given a large integer represented as an integer array `digits`, where each `digits[i]` is the *i*-th digit of the integer, ordered from most significant to least significant in left-to-right order (without any leading zeros), implement a program to increment the large integer by one and return the resulting array of digits.
2. Chef has set a target to solve at least 10 problems every week for a duration of 4 weeks. The input consists of four integers representing the number of problems Chef solved in each week (`P1`, `P2`, `P3`, and `P4`). The task is to determine the number of weeks in which Chef met his target. The output should be a single integer indicating the count of weeks where Chef solved at least 10 problems.
3. Code Chef recently revamped its practice page to make it easier for users to identify the next problems they should solve by introducing some new features: Recent Contest Problems - contains only problems from the last 2 contests Separate Un-Attempted, Attempted, and All tabs.

Problem Difficulty Rating-there commended drop down menu has various difficulty ranges so that you can attempt the problems most suited to your experience Popular Topics and Tags. Like most users, Chef didn't know that he could add problems to a personal to-do list by clicking on the magic '+' symbol on the top-right of each problem page. But once he found out about it, he went crazy and added loads of problems to his to-do list without looking at their difficulty rating.

Chef is a beginner and should ideally try and solve only problems with difficulty rating strictly less than 1000. Given a list of difficulty ratings for problems in the Chef's to-do list, please help him identify how many of those problems Chef should remove from his to-do list, so that he is only left with problems of difficulty rating less than 1000.

4. You are given an array `price` where `prices[i]` is the price of a given stock on the *i*th day. You want to maximize your profit by choosing a single day to buy one stock and choosing a different day in the future to sell that stock. Return the maximum profit you can achieve from this transaction. If you cannot achieve any profit, return 0.
5. Given a non-empty array of integer's `nums`, every element appears twice except for one. Find that single one. You must implement a solution with a linear runtime complexity and use only constant extra space.
6. Given an array `nums` of size *n*, return the majority element. The majority element is the element that appears more than $\lfloor n / 2 \rfloor$ times. You may assume that the majority element always exists in the array.
7. Write a C program to calculate the factorial of small positive integers. The input consists of an integer 't' representing the number of test cases, followed by 't' lines containing a single

integer 'n' ($1 \leq n \leq 100$) for each test case. The output should display the factorial of 'n' on a separate line for each input value of 'n'.

8. (Puzzle) On the Way to Market One morning.

I was on my way to the market and met a man who had 4 wives. Each of the wives had 4 bags, containing 4 dogs and each dog had 4 puppies. Taking all things into consideration how many were going to the market?

9. Vasya likes the number 239. Therefore, he considers a number pretty if its last digit is 2, 3 or 9. Vasya wants to watch the numbers between L and R (both inclusive), so he asked you to determine how many pretty numbers are in this range. Can you help him?

10. You are participating in a contest which has 11 problems (numbered 1 through 11). The first eight problems (i.e. problems 1, 2, ..., 8) are scorable, while the last three problems (9, 10 and 11) are non-scorable — this means that any submissions you make on any of these problems do not affect your total score.

Your total score is the sum of your best scores for all scorable problems. That is, for each scorable problem, you look at the score of all submissions you made on that problem and take the maximum of these scores (or 0 if you didn't make any submissions on that problem); the total score is the sum of the maximum scores you took. You know the results of all submissions you made. Calculate your total score.

Skill Oriented Exercise

11. Write a C program to help Joe and Lilly multiply two matrices, A and B. The program

should take input for multiple test cases. For each test case, the program should read the dimensions and values of matrices A and B. If the multiplication is possible, the program should print the output matrix values. If the multiplication is not possible, the program should print "IMPOSSIBLE".

12. You are given an $m \times n$ integer matrix with the following two properties:

Each row is sorted in non-decreasing order. The first integer of each row is greater than the last integer of the previous row. Given an integer target, return true if target is in matrix or false otherwise.

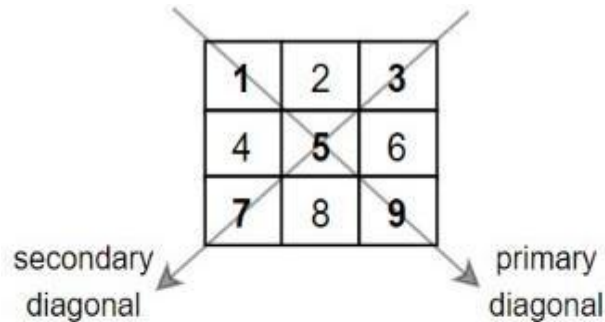
| | | | |
|----|----|----|----|
| 1 | 3 | 5 | 7 |
| 10 | 11 | 16 | 20 |
| 23 | 30 | 34 | 60 |

Input : matrix = [[1,3,5,7],[10,11,16,20],[23,30,34,60]], target = 3

Output: true

13. You are given an $m \times n$ integer grid accounts where $\text{accounts}[i][j]$ is the amount of money the i th customer has in the j th bank. Return the wealth that the richest customer has. A customer's wealth is the amount of money they have in all their bank accounts. The richest customer is the customer that has the maximum wealth.

14. Given a square matrix `mat`, return the sum of the matrix diagonals. Only include the sum of all the elements on the primary diagonal and all the elements on the secondary diagonal that are not part of the primary diagonal.



Input: `mat = [[1,2,3],
[4,5,6],
[7,8,9]]`

Output: 25

Explanation: Diagonals sum: $1 + 5 + 9 + 3 + 7 = 25$
Notice that element `mat[1][1] = 5` is counted only once.

15. Write a program to perform matrix multiplication. If multiplication cannot be done for a given matrices then print "NOT POSSIBLE"

$$A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix} \quad B = \begin{pmatrix} 5 & 6 & 7 \\ 8 & 9 & 10 \end{pmatrix}$$

Multiplication of two matrixes:

$$A * B = \begin{pmatrix} 1*5 + 2*8 & 1*6 + 2*9 & 1*7 + 2*10 \\ 3*5 + 4*8 & 3*6 + 4*9 & 3*7 + 4*10 \end{pmatrix}$$

$$A * B = \begin{pmatrix} 21 & 24 & 27 \\ 47 & 54 & 61 \end{pmatrix}$$

Input:

- 1) Read the row & column size of matrix 1
- 2) Read the matrix 1
- 3) Read the row & column size of matrix 2
- 4) Read the matrix 2

Output:

Resultant Matrix.

| Sample Input | Sample Output |
|--------------|---------------|
| 22 | 710 |
| 12 | 1522 |
| 34 | |
| 22 | |
| 12 | |
| 34 | |

16. Given two sorted arrays num s1and num s2ofsize mandnrespectively,return the median of the two sorted arrays.

Input: nums1 = [1,3], nums2 = [2] Output: 2.00000

Explanation: merged array=[1,2,3] and median is 2.

17. Given a m x n grid filled with non-negative numbers, find a path from top left to bottom right, which minimizes the sum of all numbers along its path.

Note: You can only move either down or right at any point in time.

| | | |
|---|---|---|
| 1 | 3 | 1 |
| 1 | 5 | 1 |
| 4 | 2 | 1 |

Input: grid=[[1,3,1],[1,5,1],[4,2,1]]

Output:7

Explanation: Because the path1→3→ 1→1→1 minimizes the um.

18. Given an array nums of size n, return the majority element. The majority element is the element that appears more than $\lfloor n/2 \rfloor$ times. You may assume that the majority element always exists in the array.

Input: nums=[3,2,3]Output:3

19. Given a sorted array of distinct integers and a target value, return the index if the target is found. If not, return the index where it would be if it were inserted in order.

Input: nums=[1,3,5,6],target=5Output:2

20. Given a m x n matrix grid which is sorted in non-increasing order both row-wise and column-wise, return the number of negative numbers in grid.

```
Input: grid = [[4,3,2,-1],[3,2,1,-1],[1,1,-1,-2],[-1,-1,-2,-3]]
Output: 8
Explanation: There are 8 negatives number in the matrix.
```

Example 2:

```
Input: grid = [[3,2],[1,0]]
Output: 0
```

Week8: String Handling

1. Louise joined a social networking site to stay in touch with her friends. The signup page required her to input a *name* and a *password*. However, the password must be *strong*. The website considers a password to be *strong* if it satisfies the following criteria:

- Its length is at least 6.
- It contains at least one digit.
- It contains at least one lower case English character.
- It contains at least one upper case English character.
- It contains at least one special character. The special

characters are: @#\$\$%^&*()-+!

