GUDLAVALLERU ENGINEERING COLLEGE

(An Autonomous Institute with Permanent Affiliation to JNTUK, Kakinada)
Seshadri Rao Knowledge Village, Gudlavalleru

Department of Computer Science and Engineering

B. Tech (Artificial Intelligence and Data Science)

I Year 1st Semester

Sl. No.	Name of the Course / Laboratory		No. of Hours per week			Total Credits
			L	T	P	
1	Functional English	HSS	3	-	-	3
2	Descriptive Statistics	BS	2	1	-	3
3	Engineering Calculus	BS	2	1	-	3
4	Programming for Problem Solving	ES	3	-	-	3
5	Universal Human Values 2: Understanding Harmony	HSS	2	1	-	3
6	Functional English Lab	HSS	-	-	2	1
7	C Programming Lab	ES	-	-	4	2
8	Statistics using R Lab	BS	-	-	2	1
	Total :		**13**	**3**	**6**	**19**
9	Constitution of India (Mandatory Non-Credit Course)		2	-	-	-

I Year 2nd Semester

Sl. No.	Name of the Course / Laboratory		No. of Hours per week			Total Credits
			L	T	P	
1	Professional Communication	HSS	2	-	-	2
2	Integral Transforms and Vector Calculus	BS	3	1	-	4
3	Linear Algebra	BS	2	1	-	3
4	Python Programming	ES	3	-	-	3
5	Data Structures	PC	3	-	-	3
6	Professional Communication Lab	HSS	-	-	4	2
7	Python Programming Lab	ES	-	-	4	2
8	Data Structures Lab	PC	-	-	4	2
	Total :		**13**	**2**	**12**	**21**
9	Environmental Studies (Mandatory Non-Credit Course)		2	-	-	-

FUNCTIONAL ENGLISH

(Common to CE, EEE, ME, ECE, CSE, IT, AI&DS, IoT)

I Year- I Semester

Lecture: 3 Internal Marks: 30

Credits: 3 External Marks: 70

Course Objectives

1. To equip the students for their present and future academic pursuits involving the following:
   - listening to (and viewing) classroom lectures and other academic presentations with a reasonable degree of accuracy, understanding, and appreciation, and responding to them appropriately;
   - speaking in academic (e.g. classroom discussions) and social contexts with a fair degree of fluency, accuracy and intelligibility, and with due attention to factors such as purpose, audience, context, and culture;
   - reading a wide range of informational and functional texts, including course books and reference materials, from print and non-print sources and using them for a variety of purposes; and
   - writing for academic purposes (e.g. assignments, examination answers) in an organized way following the rules of discourse and using vocabulary and grammar appropriately and accurately; and
2. To develop in them the communication strategies and social graces necessary for functioning effectively in social, academic, and other situations in which they may be called upon to use English.

Course Outcomes

Upon completion of Functional English, the students will be able to:

- speak with a reasonable degree of fluency using communication strategies (i.e. using language appropriately to carry out functions such as greeting, requesting information, seeking confirmation, disagreeing) as well conventions of politeness and courtesy
- speak with a reasonable degree of fluency and accuracy in contexts requiring tasks such as narrating and describing listen to short audio and video clips
  - in standard Indian accent with understanding of the types listed in D (1) (a) below; and
  - in native English accent (British and American), especially clips in which the speakers or voice actors speak slowly, and gain both understanding of messages and sensitivity to native-speaker accents
- read fluently comprehending texts of different kinds using multiple strategies
- to understand explicitly-stated information as well as underlying meanings
- write coherent paragraphs with attention to elements of writing such as content, organization, language, style, and mechanics and the conventions of academic writing
- write survey reports with attention to conventions of report writing
- guard against mistakes Indians typically make in their speech and writing in English

Unit – I

Listening: Listening Comprehension – Task 1 (IWE - Chapt II)

Speaking: Communication Functions – Conversation between Raghu and Sridhar (IWE - Chapt II)

Reading: Reading Comprehension – Task 1 (DPM)

Vocabulary: (a) GRE Words – 1.1, (b) Collocations – 2.1 (VB)

Grammar: Tenses – Simple Present and Present Continuous (IWE -Chapt II)

Writing: Paragraph-Writing (IWE - Chapt II)