2. As space explorer's ship crashed on Mars! They send a series of SOS messages to Earth for help.



Letters in some of the SOS messages are altered by cosmic radiation during transmission. Given the signal received by Earth as a string, determine how many letters of the SOS message have been changed by radiation.

s='SOSTOT'

Example

The original message was SOSSOS. Two of the message's characters were changed in transit.

Function Description

Complete the `marsExploration` function in the editor below. `marsExploration` has the following parameter(s):

`s`: the string as received on Earth

Returns

`int`: the number of letters changed during transmission

3. Chef has a string `S` with him. Chef is happy if the string contains a contiguous substring of length strictly greater than 2 in which all its characters are vowels. Determine whether Chef is happy or not. Note that, in English alphabet, vowels are a, e, i, o, and u.
4. Given two strings `needle` and `haystack`, return the index of the first occurrence of `needle` in `haystack`, or -1 if `needle` is not part of `haystack`.
5. Given a string consisting of words and spaces, return the length of the last word in the string. A word is a maximal substring consisting of non-space characters only.
6. Given a string `S`, reverse only all the vowels in the string and return it. The vowels are 'a', 'e', 'i', 'o', and 'u', and they can appear in both lower and upper cases, more than once.
7. You have been given a String `S`. You need to find and print whether this string is a palindrome or not. If yes, print "YES" (without quotes), else print "NO" (without quotes).

Skill Oriented Exercise

8. Jeff, Chef's younger brother, is learning to read and knows a subset of the Latin alphabet. Chef gave Jeff a book with `N` words to practice. Jeff can only read words that consist of the letters he knows. The task is to determine which words Jeff can read based on the given letters and output "Yes" or "No"

accordingly.

9. Timur loves code forces. That's why he has a string `Shaving length 10` made containing only lower case Latin letters. Timur wants to know how many indices string `s` differs from the string `"codeforces"`.

For example strings `"coolforsez"` differs from `"codeforces"` in 4 indices, shown in bold.

Up the Ladder

A man wants to reach window which is 40ft above from the ground. And the distance between the foot of the ladder and wall is 9 feet. How long should the ladder be?

10. Given two strings `s` and `t`, return true if `t` is an anagram of `s`, and false otherwise. An Anagram is a word or phrase formed by rearranging the letters of a different word or phrase, typically using all the original letters exactly once. Given strings, find the first non-repeating character in it and return its index. If it does not exist, return -1.
11. A robot starts at the origin (0, 0) on a 2D plane. It is given a sequence of moves represented by the string `"moves"`. Each move is represented by 'R' (right), 'L' (left), 'U' (up), or 'D' (down). The task is to determine if the robot returns to the origin after completing all the moves. The robot's direction is irrelevant, and all moves have the same magnitude. Return true if the robot ends up at the origin, and false otherwise.
12. Chandu is a bad student. Once his teacher asked him to print the reverse of a given string. He took three hours to solve it. The teacher got agitated at Chandu and asked you the same question. Can you solve it?
13. There is a string `s` of lowercase English letters that is repeated infinitely many times. Given an integer `n` find and print the number of letter 'a's in the first `n` letters of the infinite string.

Week9: Recursion

1. Given an integer `n`, return true if it is a power of three. Otherwise, return false. An integer `n` is a power of three, if there exists an integer `x` such that $n == 3^x$.
2. You are climbing a stair case. It takes `n` steps to reach the top. Each time you can either climb 1 or 2 steps. In how many distinct ways can you climb to the top?
3. Given an integer `n`, return true if it is a power of four. Otherwise, return false. An integer `n` is a power of four, if there exists an integer `x` such that $n == 4^x$.
4. You are given an integer `N`. You need to print `N!` –the factorial of `N`.

Input The first line of the input contains a single integer `T` denoting the number of test cases. The description of `T` test cases follows. The first and only line of each test case contains a single integer `N`.

Output For each test case print a single line containing a single integer `N!`

5. The Fibonacci numbers, commonly denoted `F(n)` form a sequence, called the Fibonacci sequence, such that each number is the sum of the two preceding ones, starting from 0 and 1
6. Kristen loves playing with and comparing numbers. She thinks that if she takes two different positive numbers, the one whose digits sum to a larger number is *better* than the other.

If the sum of digits is equal for both numbers, then she thinks the smaller number is *better*. For example, Kristen thinks that 13 is better than 31 and that 12 is better than 11. Given an integer, n , can you find the divisor of n that Kristin will consider to be the best?

7. A perfect number is a positive integer that is equal to the sum of its positive divisors, excluding the number itself. A divisor of an integer x is an integer that can divide x evenly. Given a positive integer n , return true if n is a perfect number, otherwise return false.
8. Given an integer num , repeatedly add all its digits until the result has only one digit, and return it.
9. **Something for Profit:** A friend of mine bought a used pressure cooker for Rs. 60. She somehow did not find it useful and so when a friend of hers offered her Rs. 70 she sold it to her. However, she felt bad after selling it and decided to buy it back from her friend by offering her Rs. 80. After having bought it once again she felt that she did not really need the cooker. So, she sold it at the auction for Rs. 90. How much profit did she make? Did she really make any profit?
10. Given a signed 32-bit integer x , return x with its digits reversed. If reversing x causes the value to go outside the signed 32-bit integer range $[-2^{31}, 2^{31} - 1]$, then return 0.
11. Given an integer array $nums$, move all 0's to the end of it while maintaining the relative order of the non-zero elements.
12. Write a function that takes the binary representation of an unsigned integer and returns the number of '1' bits it has (also known as the Hamming weight).
13. Martha is interviewing at Subway. One of the rounds of the interview requires her to cut a bread of size $l \times b$ into smaller identical pieces such that each piece is a square having maximum possible side length with no leftover piece of bread.
14. Given N two-dimensional points in space, determine whether they lie on some vertical or horizontal line.
If yes, print YES; otherwise, print NO.

Skill Oriented Exercise

PREDICT THE OUTPUT

```
#include<stdio.h>voidfoo(intn){
if(n>0){printf("%d",n);foo(n-1);printf("%d",n);
}
}
intmain(){
foo(3);return0;
}
```

1. What is the output of the above program?

- 321123
- 321
- 123
- 123321

```
#include<stdio.h>intbar(intn){ if (n
<= 0) { return 0;
}else{
returnn+bar(n-2);
}
}
int main(){
intresult=bar(7); printf("%d",result);return0;
}
```

2. What is the output of the above program?

- 20
- 16
- 14
- 12

```
#include<stdio.h>voidbaz(intn){ if (n >
0) {
baz(n/2);printf("%d",n%2);
}
}
intmain(){
baz(10);return0;
}
```

3. What is the output of the above program?

- 1010
- 0101
- 00101
- 1101

```
#include<stdio.h> intfactorial(intn){ if (n
== 0) { return 1;
}else{
returnn*factorial(n-1);
}
}
intmain(){
intresult=factorial(5); printf("%d",result);return0;
}
```

4. What is the output of the above program?

- 120
- 24
- 25
- 20

```
#include<stdio.h>
intpower(intbase,intexponent){if(exponent==0){return1;
}else{
returnbase*power(base,exponent-1);
}
}
```

```
int main(){
    int result=power(2,4);printf("%d",result); return 0;
}
```