Unit-II
Listening: Listening comprehension – Task 2 (WR)
Speaking: Communication Functions – Exercise (DPM)
Reading: Reading Comprehension – Task 2 (DPM)
Vocabulary: (a) Words Often Confused – 3.1, (b) One-Word Substitutes – 4.1 (VB)
Grammar: (a) Indianism and (b) Have to (IWE - Chapt II)
Writing: Paragraph-Writing (IWE - Chapt II)

Unit-III
Listening: Listening Comprehension – Task 3 (IWE - Chapt III)
Speaking: Communication Functions – Conversation between Shreya and Kalpana (IWE - Chapt III)
Intensive Reading: Reading Comprehension Task – 3 (DPM)
Extensive Reading: The Adventures of Huckleberry Finn by Mark Twain
Vocabulary: (a)Idioms – 5.1, (b) Phrasal Verbs – 6.1 (VB)
Grammar: Tenses – Simple Past and Present Perfect (IWE – Chapt III)
Writing: Paragraph-Writing – Coherence (IWE - Chapt III)

Unit-IV
Listening: Listening Comprehension – Task 4 (IWE - Chapt IV)
Speaking: Communication Functions – Conversation between professor and Mayur (IWE - Chapt IV)
Reading: Reading Comprehension – Task 4 (DPM)
Vocabulary: (a) GRE words – 1.2, (b) Collocations – 2.2, (c) Words Often Confused – 3.2 (VB)
Grammar: Expressing Futurity (IWE - Chapt IV)
Writing: Clutter-Free Writing (IWE - Chapt IV)

Unit-V
Listening: Listening comprehension – Task 5 (WR)
Speaking: (a) Communication Functions and (b) Telephone Etiquette– Exercises (IWE - Chapt IV)
Intensive Reading: Reading Comprehension – Task 5 (DPM)
Extensive Reading: More Tales from Shakespeare by Charles and Mary Lamb
Vocabulary: (a) One-Word Substitutes – 4.2, (b) Idioms – 5.2, (c) Phrasal verbs – 6.2 (VB)
Grammar: Structure – Going to (IWE - Chapt IV)
Writing: Technical Report Writing (DPM)

References

- IWE – Innovate with English by T Samson (Foundation)
- Chapt – Chapter
- DPM – Department-produced materials (handouts)
- WR – Web-resources
- VB – Vocabulary Builder for Students of Engineering and Technology by Vijaya Lakshmi et al (Maruthi)

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DESCRIPTIVE STATISTICS

I Year I Semester

Lecture: 2+1 Internal Marks:30
Credits:3 External Marks:70

Course Objectives

- To understand the significance of statistics in our day to day life and its use.
- To emphasize the use of various statistical methods like measures of central tendency, dispersion, correlation and graphical representation of bi-variate data.
- To explore the concept of probability in real time engineering problems.

Course Outcomes

Upon completion of the course the students will be able to

- demonstrate different types of data
- measure central tendency of the given data and draw useful conclusions.
- compute correlation in bi-variate data and find linear regression equation for predicting y values from the x values in a set of correlation data.
- describe different types of attributes and methods of measures of association between the attributes.
- explain the probability and the underlying assumption of random sampling.

UNIT – I: Statistical Methods

Definition and scope of Statistics, concepts of statistical population and sample. Classification and Categorization of data, Measurements of scales. Presentation of data.

UNIT – II: Measures of Central Tendency and Dispersion

Measures of Central Tendencies: Mean, Median, Mode, Geometric mean and Harmonic mean. Measures of Dispersion: Range, Quartile deviation, Mean deviation, Standard deviation, Coefficient of variation, Moments, Skewness and Kurtosis, Sheppard's corrections.

UNIT – III: Bi-variate data

Bi-variate data: Definition, scatter diagram, Simple correlation, Partial and Multiple correlations (3 variables only), Rank correlation. Simple linear regression.

UNIT – IV: Curve Fittting and Attributes

Principle of least squares and fitting of polynomials and exponential and power curves.
Theory of attributes: Independence and association of attributes, consistency of data, measures of association and contingency, Yule's coefficient of colligation.

UNIT – V: Probability

Probability: Introduction, random experiments, sample space, events and algebra of events. Definitions of Probability. Conditional Probability, addition and multiplication laws of probability, independent events – applications. Baye's theorem and its applications.