5. What is the output of the above program?

- 16
- 8
- 32
- 64

Week 10: Structures

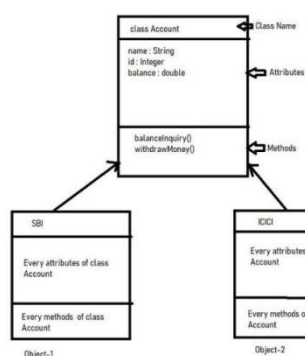
1. You are building a pay roll system for accompany with multiple departments. Design a program using structures that store employee details such as name, employee ID, and salary. Implement an array of structures to store employee records for each department. Calculate the total salary expenditure for each department and display it. Additionally, identify the department with the highest salary expenditure and acknowledge it as the top-performing department
2. VGP logistics is a premium Cargo service for Sending/receiving parcels from Vijayawada to Singapore. You are appointed as Manager in delivery department and need to maintain the arrival and delivery of the consignments sent/received. Create a structure consignment with the following Members Consignment_id, name, from, to, DOS (Date of Shipment), net weight, Address.
For Example:
Consignment_id:1008 Name:Haier Steamer From:Vijayawada To:
Singapore
DOS(Date of Shipment):30-may-2023 net_weight:28.8kg Address:
Mint Street Chennai
3. You have been assigned the task of developing a student grading system for a prestigious college. Design a program using structures that stores student details, such as name, roll number, and marks in various subjects. Implement an array of structures to store multiple student records and calculate the overall percentage for each student. Additionally, provide a functionality to generate a grade for each student based on their percentage and display it alongside their record.
4. You are developing a soldier management system for an army unit. Each soldier's record consists of the following information: name, rank, and years of service. Implement an array of structures to store the records of multiple soldiers. Write a C program to calculate and display the average years of service for all soldiers in the unit.
5. You are working on a ship management system for a naval fleet. Each ship's record contains the following details: name, type (e.g., aircraft carrier, destroyer), and year of commissioning. Implement an array of structures to store the ship records. Write a C program to search for a specific type of ship within the fleet and display the names of all ships belonging to that type.
6. You have been assigned the task of developing a pilot roster system for an air force squadron. Each pilot's record includes the following information: name, rank, and flight hours. Implement an array of structures to store the pilot records. Write a C program to find and display the pilot with the highest number of flight hours in the squadron.
7. You are working on a reservation system for a luxurious hotel. Create a program using structures that stores guest details, including name, room number, and check-in

date. Implement an array of structures to store multiple guest records and allow the hotel staff to search for guests by either their room number or name. Provide an additional feature that calculates the duration of each guest's stay and generates the total revenue earned by the hotel.

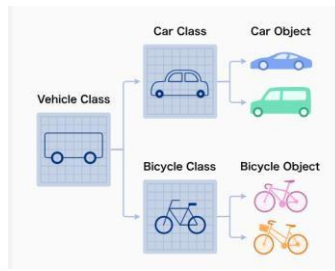
Skill Oriented Exercise

8. You have been tasked with developing a library management system for a renowned library. Create a program using structures that stores book information, including title, author, and publication year. Implement an array of structures to store multiple book records and allow the librarian to search for books by either title or author's name. Enhance the system by enabling the librarian to borrow and return books, updating the book status accordingly.
9. You have been assigned the task of creating a customer billing system using an array of structures. Each structure should store the customer's name, account number, and total amount due. Implement functions to add customer records, display all records, and find the customer with the highest amount due.
10. You are working on a car inventory management system using an array of structures. Each structure should hold the details of a car, including the make, model, and year of manufacture. Implement functions to add car records, display all records, and find the newest car in the inventory.
11. You are developing a product inventory management system for a retail store. Each product has a unique identifier, name, price, and quantity in stock. Implement an array of structures to store the product records. Create functions to add new products, update product details, display all products, and search for products based on their identifier or name.

Week11: Class and Objects:



1. Create a class and the object code for the above scenario.



2. Develop code for Class and Object.

Week12: Data Abstraction

Developing a banking application that handles various types of accounts such as savings, checking, and loans.

- **Abstraction Use:** Create abstract classes or interfaces like Account with common methods (e.g., deposit(), withdraw(), get Balance()). Concrete classes (e.g., Savings Account, Checking Account) implement these methods. The user interacts with Account objects without needing to know the specific type of account or its internal workings.

Inheritance

Developing a graphical user interface (GUI) library with various types of buttons.

- **Inheritance Use:** Create a base class Button with common properties like label, size, and methods like click(). Derive subclasses like Image Button, Toggle Button, and RadioButton that inherit from Button and add specific properties or methods unique to each type of button.

Building a ne-commerce plat form with different types of products.

- **Inheritance Use:** Define a base class Product with common attributes like name, price, and methods like apply Discount(). Create subclasses like Electronics, Clothing, and Books, each adding specific attributes (e.g., Electronics might have warrantyPeriod, Clothing might have size and color).

Skill Oriented Exercise

Building educational software that manages different types of learning resources.

- **Inheritance Use:** Establish a base class Learning Resource with common properties like title, subject, and methods like display(). Derive subclasses such as Book, Video Lecture, and Quiz, each adding specific attributes and methods (e.g., Quiz might have questions and a method evaluate()).

Designing a system to classify and manage information about different animals.

- **Inheritance Use:** Define a base class Animal with common attributes like name, habitat, and methods like eat(), sleep(). Create subclasses such as Mammal, Bird, and Reptile, each with specific characteristics and methods (e.g., Bird might have methods fly()).

Week13: Polymorphism

An application that can draw various shapes such as circles, rectangles, and triangles.

- **Polymorphism Use:** Define an abstract class Shape with a method draw(). Implement subclasses Circle, Rectangle, and Triangle, each providing its specific draw() implementation. The application can then handle any shape object through the Shape interface

A program that simulates sounds of different animals.

- **Polymorphism Use:** Create a base class Animal with an abstract method make Sound(). Implement subclasses Dog, Cat, and Cow that override make Sound(). The simulator can then invoke make Sound() on any animal object

Managing different types of transportation such as cars, buses, and bicycles.

Skill Oriented Exercise

- **Polymorphism Use:** Define a base class Vehicle with an abstract method move(). Implement subclasses Car, Bus, and Bicycle, each with its own implementation of move(). The system can then manage different vehicles uniformly

A system sending notifications via email, SMS, and push notifications.

- **Polymorphism Use:** Define an abstract class Notification with a method send(). Implement subclasses Email Notification, SMS Notification, and Push Notification, each with its own send() method. The system can send notifications through any medium using the same interface

Week14: Virtual functions

A document editor that supports different types of documents such as text documents, spreadsheets, and presentations.

- **Virtual Function Use:** Define a base class Document with a virtual function save(). Subclasses Text Document, Spreadsheet, and Presentation override save() to handle specific saving mechanisms.

An audio processing library that handles various audio effects such as reverb, echo, and distortion.

Skill Oriented Exercise

- **Virtual Function Use:** Define a base class Audio Effect with a virtual function apply(). Subclasses ReverbEffect, EchoEffect, and DistortionEffect override apply() to implement specific effects.

An AI strategy game that involves different types of game characters such as warriors, mages, and archers.

- **Virtual Function Use:** Define a base class Character with a virtual function attack(). Subclasses Warrior, Mage, and Archer override attack() to provide specific attack behaviors.

Week15: Exception handling

- 1) File Operations Scenario: An application needs to read data from a file. Exception Handling Use: Implement code to handle scenarios where the file might not exist, the

application lacks permissions, or the file is corrupted. Use try-catch blocks to manage these exceptions:

2) E-Commerce Checkout Process

Scenario: An e-commerce application processes user orders during checkout.

- Exception Handling Use: Handle errors such as invalid payment details, out-of-stock items, or delivery address issues.

Skill Oriented Exercise

3) An application processes images for various operations like resizing, filtering, and saving.

- Exception Handling Use: Handle errors such as unsupported file formats, corrupted files, or out-of-memory issues.

TEXTBOOKS:

1. Forouzan B. A. & Richard F. Gilberg, A Structured Programming Approach using C, 3rd Edition (2013), Cengage Learning.
2. Jeri R. Hanly and Elliot B. Koffman, Problem Solving and Program Design in C 7th Edition, Pearson
3. ANSI and Turbo C++ by Ashoke N. Kamthane, Pearson Education

REFERENCES:

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

24X0073: ENGLISH LANGUAGE AND COMMUNICATION SKILLS LABORATORY

B.Tech. I Year. II Sem.

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

Course Objective

- ✓ To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
- ✓ To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
- ✓ 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 the impact of dialects.
- ✓ To train students to use language appropriately for public speaking, group discussions and interviews

Course Outcomes: Students will be able to:

- ✓ Understand the nuances of the English language through audio-visual experience and group activities
- ✓ Neutralize their accent for intelligibility
- ✓ Speak with clarity and confidence which in turn enhances their employability skills

Syllabus: 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 to develop their listening skills so that they may appreciate the 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

Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and to recognize and use the right intonation in sentences.

- Listening to general content
- Listening to fill up information
- Intensive listening
- Listening to specific information

Speaking Skills:

Objectives

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

The following course content is prescribed for the **English Language and Communication Skills Lab**.

Exercise – ICALL Lab:

Understand Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening. *Practice:* Introduction to Phonetics – Speech Sounds – Vowels and Consonants
– Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*

ICS Lab:

Understand: Spoken vs. Written Language- Formal and Informal English.