Text Books

1. Feller, W. (2014): An Introduction to Probability theory and application, Wiley.
2. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & 11, 8thEdn. The World Press, Kolkata.

Reference Books

1. S.P.Gupta, (2014): Statistical Methods, 43rd Edition, Sultan Chand & Sons.
2. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7thEdn.), Pearson Education, Asia.
3. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rdEdn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
4. Myer, P.L. (1970): Introductory Probability and Statistical Applications, Oxford & IBH Publishing, New D

ENGINEERING CALCULUS

I Year – I Semester

Lecture: 2+1 Internal Marks: 30
Credits: 3 External Marks: 70

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Course Objectives

- To understand the procedure of solving exact and non-exact differential equations.
- To familiarize with Higher order linear differential equations.
- To understand the concepts of partial derivatives and know the procedure to find the maxima and/or minima for a given surface.
- To familiarize with linear and non-linear partial differential equations.
- To know the concepts of multiple integrals.

Course Outcomes

Upon completion of the course, the students will be able to

- Solve exact and non- exact differential equations and to use them in various practical situations.
- Apply 1st & 2nd order differential equations to solve various engineering problems.
- Evaluate maxima and/or minima for a given surface.
- Solve first order linear & non-linear partial differential equations.
- Evaluate areas, volumes using double and triple integrals.

UNIT– I: 1st Order Linear ODEs

Exact and non-exact differential equations, Applications – Law of natural growth and decay, Newton's Law of cooling.

UNIT– II: Higher Order Linear ODE

Solving Homogeneous differential equations, and Non-Homogeneous differential equations when RHS terms are of the form e^{ax} *sin ax, cos ax, polynomial in x,* e^{ax}*v(x), xv(x)* . Method of variation of parameters. Overview of Cauchy's and Legendre equations.

UNIT– III: Partial Differentiation

Total derivative, chain rule, Jacobians, Application- finding maxima and minima of a function of two or three variables.

UNIT– IV: First order PDE

Overview of formation of PDEs by eleminatingaribitrary constants and functions. Solutions of first order linear PDE – Linear (Lagrange's Equation) and Non-Linear PDE by Charpit's method.

UNIT– V: Multiple Integrals

Areas, volumes using double integrals and triple integrals (Polar and Cartesian Coordinates), Changeof Order of integration.

Text Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 8th edition, MaitreyPrintech Pvt. Ltd, Noida, 2009.
2. B.S. Grewal, Higher Engineering Mathematics, 42 nd edition, Khanna Publishers, New Delhi, 2012.

Reference Books

1. Schaum's Series, Differential Equations, Tata-McGraw Hill Company Limited.
2. Bali &Iyengar,Text Book of Engineering Mathemtics, Laxmi Publications (P) Ltd.

PROGRAMMING FOR PROBLEM SOLVING

(Common to CSE, AI&DS, IT)

I Year – I Semester

Lecture: 3	Internal Marks: 30
Credits: 3	External Marks: 70

Course Objectives

- To emphasize the use of algorithm and flowchart in problem solving.
- To apply C language in problem solving.

Course Outcomes

Upon completion of the course, the students will be able to

- outline problem solving steps and solve sample problems
- use control statements for writing the programs.
- apply the concepts of arrays and strings in problem solving.
- decompose a problem into functions to develop modular reusable code.
- apply user- defined data types and text I/O operations for efficient handling of data.

UNIT–I: Problem Solving Steps and Basics of C

Problem Solving Steps – Understanding problem, developing algorithm, flowchart, coding, debugging and testing.

General form of a C program, Identifiers, Types, Variables, Constants, Operators, I/O statements, Expressions, Precedence and Associativity, Type Conversion.

Problem Solving – Sample problems such as evaluating formulae.

UNIT–II: Control Statements

Selection - Making Decisions – Single-way, Two-Way Selection, Multi-way Selection, Dangling else Problem.

Repetition –Concept of loop, Loops in C: while, do-while and for.

Jump Statements – return, goto, break, exit and continue.

Problem Solving–Factorial computation, generation of Fibonacci sequence, reversing digits of an integer, generating prime numbers.

UNIT–III: Arrays and Strings

Arrays -Arrays Concepts, Using Arrays in C, Array Applications, Two-Dimensional Arrays and Multidimensional arrays.

Strings -Strings Concepts, C Strings, String Input/ Output Functions, Arrays of Strings, String Handling Functions.