Practice: Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave

– Introducing Oneself and Others.

Exercise –

IICALL

Lab:

Understand: Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Stress

pattern insentences – Intonation.

Practice: Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Stresspattern in sentences – Intonation - *Testing Exercises*

ICS Lab:

Understand: Features of Good Conversation – Strategies for Effective Communication. *Practice:* Situational Dialogues – Role Play- Expressions in Various Situations –MakingRequests and Seeking Permissions - Telephone Etiquette.

Exercise -

IIICALL

Lab:

Understand: Errors in Pronunciation-Neutralising Mother Tongue Interference (MTI).

Practice: Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -*Testing Exercises*

ICS Lab:

Understand: Descriptions- Narrations- Giving Directions and Guidelines – Blog Writing

Practice: Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

Exercise – IVCALL Lab:

Understand: Listening for General Details.

Practice: Listening Comprehension Tests - *Testing Exercises*

ICS Lab:

Understand: Public Speaking – Exposure to Structured Talks -

Non-verbalCommunication- Presentation Skills.

Practice: Making a Short Speech – Extempore- Making a Presentation.

Exercise –

VCALL

Lab:

Understand: Listening for Specific Details.

Practice: Listening Comprehension Tests -*Testing Exercises*

ICS Lab:

Understand: Group Discussion

Practice: Group Discussion

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.

Source of Material (Master Copy):

- *Exercises in Spoken English. Part 1,2,3.* CIEFL and Oxford University Press

Note: Teachers are requested to make use of the master copy and get it tailor-made to suit the contents of the syllabus.

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).
- Digital All
- Orell Digital Language Lab (Licensed Version)

REFERENCE BOOKS:

1. (2022). *English Language Communication Skills – Lab Manual cum Workbook*. Cengage Learning India Pvt. Ltd.
2. Shobha, KN & Rayen, J. Lourdes. (2019). *Communicative English – A workbook*. Cambridge University Press
3. Kumar, Sanjay & Lata, Pushp. (2019). *Communication Skills: A Workbook*. OxfordUniversity Press
4. Board of Editors. (2016). *ELCS Lab Manual: A Workbook for CALL and ICS Lab Activities*. Orient Black Swan Pvt. Ltd.
5. Mishra, Veerendra et al. (2020). *English Language Skills: A Practical Approach*. Cambridge University Press.

2410596: WEB APPLICATION DEVELOPMENT

B.Tech. I Year. I Sem

| L | T | P | C |
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COURSE OBJECTIVES: The students will try to learn

- HTML tags
- CSS
- Development of static web site
- Concepts of Java script
- Development of dynamic web site

0 0 2 1

COURSE OUTCOMES: After successful completion of the course, students should be able to

- Learn HTML tags and CSS
- Develop static web pages using HTML
- Use CSS in web pages
- Understand basic concepts of Javascript
- Develop dynamic web pages

PART-A

1. Write a HTML program to create a webpage about the different art forms of India, with appropriate title on the title bar. Use different heading tags for the headings, and list them using ordered list.
2. Write a HTML program to create sections in the document using appropriate tags and apply different color as background to them. Use internal hyperlinks to move to different points within the page.
3. Write a HTML program to insert a picture on the webpage, giving description for the picture in a paragraph. Use properties of height, width, hspace, vspace and align, with different values.
4. Write a HTML Program, to create a profile of 2 pages, the First page containing the applicant's picture with personal details using unordered lists, and the second containing Educational details using tables. Use hyperlinks to move to the next page.
5. Using Frames create an Indian Flag and insert the image of chakra in the center.
6. Create a frame like structure based on the given diagram, such that When the first link is clicked, the contents of the first frame is filled with the corresponding information and when the second link is clicked the second frame is filled.

| | |
|---|---------------|
| <ul style="list-style-type: none">• <u>Networks</u>• <u>Simulation</u> | Networks..... |
| | Simulation |

7. Write a program in HTML to demonstrate the concept of Image map, for India map. Map for areas rectangle, Circle and polygon.

PART-B

1. Write a program using Javascript to do the multiplication table for a number entered by the user in the textbox.
2. Create a sparse array using the values entered by the user in the five textboxes, and use Array methods such as sort(), pop(), push(), reverse() and join().
3. Create a Math object and use methods ceil(), floor(), round() for rounding off the number, also use methods such as cos(), sin(), sqrt().
4. Write a Program using Javascript to print a bill for 5 items purchased by the user.
5. Write a program Using Date object, to display appropriate greeting message “Good Morning” or “Good Afternoon” or “Good Night”, in an alert box with the user’s name, after receiving the same in the prompt box.
6. To demonstrate the concept of styles, Write a program applying internal style for paragraph tag, and override the same by applying inline style. Also create an external CSS file applying styles for the headings.
7. Create a registration form for creating an email account, having the input type elements like checkbox, radio button, select option, text area and submit button, and validate the textboxes for verifying the password.
8. Create a web page using two image files, which switch between one another as the mouse pointer moves over the image. Use on Mouse Out and on Mouse Over event handlers.
9. Using filters apply opacity feature to blur the image and using Transition apply hover feature, so the image will be transparent again when the mouse pointer is placed on the image.

III

2420002: DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

(CSE, CSD, CSM, ECE, EEE, MECH, CIVIL)

I Year B.Tech. II Sem.

L T P C

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Course Overview:

This course plays a crucial role in engineering, serving as the foundation upon which engineers build and apply their knowledge to solve real world applications. It presents a systematic and comprehensive introduction to ordinary differential equations and vector calculus for engineering students. Mathematical concepts and various techniques are presented in a clear logical and concise manner. A linear differential equation is used to regulate the flow of electricity in various electrical circuits like LR, LCR and CR circuits. Vector calculus is extensively used in the description of electromagnetic fields, gravitational fields and fluid flow.

Pre-requisites: Mathematics courses of 10+2 year of study.

Course Objectives: The student will try to learn

- Methods of solving the differential equations of first order and first degree.
- Concept of higher order linear differential equations.
- Concept, properties of Laplace transforms, solving ordinary differential equations by using Laplace transforms techniques.
- The physical quantities involved in engineering field related to vector valued functions.
- The basic properties of vector valued functions and their applications to line, surface and volume integrals.

Course outcomes: After successful completion of the course, students should be able to

- CO1:** Identify whether the given first order differential equation is exact or not.
- CO2:** Solve higher differential equation and apply the concept of differential equation to real world problems.
- CO3:** Use the Laplace transforms techniques for solving ODE's.
- CO4:** Apply the Del operator to scalar and vector point functions.
- CO5:** Evaluate the line, surface and volume integrals and converting them from one to another.

UNIT-I: First Order ODE 10L

Exact differential equations, equations reducible to exact differential equations, linear and Bernoulli's equations, Orthogonal Trajectories (only in Cartesian Coordinates). Applications: Newton's law of cooling, Law of natural growth and decay.

UNIT-II: Ordinary Differential Equations of Higher Order 10 L

Second 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, Equations reducible to linear ODE with constant coefficients: Legendre's equation, Cauchy-Euler equation.

UNIT-III: Laplace transforms 10 L

Laplace Transforms: Laplace Transform of standard functions, First shifting theorem, Second shifting theorem, Unit step function, Dirac delta function, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function (All without proof), Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof). Applications: solving Initial value problems by Laplace Transform method.

UNIT-IV: Vector Differentiation 8 L

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

UNIT-V: Vector Integration 10 L

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

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. H. K. Dass and Er. Rajnish Verma, Higher Engineering Mathematics, S Chand and Company Limited, New Delhi.

24X0009: ENGINEERING CHEMISTRY

B.Tech I Year II Sem

L T P C

3 1 0 4

Course overview:

1. **Importance of course-** It helps engineers understand the nature of different materials. It also helps engineers learn how to work with different types of matter without causing pollution or waste.
2. **Brief about course-** To impart knowledge on the fundamental concepts of chemistry
Involved in application of several important engineering materials that are used in Industry/day to day life.
3. **Applications of course:** Engineering chemistry graduates use raw materials and chemicals to design, manufacture, and test new products, systems and machinery which are used in numerous industries.

Prerequisites: chemistry knowledge at Pre- University level

Course Objectives: The students will try to learn

1. Knowledge about desalination of brackish water and treatment of municipal water.
2. Fundamental aspects of battery chemistry, significance of corrosion its control to protect the structures.
3. Knowledge of polymers, conducting polymers, bio-degradable polymers and fiber reinforced plastics.
4. Basic concepts of petroleum and its products.
5. Knowledge about engineering materials like cement, smart materials and Lubricants.

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

1. Apply softness of water by ion exchange process.
2. Analyze the various types Factors affecting of corrosion.
3. Understand the fundamental concepts of polymers
4. Analyze the various type of Gaseous Fuels.
5. Evaluate the smart materials and their Applications.

Course articulation matrix

| PO/PS O/CO | PO 1 | PO 2 | PO 3 | PO 4 | PO 5 | PO 6 | P O 7 | P O 8 | P O 9 | PO 10 | PO 11 | PSO 1 | PS O2 | PS O3 |
|---------------|---------|---------|---------|---------|---------|---------|-------------|-------------|-------------|----------|----------|----------|----------|----------|
| CO1 | 2 | 4 | 2 | 1 | - | - | 1 | - | - | - | - | 1 | 1 | - |
| CO2 | 2 | 4 | 3 | 4 | 2 | 1 | 1 | 1 | - | - | - | 1 | 1 | - |
| CO3 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | - | - | - | - | 1 | 1 | - |
| CO4 | 1 | 4 | 4 | 5 | 1 | 2 | 1 | - | - | - | - | 1 | 1 | - |
| CO5 | 1 | 4 | 4 | 5 | 1 | 2 | 1 | - | - | - | - | 1 | 1 | - |

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

Introduction to hardness of water – Estimation of hardness of water by complexometric method and related numerical problems. Potable water and its specifications - Steps involved in the treatment of potable water-Disinfection of potable water by chlorination and break-point chlorination.

Boiler troubles: Sludges, Scales 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 Battery Chemistry & Corrosion [8]

Introduction-Classification of batteries-primary, secondary and reserve batteries with examples. Basic requirements for commercial batteries. Construction, working and applications of: Lithium ion battery, Applications of Li-ion battery to electrical vehicles. Fuel Cells- Differences between battery and a fuel cell.

Construction and applications of Hydrogen Oxygen fuel cell. Solar cells - Introduction and applications of Solar cells.

Corrosion: Causes and effects of corrosion – theories of chemical and electrochemical corrosion mechanism of electrochemical corrosion,

Types of corrosion: Galvanic, water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anode and impressed current methods. Surface coatings-Metallic coatings-Hot dipping-Galvanisation, Tinning

UNIT - III: Polymeric materials: [8]

Definition – Classification of polymers with examples – Types of polymerization–addition (Mechanism of free radical addition) and condensation polymerization with examples – Nylon 6:6.

Plastics: Definition and characteristics- thermoplastic and thermosetting plastics, Preparation, Properties and engineering applications of PVC ,Teflon, Fiber reinforced plastics (FRP).

Rubbers: Natural rubber and its vulcanization.

Elastomers: Characteristics –preparation – properties and applications of Buna-S,Thiokol rubber.

Conducting polymers: Characteristic, Classification and applications of conducting polymers.

Biodegradable polymers: Concept and advantages - Poly vinyl alcohol and their applications.

UNIT - IV: Energy Sources: [8]

Introduction, Calorific value of fuel – HCV, LCV- Dulong's formula. Classification- solid fuels: coal – analysis of coal – proximate and ultimate analysis and their significance. Liquid fuels – petroleum and its refining,. Knocking – octane and cetane rating, synthetic petrol - Fischer-Tropsch's process; Gaseous fuels – composition and uses of natural gas, LPG and CNG.Bio-diesel- Transesterification-advantages.

UNIT - V: Engineering Materials: [8]

Cement: Portland cement, its composition, setting and hardening, special cements-white cement, waterproof cement, high alumina cement.

Smart materials and their applications:-

Classification-(piezoelectric materials-quartz, Shape memory material (SMA-Nitinol), Thermoresponsive materials, magneto rheological materials-Examples.

Lubricants: Classification of lubricants with examples-characteristics of a good lubricants-

mechanism of lubrication (thick film, thin film and extreme pressure)- properties of lubricants: viscosity, cloud point, pour point, flash point and fire point.

TEXT BOOKS:

1. Engineering Chemistry by P.C. Jain and M. Jain, Dhanpatrai Publishing Company, 2010.
2. Engineering Chemistry by Rama Devi, and Rath, Cengage learning, Second edition 2022.
3. Textbook of Engineering Chemistry by Jaya Shree Anjireddy, Wiley Publications, 2022.
4. A text book of Engineering Chemistry by M. Thirumala Chary, E. Laxminarayana and K. Shashikala, Pearson Publications, 2021.
- 5.

REFERENCE BOOKS:

4. Engineering Chemistry by Shikha Agarwal, Cambridge University Press, Delhi (2015)
5. Engineering Chemistry by Shashi Chawla, Dhanpatrai and Company (P) Ltd. Delhi (2011)

24X0321: APPLIED MECHANICS

(Common to Mechanical & Civil)

B.Tech.I Year II Semester

| | L | T | P | C |
|--|---|---|---|---|
| | 3 | 0 | 0 | 3 |

Course Overview:

Engineering mechanics is the basic course which is useful for the engineering students, studying of the subject helps to develop the thinking, analytical ability and imagination, skills of the student. This course covers a essential topics such as equilibrium system of forces, friction, centroids and centre of gravity, moment of inertia, trusses and work energy. This course principles apply for manufacturing of various products and projects such as automobiles, railways, bridges, dam, power transmission towers, etc.

Prerequisite: Nil

Course Objective: The students will be able

- To solve resultant of any force system.
- To analyze the types of friction for moving bodies and problems related to friction.
- To determine the centroid of an area and centre of gravity of a body.
- To understand the concept of trusses and virtual works.
- Understand the work energy principle.

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

- Determine the resultant forces acting on a body and analyze equilibrium of a body subjected to a system of forces.
- Solve problem of bodies subjected to friction.
- Find the location of centroid and calculate moment of inertia of given section.
- Determine the forces in the member of the trusses.
- Solve the problem using work energy equations for translation, fixed axis rotation and plane motion of rigid bodies.

Module-I: Introduction to Engineering Mechanics

[10]

Basic Concepts, system of Forces Coplanar Concurrent Forces -Components in Space - Resultant -Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems.

Module-II: Friction, Centroid and center of Gravity

[08]

Types of friction -Limiting friction -Laws of Friction -static and Dynamic Frictions – Types of friction – Dry friction – Ladder friction – Wedge friction – Screw friction – Centroid and centre of gravity- Centroid of lines, Areas and volumes from First principle, Centroids of composite sections; Centre of gravity and its implications.

Module -III: Area of Moment of Inertia and Mass Moment of Inertia.

[10]

Introduction – Definition of Moment of Inertia of plane sections from first principle, Theorems of moment of inertia – Moments of inertia of standard sections and Moments of Inertia of Composite sections; Product of Inertia. Parallel axis theorem, Perpendicular axis theorem, Mass moment of Inertia, Inertia of masses- Mass moment of inertia of composite bodies.

Module -IV: Analysis of trusses and Virtual work

[10]

Introduction, Classification of trusses, Assumptions made in the analysis of perfect truss, methods of Trusses-Methods of Joint and Methods of sections. Principle of virtual work: Equilibrium of ideal systems, efficiency of simple machines, stable and unstable equilibriums

Module –V: Review of partical dynamics:

[10]

Rectilinear motion, Plane curvilinear motion(rectangular, path and polar coordinates). 3-D curvilinear motion, relative and constrained motion; Newton's 2nd law (rectangular, path and polar coordinates), D'Alemberts Principle, Work-Kinetic energy, power, potential energy. Impulse-momentum (linear, angular) Impact (Direct and oblique)

Text Books:

1. Reddy Vijay Kumar K. and J.Suresh Kumar (2010),Singer's Engineering Mechanics -Statics & Dynamics.
2. A.Nelson, "Engineering Mechanics: Statics & Dynamics", Tata McGraw-Hill Education, 2009.

Reference Books:

1. Timoshenko S.P & Young D.H "Engineering Mechanics" McGraw-Hill international Edition,1983
2. A.K Thayal, Engineering Mechanics Uma Publications 14th edition,2013
3. R.k. Bansal Engineering Mechanics , laxmi Publications 8th edition.2013

24X0502: Essentials of Problem Solving Using Python

B.Tech. I Year II Sem.