Problem Solving – Computing mean and variance of a set of numbers, reverse the elements in an array, addition and multiplication of two matrices, insert sub-string into main-string, reverse of given string without using string handling functions.

UNIT–IV: Pointers and Functions

Pointers – Declarations, initialization, Pointer Arithmetic, Memory allocation Functions, Arrays and Pointers, Lvalue and Rvalue.

Functions –Designing Structured Programs, User-Defined Functions, Standard Functions, Parameter Passing Techniques, Passing Array to Functions, Passing Pointers to Function, Recursion, storage classes.

Problem solving–Using functions print the sum of all elements of the array using pointers, convert decimal number to binary number using function, calculate the GCD of two non-negative integers using recursion.

UNIT–V: User defined Datatypes and File Handling

User defined Datatypes: The Type Definition (typedef), Enumerated Types, Structure: Declaration, Initialization, accessing structures, Operations on Structures, Nested Structures, Structure Containing Arrays, Pointers and Structures, Arrays of Structures Unions.

File Handling - Files, Streams, Standard Library Input/ Output Functions, Formatting Input/ Output Functions, Character Input/ Output Functions and random access to files.

Problem solving –To implement a structure to read and display the name, salary and address of an Employee (Use nested structure for address),Copy the contents of one file to another, count the number of characters, words and lines in a file.

Text Books

1. C Programming: A Problem-Solving Approach, Behrouz A Forouzan, E V Prasad, Richard F Gilberg, CENGAGE learning.
2. Programming in C, Pradip Dey, Manas Ghosh, 2nd Edition, OXFORD Higher Education.

Reference Books

1. Programming in C, ReemaThareja, 2nd Edition, OXFORDHigher Education.
2. Programming in ANSI C, E Balaguruswamy, 7thedition, McGrawHill.
3. R G Dromey, How to Solve it by Computer, C A R Hoare, Prentice Hall International Series in Computing Science.

UNIVERSAL HUMAN VALUES 2: Understanding Harmony

(Common to CE, EEE, ME, ECE, CSE, IT)

I Year – I Semester

Lecture: 3 Internal Marks: 30

Credits: 3 External Marks: 70

Course Objectives:

1. To help students understand the need, basic guidelines, content and process of value education.
2. To help students initiate a process of dialog with in themselves to know what they really want to be in their life and profession.
3. To facilitate the students to understand harmony at all the levels of human living, and live accordingly.
4. Understand the harmony in nature and existence.
5. To facilitate the students in applying the understanding of harmony in existence in their profession and lead an ethical life.

Course Outcomes

On completion of this course, the students will be able to

- Be aware of themselves and surroundings
- Be Responsible in life
- Develop personality to be happy continuously and prosper
- Handle the problems with sustainable solutions.
- Possess human nature in mind
- Apply what they have learnt to their own self in real life situations

UNIT -1 :VALUE EDUCATION

Significance of Universal Human values, Value Education – Importance, content, Process. Self-exploration, Basic Human aspirations, Right understanding, Natural Acceptance.

Suggested topics for Tutorial/Practice sessions:

Learning HVLS from the Inspiring Life Sketches of great personalities:

Isaac Newton, Michael Faraday, JJ Thomson, Einstein, Madam Curie, Mahatma Gandhi, Abraham Lincoln, JF Kennedy, Martin Luther King, BR Ambedkar, Charles Darwin, Karl Marx, Helen Keller, Sam Pitroda, Mark Zuckerberg, SudhaMurty, Leonardo Davincy, Michelangelo, The eternal 3: Socrates, Plato, Aristotle, Alexander, Swami Vivekananda, Abdul Kalam, AB Vajapayee, Sergei Bubka.

UNIT -2: HARMONY IN MYSELF

Co-existence of the self and the Body, Understanding the needs of Self (I') and Body'-Sukh and Suvidha, Body as an instrument of 'I', Harmony in 'I' - Sanyam and Svasthya, correct appraisal of our Physical needs.