L T P C

3 0 0 3

Course Overview:

This course gives acquaintance to Python Programming and Graph Theory. The course deals with Python programming concepts and concepts in graph theory like properties of standard graphs, Eulerian graphs, Hamiltonian graphs, Chordal graphs, Distances in graphs, Planar graphs, graph connectivity and Colouring of graphs.

Graph theory is used in Network Topologies and Routing Algorithms, Algorithm Design, Social Network Design, Logistics.

Prerequisites:

- A course on “Problem solving using C and C++”.

Course Objectives: The students will try to learn

- Basic building blocks of python
- Using of Functions and Modules
- Importance of Multithreading in problem solving
- The fundamental concepts of graph theory
- Graph coloring and traversal algorithms for solving real-world problems

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

- Construct Python data structures programs using tuples sets and dictionaries
- Design Programs using Functions and Modules
- Implement Multithread concept in solving problems
- Understand graph terminology
- Build efficient graph routing algorithms for various optimization problems on graphs.

Module-I

[10]

Python Basics: Python Objects, Operators, Python Numbers, Operators, Built-in Functions. Conditionals and Loops-if, else, elif, for, while, break, continue, pass.

Sequences: Strings, Lists, and Tuples- Built-in Functions, Special features.

Mapping and Set Types: Dictionaries, Sets.

Module –II

[9]

Functions and Functional Programming –Calling Functions , Creating Functions, Passing Functions , Formal Arguments, Variable-Length Arguments, Functional Programming.

Modules–Modules and Files, Namespaces, Importing Modules, Module Built-in Functions, Packages, Related modules.

Module –III**[8]**

Files and Input / Output: File Objects, File Built-in Functions, File Built-in Methods, File Built-in Attributes, Standard Files, Command-line Arguments. Multithreaded Programming: Introduction, Threads and Processes, Python Threads, the Global Interpreter Lock, Thread Module, Threading Module.

Module -IV**[8]**

Graph terminology, Digraphs, Weighted graphs, Complete graphs, Graph complements, Bipartite graphs, Graph combinations, Isomorphism's, Matrix representations of graphs, incidence and adjacency matrices, Degree Sequence, Eulerian circuit: Konigsberg bridge problem, Touring a graph; Eulerian graphs, Hamiltonian cycles

Module – V**[7]**

Shortest paths: Dijkstra's algorithm, Walks using matrices. Graph Coloring And Graph Algorithms: Four color theorem, Vertex Coloring, Edge Coloring, Coloring Variations. Graph traversal: Depth-First Search, Breadth-First Search and its applications; The traveling salesman problem, Minimum Spanning Trees: Kruskal's and Prim's algorithm

TEXTBOOKS:

1. Core Python Programming, Wesley J. Chun, Third Edition, Prentice Hall PTR
2. Karin R Saoub, Graph Theory: An Introduction to Proofs, Algorithms, and Applications, 1 st edition, Chapman and Hall, 2021.

REFERENCES:

1. Think Python, Allen Downey, Green Tea Press
2. Introduction to Python, Kenneth A. Lambert, Cengage
3. Python Programming: A Modern Approach, VamsiKurama, Pearson
4. Learning Python, Mark Lutz, O'Really
5. R Balakrishnan, K Ranganathan, A Textbook of Graph Theory, Springer Exclusive, 2 nd edition, 2019.

24X0371: COMPUTER AIDED ENGINEERING GRAPHICS

(Common to All Branches)

B.Tech I Year II Semester

L T P C

1 0 4 3

Course Overview:

Engineering Graphics is a foundational course designed to introduce first-year engineering students to the principles and practices of technical drawing and computer-aided design (CAD). This course covers essential topics such as geometric construction, orthographic projection, isometric drawing, lettering and dimensioning. Students will develop skills to create and interpret engineering drawings and gain proficiency in using CAD software for engineering applications.

Prerequisite: NIL

Course Objective: The students will be able

1. To understand the importance of engineering graphics in the engineering design process.
2. To apply principles of dimensioning and lettering in engineering drawings
3. To develop the ability to create and interpret technical drawings.
4. To master geometric constructions and projections.
5. To gain proficiency in computer-aided design (CAD) software.

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

1. Explain the role of engineering graphics in the engineering design and manufacturing process.
2. Understand the fundamental concepts of AutoCAD.
3. Perform basic geometric constructions and create accurate technical drawings.
4. Develop skills to create 2D and 3D drawings.
5. Use CAD software to create, modify, and manage engineering drawings.

Module-I: Introduction to Engineering Graphics: [12]

The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line, The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.

Module-II: Conic Sections and Engineering Curves

[10]

Construction of Ellipse, Parabola, Hyperbola (General Method Only)

Engineering Curves: Cycloids, Epicycloid and Hypocycloid

Module -III: Orthographic Projections

[12]

Introduction to Projections: Assumptions, Principles and Different angles of projections.

Projections of Points: Located in all Quadrants

Projections of Lines: Parallel, Perpendicular, Inclined to one plane.

Module -IV: Projections of Planes and Projection of Solids [10]

Projections of Planes: Introduction to planes, Regular lamina- Orientations- Surface parallel to HP, Surface parallel to VP, Inclined to HP, Inclined to VP.

Projections of Solids: Introduction to solids, Right Regular Solids- Orientations- Axis perpendicular to HP, Axis perpendicular to VP, Axis inclined to HP, Axis inclined to VP.

Module –V: Isometric Drawing and Conversions

[14]

Principles of Isometric projections, Isometric View and Isometric Scale, Isometric view of: Planes and Solids, Conversion: Isometric to Orthographic and Vice Versa

Text Books:

1. **"Engineering Drawing"**, N.D. Bhatt, Charotar Publishing House Pvt. Ltd, 53rd Edition, 2014, ISBN: 978-9380358173
2. **"Textbook of Engineering Drawing"**, K. Venkata Reddy, BS Publications, Revised Edition, 2013, ISBN: 978-9381075994
3. **"Engineering Graphics"**, K.R. Gopalakrishna, Subhas Stores, 32nd Edition, 2014, ISBN: 978-9353460206
4. **"Engineering Drawing and Computer Graphics"**, M B Shah & C. Rana, Pearson Edition 2010.

Reference Books:

1. **"A Textbook of Engineering Drawing"**, R.K. Dhawan, S. Chand Publishing, Revised Edition, 2012, ISBN: 978-8121914311
2. **"AutoCAD 2024: A Problem-Solving Approach, Basic and Intermediate"**, Sham Tickoo, CAD/CIM Technologies, 1st Edition, 2023, ISBN: 978-1640571577
3. **"Engineering Drawing and Graphics Using AutoCAD"**, T. Jeyapoovan, Vikas Publishing House 2nd Edition, 2015, ISBN: 978-9325982417

Course Objectives: The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

- Estimation of hardness of water to check its suitability for drinking purpose.
- Students are able to perform estimations of acids and bases using conductometry, potentiometry methods.
- Students will learn to prepare polymers such as Bakelite and Thiokol rubber in the laboratory.
- Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

Course Outcomes: The experiments will make the student gain skills on:

- Determination of parameters like hardness of water
- Able to perform methods such as conductometry, potentiometry and in order to find out the concentrations or equivalence points of acids and bases.
- Students are able to prepare polymers like bakelite and Thiokol rubber.
- Estimations saponification value, surface tension and viscosity of lubricant oils.

List of Experiments:

I. Volumetric Analysis: Estimation of Hardness of water by EDTA Complexometry method.

II. Conductometry: 1.Estimation of the concentration of an strong acid by Conductometry.

III. Potentiometry: Estimation of the amount of Fe^{+2} by Potentiometry.

IV. Dichrometry: Determination of Ferrous ion by Dichrometry

V. Preparations:

1. Preparation of Thiokol rubber

VI. Lubricants:

1. Estimation of acid value of given lubricant oil.
2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

VII.Preparation of Hand sanitizer(Iso propyl alcohol)

VIII. Virtual lab experiments

1. Construction of Fuel cell and its working.
2. Smart materials for Biomedical applications
3. Batteries for electrical vehicles.
4. Functioning of solar cell and its applications.

REFERENCE BOOKS:

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

FUELS AND LUBRICATION LAB

B.Tech. I Year II Sem

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

Pre-Requisites: Engineering Physics & Chemistry

Course Objectives: The students will try to learn

1. To understand the fuels and lubricants Properties
2. To understand the knowledge of automobile fuels and lubricants.
3. To understand the viscosity of lubricants and its variation with temperature
4. To understand the distillation characteristics of petroleum products

Course Outcomes: After completion of the course the student is able to

1. Find the kinematic viscosity of lubricants and its variation with temperature
2. Determine the flash point, fire point, cloud point and pour point of liquid fuels
3. Determine the calorific value of solid, liquid and gaseous fuels
4. Determination of the dropping point of lubricating grease
5. Determination of distillation characteristics of petroleum products

List Of Experiments

1. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Abels Apparatus.
2. Determination of Flash and Fire points of Liquid fuels/Lubricants using: Pensky Martens Apparatus.
3. Determination of Carbon residue test: Liquid fuels.
4. Determination of Viscosity of Liquid lubricants and Fuels using: Saybolt Viscometer.
5. Determination of Viscosity of Liquid lubricants and Fuels using: Redwood Viscometer –I.
6. Determination of Viscosity of Liquid lubricants and Fuels using: Redwood Viscometer – II.
7. Determination of Viscosity of Liquid lubricants and Fuels using: Engler Viscometer.
8. Determination of Calorific value of Gaseous fuels using: Junkers Gas Calorimeter.
9. Determination of Calorific value: Solid/Liquid/ fuels using: Bomb Calorimeter.
10. Drop point and Penetration Apparatus for Grease.
11. ASTM Distillation Test Apparatus.
12. Cloud and Pour point Apparatus.

24X0572:Essentials Of Problem Solving Using Python Laboratory

B.Tech. I Year II Sem.

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

Course Overview:

This course gives acquaintance to Python Programming and Graph Theory. It deals with Python programming concepts and concepts in graph theory like properties of standard graphs, Eulerian graphs, Hamiltonian graphs, Chordal graphs, Distances in graphs, Planar graphs, graph connectivity and Colouring of graphs. Python programming is used developing machine learning and data science applications. Graph theory is used in Network Topologies and Routing Algorithms, Algorithm Design, Social Network Design, Logistics.

Prerequisites:

- A course on “Problem solving using C and C++”.

Co-Requisites: Essentials of problem solving

Course Objectives: The students will try to learn

- Basic building blocks of python
- Using of Functions and Modules
- Importance of Multithreading in problem solving
- The fundamental concepts of graph theory
- Graph coloring and traversal algorithms for solving real-world problems

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

- Construct Python data structures programs using tuples sets and dictionaries
- Design Programs using Functions and Modules
- Implement Multithread concept in solving problems
- Understand graph terminology
- Build efficient graph routing algorithms for various optimization problems on graphs.

Week 1: *Python Numbers*

- a) You are developing a program to determine whether a given year is a leap year, using the following formula: a leap year is one that is divisible by four, but not by one hundred, unless it is also divisible by four hundred. For example, 1992, 1996, and 2000 are leap years, but 1967 and 1900 are not. The next leap year falling on a century is 2400.
- b) You are developing a program to determine the greatest common divisor and least common multiple of a pair of integers.
- c) You are developing a program to create a calculator application. Write code that will take two numbers and an operator in the format: N1 OP N2, where N1 and N2 are floating point or integer values, and OP is one of the following: +, -, *, /, %, **, representing addition, subtraction, multiplication, division, modulus/remainder, and exponentiation, respectively, and displays the result of carrying out that operation on the input operands.

Hint: You may use the string split() method, but you cannot use the eval() built-in function.

Skill Oriented Exercise

1. The cricket World Cup has started in Chefland. There are many teams participating in the group stage matches. Any team that scores 12 or more points in the group stage matches qualifies for the next stage.
2. The elections in Chefland have concluded, and the results are conducted. Chef received X votes, and his rival Chefu received Y. Chef thinks he dominated the election if and only if he received at least double the number of votes Chefu received. Did Chef dominate the election?
3. Bob has an account in the Bobby Bank. His current account balance is W rupees. Each month, the office in which Bob works deposits a fixed amount of X rupees to his account. Y rupees is deducted from Bob's account each month as bank charges. Find his final account balance after Z months. Note that the account balance can be negative as well.
4. You're a bit all over the place as a college student. You used to eat out at expensive restaurants almost every day until your parents gave you a talking-to about being irresponsible. Now, you've got to control your eating and spending habits. So, here's the plan: you'll stick to the college mess for your meals every day, except Sundays. On Sundays, you're treating yourself to those fancy restaurant meals. The cost is Rs.X for the mess food each day, and Rs. Y for the restaurant splurges. Now, what's the cost of food per week? Note that you don't have to pay for the mess on Sundays. (A week has seven days, as usual.)

Week 2: Control Flow

- a) Write a Program for checking whether the given number is a prime number or not.
- b) Write a program to print Fibonacci series upto given n value.
- c) Write a program to calculate factorial of given integer number.
- d) Write a program to calculate value of the following series $1+x-x^2+x^3-x^4+\dots+x^n$.
- e) Write a program to print Pascal triangle.

Skill Oriented Exercise

1. Charlie is 17 years old and is eager to vote. Write a Python program to check if he meets the legal voting age of 18.
2. Your friend given a list of numbers to you and asked to find out the largest number among them. Write a python program to find the largest number.
3. Daemon don't like the multiples of 7 so help him to write a Python program that prints numbers from 1 to 30 but skip the number if it encounters multiple of a 7.

4. Bob has an account in the Bobby Bank. His current account balance is W rupees. Each month, the office in which Bob works deposits a fixed amount of X rupees to his account. Y rupees is deducted from Bob's account each month as bank charges. Find his final account balance after Z months. Note that the account balance can be negative as well.

Week-3 Python Sequences

- a) Write a program to sort the numbers in ascending order and strings in reverse alphabetical order.
- b) Given an integer value, return a string with the equivalent English text of each digit. For example, an input of 89 results in "eight-nine" being returned. Write a program to implement it.
- c) Write a program to create a function that will return another string similar to the input string, but with its case inverted. For example, input of "Mr. Ed" will result in "mR.eD" as the output string.
- d) Write a program to take a string and append a backward copy of that string, making a palindrome.

Skill Oriented Exercise

1. Alice loves quotes. Write a Python program to count the number of characters in her favorite quote: "To be or not to be, that is the question."
2. Emily wants to know if her friends name is a palindrome. Write a Python program to check for a name is a palindrome.
3. Charlie just read a new book and wants to add it to his set of favorite books {"The Hobbit", "Harry Potter"}. Write a Python program to add "The Great Gatsby" to Charlie's set and print the updated set.
4. You have a list of friends' ages: [25, 22, 29, 24]. Write a Python program to sort this list in ascending order.

Week-4 Python Dictionaries

- a) Write a program to create a dictionary and display its keys alphabetically.
- b) Write a program to take a dictionary as input and return one as output, but the values are now the keys and vice versa.
- c) Given a List, extract all elements whose frequency is greater than K. Ex: Input test_list = [4,6,4,3,3,4,3,4,3,8], k=3

Output =[4,3]

Skill Oriented Exercise

1. You have a dictionary of your friends' favorite fruits: {"Alice": "Apple", "Bob": "Banana", "Charlie": "Cherry"}. Write a Python program to print Bob's favorite fruit.
2. John manages a small store and needs a program to track his product inventory. Write a Python program that will help John Creating the dictionary which contains the name and

price of the product and print the maximum product name along with its price.

Week-5 Files

- a) Write a program to compare two text files. If they are different, give the line and column numbers in the files where the first difference occurs.
- b) Write a program to compute the number of characters, words and lines in a file.

Skill Oriented Exercise

1. Alice wants to list all files in her current directory. Write a Python program to import the `os` module and use it to print the names of all files in the current directory.
2. Charlie wants to read the contents of `books.txt` line by line and print each book name. Write a Python program to open the file and use the `readline` method to print each line.
3. Write a Python program `greet.py` that takes a name as a command-line argument and prints "Hello, [name]!". Demonstrate how to run it with the argument "Alice".

Week- 6&7 Functions

- a) Write a function `ball_collide` that takes two balls as parameters and computes if they are colliding. Your function should return a Boolean representing whether or not the balls are colliding.