Suggested topics for Tutorial/Practice sessions:

Leadership through Literature:

ValmikiRamayan, VyasaMahaBharath- Bhagavad Gita, Answers of Yudhistir to Questions by Yaksha, Kaalidas- Raghu Vamsam, AbhignyanaSaakuntalam and MaalavikaAgnimitram, Homer- Iliad and Odyssey, Professionalism- Learning from the Jews, Buddha, The Bible- Jesus Christ, Solomon's wisdom, The Koran- Prophet Mohammad, Guru Nanak, John Milton, Shakespeare, Sigmond Freud, Robin Sharma, Ravindranath Tagore, SadguruJaggiVasudev, War and Peace by Leo Tolstoy, Unto the Last by Ruskin, Social Contracts by Rousseu, If by Rudyard Kipling, The 7 Habits of highly effective people by Stephen R Covey. Art of Rhetoric by Aristotle.

UNIT -3:HARMONY IN THE FAMILY AND SOCIETY

Family as the basic unit of human interaction, Harmony in the family, Justice, Trust, Respect, Intention vs competence, Respect is Differentiation.Extending relationship from family to society.Comprehensive human goal – identification, programs for achievement of the goal.Dimensions of Human endeavour, Harmony from family order to world family order.

Suggested topics for Tutorial/Practice sessions:

Ideal Home:

Characteristics of Happy families, Personal hygiene and habits, Harmony, Health and happiness, Advantages of combined families.VasudhaikaKutumbam- Universalism.VilasaVidya- Importance of hobbies, Music therapy. Influence of friends and peer groups- ideal friend, Friendship and faith, Avoiding vices, Advance Crime detection technologies, Law and legislation pertaining to students.

UNIT -4:HARMONY IN THE NATURE AND EXISTENCE

Harmony in the nature – orders in nature, existence as co-existence, co-existence of units in space, holistic perception of harmony at all levels of existence.

Suggested topics for Tutorial/Practice sessions:

Leadership through languages:

Atleast 5 poems/rhymes and 10 Sentences of each among atleast 10 of the following languages: Sanskrit, Telugu, Tamil, Malayalam, Kannada, Oriya, Bengali, Hindi, Urdu, Punjabi, Maratthi, Gujarati, Latin, Greek, Chinese, Japanese, Italian, Spanish, French and German. Bionics: Technology from animals. Interpretation of Paintings.

UNIT -5:IMPLICATIONS OF THE RIGHT UNDERSTANDING

Values in different dimensions of Human living,definitiveness of ethical human conduct,development of Human consciousness ,implications of value based living. Identification of comprehensive Human goal, Humanistic Education, humanistic constitution,humanistic universal order and its implications. Competence in professional Ethics, Holistic technologies and systems.

Suggested topics for Tutorial/Practice sessions:

Personality traits:

Ich Bin- Who am I? Know thyself. Self esteem, Sanyam: Self learning, self motivation, self control and self discipline, Thinking aloud, Team work, Discipline, Courage, Creativity, Sense of humour, Equanimity- love for animals and nature, Gratitude, Time and money management, Leadership skills, Importance of sports and games, Importance of Swimming, Writing and Public speaking skills, Quotable quotations: Those who quote only are quoted. Mpemba Effect – The Rags to riches concept. Commonalities of great personalities.Estimation of value of a person and his habits. SWOT Analysis.

Prescribed Text Book

1. R.R Gaur, R.Sangal and G.P.Bagaria; "A Foundation Course in Human Values and Professional Ethics", 2011, Excel Books, New Delhi.

Reference Books

1. A N Tripathy, 2003, Human Values, New Age International Publishers.
2. KVSG Murali Krishna, Mastering LIFE SKILLS ,Environmental Protection Society, Kakinada, 2015.
3. M Govindrajran, S Natrajan& V.S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.

FUNCTIONAL ENGLISH LAB
(Common to CE, EEE, ME, ECE, CSE, AI&DS, IT)
I Year – I Semester

Practical: 2 Internal Marks: 30
Credits: 1 External Marks: 70

Course Objectives

- Functional English (Lab) seeks to develop in the students the communication strategies and social graces necessary in order to function effectively in social and other situations in which they may be called upon to speak in English.
- It seeks to develop in them a greater awareness of English pronunciation and provides for focused practice with the sounds of English and intonation patterns improve their pronunciation skills and to enable them to speak with a reasonable degree of intelligibility.