Hint: Represent a ball on a plane as a tuple of (x, y, r) , r being the radius

If (distance between two balls centers) \leq (sum of their radii) then (they are colliding)

- b) Find mean, median, mode for the given set of numbers in a list.
- c) Write simple functions `max2()` and `min2()` that take two items and return the larger and smaller item, respectively. They should work on arbitrary Python objects. For example, `max2(4, 8)` and `min2(4, 8)` would each return 8 and 4, respectively.
- d) Write a function `nearly_equal` to test whether two strings are nearly equal. Two strings `a` and `b` are nearly equal when `a` can be generated by a single mutation on `b`.
- e) Write a function `dups` to find all duplicates in the list.
- f) Write a function `unique` to find all the unique elements of a list.
- g) Write a function `cumulative_product` to compute cumulative product of a list of numbers.
- h) Write a function `reverse` to reverse a list. Without using the `reverse` function.
- i) Write function to compute GCD, LCM of two numbers. Each function should not exceed one line.

Skill Oriented Exercise

1. Alice wants to create a reusable function to greet her friends. Write a Python function `greet` that takes a friend's name as an argument and prints a greeting. Call the function with the name "Bob."

2. Charlie needs a function that can sum any number of arguments. Write a function `sum_numbers` that takes a variable number of arguments and returns their sum. Use this function to sum 1, 2, 3, and 4.
3. Alice wants a quick way to increment a number by 1. Write a lambda function that takes a number and adds 1 to it. Use this lambda to increment 7.
4. Bob has written a custom module called `mymath.py` with a function `add(a, b)` that returns the sum of `a` and `b`. Write a Python program to import this module and use the `add` function to add 3 and 5.

Week- 8 Multithreading

- a) Write a program to create thread using `thread` module.
- b) Write a program to create thread using `threading` module.
- c) Write a Program to use Python's `threading` module to calculate the square and cube of a number concurrently.

Skill Oriented Exercise

1. Alice wants to perform two tasks simultaneously: counting numbers and printing messages. Write a Python program to create two threads, one for counting from 1 to 5 and another for printing "Hello" five times.
2. Charlie is learning about the Global Interpreter Lock (GIL). Write a Python program demonstrating how GIL affects multi-threaded CPU-bound tasks by incrementing a counter in two threads.
3. Diana wants to print numbers in a separate thread using the `thread` module. Write a Python program to print numbers from 1 to 5 in a new thread.
4. Emily needs a background thread to print a heartbeat message every second. Write a Python program to create a daemon thread that prints "Heartbeat" every second.
5. Alice is managing a shared resource. Write a Python program where two threads increment a shared counter using a `threading.Lock` to avoid race conditions.

Week 9:

- a) Write a Python program to implement Euler Circuit.
- b) Write a Python program to implement Dijkstra's algorithm.
- c) Given a connected graph G with N nodes and M edges (edges are bi-directional). Every node is assigned a value $A[i]$. We define a value of a simple path as :

Value of path = Maximum of (absolute difference between values of adjacent nodes in a path). A path consists of a sequence of nodes starting with start node S and end node E .

$S-u_1-u_2-....-E$ is a simple path if all nodes on the path are distinct and $S, u_1, u_2, ..., E$ are nodes in G .

Given a start node S and end node E , find the minimum possible "**value of path**" which starts with node S and ends with node E .

- d) Yatin created an interesting problem for his college juniors. Can you solve it?

Given N rooms, where each room has a one-way door to a room denoted by $room[i]$, where $1 \leq i \leq N$. Find a positive integer K such that, if a person starts from room i , ($1 \leq i \leq N$), and continuously moves to the room it is connected to (i.e. $room[i]$), the person should end up in room i after K steps;

Note: The condition should hold for each room. If there are multiple possible values of K modulo $(109+7)$, find the smallest one. If there is no valid value of K , output -1

Week 10: Implement the following using python

- a) M-coloring
- b) Vertex coloring
- c) Edge coloring

Week 11: Implement the following graph traversal methods.

- a) Depth-First Search
- b) Breadth-First Search
- c) You are presented with a network comprising N computers and M wired connections between them. Your objective is to optimize the network's connectivity using precisely K wires from your inventory. The aim is to **maximize** the number of computers that can be linked together within the given constraints. Your task is to determine and report the size of the largest network that can be formed by establishing these connections.

In the context of this problem, computers are considered connected if they share either a direct or indirect wired connection. It is worth noting that the value of K will always be less than the number of isolated (standalone) networks in the given configuration, and it may even be zero.

- d) A country consists of N cities. These cities are connected with each other using $N-1$ bidirectional roads that are in the form of a tree. Each city is numbered from 1 to N . You want to safeguard all the roads in the country from any danger, and therefore, you decide to place cameras in certain cities. A camera in a city can safeguard all the roads directly connected to it. Your task is to determine the minimum number of cameras that are required to safeguard the entire country.

Week 12: Travelling Salesman problem.

- a) You are working in a salesmen company as a programmer.

There are n towns in your country and m directed roads between them. Each road has a cost person should spend on fuel. The company wants to sell goods in all n towns. There are infinitely many salesmen in the company. We can choose some positive number of salesmen and give a non-empty list of towns to each of them. Towns from the list are the towns to sell goods in. Each salesman will visit all the towns in his list in this particular order in cycle (after the last town he will return to the first town and so on). Salesman can visit other towns on his way but he will not sell goods in these towns. Two salesmen cannot sell goods in one town because it will attract unnecessary attention to your company. But for every town there must be a salesman who sell goods in this town. If salesman's list of towns consists of exactly one town then he should pay fee to stay in this town each month (each town has its own fee) or he should go for a round trip and spend money on fuel.

Your task is to calculate the minimal amount of money company must spend monthly to achieve its goals. We will assume that every salesman will spend a month to make one cycle.

- b) It is the final leg of the most famous amazing race. The top 'n' competitors have made it to the final. The final race has just begun. The race has 'm' checkpoints. Each team can reach any of the 'm' checkpoint but after a team reaches a particular checkpoint that checkpoint gets closed and is not open to any other team. The race ends when 'k' teams finish the race. Each team travel at a constant speed throughout the race which might be different for different teams. Given the coordinates of n teams and m checkpoints and speed of individual team return the value of minimum time needed to end the race.
- c) Little Jhool is a very lenient teaching assistant in his college. He doesn't like cutting the marks of students, so obviously, every student in his tutorial loves him. But anyway, the teacher has got to know about the leniency of Jhool while giving marks, so this time in exam, he decides to give a different exam paper to every single student to check how well have the students been taught by Jhool. Now, Little Jhool knows the strong and weak topics of every single student, so he wants to maximize the total marks obtained by students in his tutorial. You are given the number of students in Jhool's tutorial, denoted by n - n also being the number of different exam papers - that is, one for every student. Every student will get only one exam paper to solve. You are further given a matrix, $(n \times n)$ denoting the marks every student will get if he attempts a particular exam paper. You've to help Jhool figure out a way by which he could maximize the total score obtained by his entire class.

Week 13: Construct minimal spanning tree using the following

- a) Prim's Algorithm
- b) Kruskal's Algorithm
- c) There are total N Hacker-cities in a plane. Each city is located on coordinates $(X[i], Y[i])$ and there can be any number of cities on the same coordinates.

You have to make these cities connected by constructing some roads in such a way that it is possible to travel between every pair of cities by traversing the roads. The

cost of constructing one road between any two cities is the minimum of the absolute difference between their X and Y coordinates.

As you want to earn more and more, you decided to do this in the most optimal way possible, such that the total cost of constructing these roads is minimal. You have to return the minimum money you need to spend on connecting all the cities.

- d) Tom is visiting the country Hacker land. Hacker land has n cities and m bi-directional roads. There are k types of tokens. Token i costs ci . The costs of the tokens are such that for all $2 \leq i \leq k$, $ci \geq 2ci-1$. For each road, you need to have a particular set of tokens, if you want to travel it. Note that you don't have to give the tokens, you just need to show them. Thus, one token can be used at any number of roads, where it is required. Tom wants to select a set of tokens, such that using them, he can go from any city to any other city. You have to help him minimize the total cost of tokens he buys.

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2. Karin R Saoub, Graph Theory: An Introduction to Proofs, Algorithms, and Applications, 1 st edition, Chapman and Hall, 2021.

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1. Think Python, Allen Downey, Green Tea Press
2. Introduction to Python, Kenneth A. Lambert, Cengage
3. Python Programming: A Modern Approach, VamsiKurama, Pearson
4. Learning Python, Mark Lutz, O'Really.