Course Outcomes

Upon completion of Functional English (Lab), the students will be able to:

- give short impromptu speeches with confidence and fluency
- Take part in conversations in different functional contexts using English following appropriate communication strategies.
- use conventions of politeness and courtesy in speech and enhance the effectiveness of their communication in English
- articulate the sounds of English (vowels, consonants, and diphthongs) with accuracy
- check the pronunciation of words in a dictionary using their knowledge of phonemic symbols.
- pause at appropriate places in their speech in English, enhancing thereby the comprehensibility of their communication
- speak English with adequate attention to stress, rhythm, and intonation
- speak without their pronunciation being marred by regional peculiarities, achieving thereby greater intelligibility in their communication with non-Telugu speakers of English
- read out texts of different kinds fluently with appropriate pauses, stress, and intonation

Exercises:

1. a) Using expressions for :
    i) Greeting others
    ii) Taking leave
    iii) Introducing

   b) Pure vowels (identifying and pronouncing vowel sounds)
2. a) Using expressions for :
    a) Asking for information and
    b) Giving information

   b) Diphthongs (identifying and pronouncing diphthongs)
3. a) Using expressions for :
    a) Inviting
    b) Accepting and declining invitations

   b) Consonants (identifying and pronouncing consonants)

4. a) Using expressions for :
    a) Giving commands or instructions
    b) Requesting

   b) Accent and rhythm (speaking rhythmically)

5. a) Using expressions for :
    a) Giving suggestions
    b) Expressing opinions

   b) Intonation (using different tones in connected speech)

References

HariPrasad,M.,SalivendraRaju,J.,andSuvarnaLakshmi,G.(2013).*Strengthen Your Communication Skills*. Hyderabad: Maruthi Publications

Software used

1. 'Multimedia Language Lab': K-Van Solution, Hyderabad
2. 'Foundation Course in Communication Skills': Andhra Pradesh State Council of Higher Education (APSCHE), Government of Andhra Pradesh.

Note:

To be done in 42-45 periods.

1. Each laboratory session consists of 3 periods of 50 minutes; there is one lab session every week.
2. Where a section requires more number of periods than suggested above for one component and fewer for another, adjustments may be made in consultation with the Head of the Department.

C PROGRAMMING LAB
(Common to CSE, AI & DS and IT)
I Year I Semester

Practical: 4 Internal Marks: 30
Credits: 2 External Marks: 70

Course Objectives

- To design flowcharts, algorithms and knowing how to debug programs.
- To develop of C programs using arrays, strings pointers and function.

Course Outcomes

Upon successful completion of the course, the students will be able to

- apply problem solving steps to solve a problem.
- develop C programs using selection and iterative statements.
- decompose a problem into functions to develop modular reusable code.
- apply structures and unions to solve a problem.
- implement file operations on a given file.

Exercise 1: Basics of C

a) Write a C program to compute the perimeter and area of a rectangle with a length of 7cms and breadth of 5 cms.

b) The area of a triangle is given by Area = $\sqrt{p(p-a)(p-b)(p-c)}$, where p is half of the perimeter, or (a + b + c) / 2. Let a,b,c be the lengths of the sides of the given triangle. Write a C program to calculate the area of triangle using this herons Formula.

Exercise 2: Selection Statements

a) A triangle is a polygon with three edges and three vertices. It is one of the basic shapes in geometry. A triangle with vertices *A*, *B*, and *C* is denoted ΔABC. Triangles can be classified according to the lengths of their sides, An equilateral triangle has all sides the same length,An isosceles triangle has two sides of equal length and A scalene triangle has all its sides of different lengths. Write a Menu-Driven Program to display various geometrical shapes of a triangle.

b) Write a C Program to find maximum and minimum of three numbers using ternary operator.

c) Read two integer operands and one operator form the user, perform the operation and then print the result. (Consider the operators +, -, *, /, % and use switch statement).

Exercise 3: Iterative Statements-I

Develop a C Program for the following

a) Reversing digits of an integer.

b) An Armstrong number is a number that is sum of its own digits each raised to the power of number of digits. Write a C program to check whether the given number is Armstrong number or not.

For example

$9=9^1=9$

$371=3^3+7^3+1^3=27+343+1=371$

$8208=8^4+2^4+0^4+8^4=4096+16+0+4096=8028$

Exercise 4: Iterative Statements-II

Develop a C program for the following:

a) Display the n terms of harmonic series and their sum.
   1 + 1/2 + 1/3 + 1/4 + 1/5 +...+ 1/n terms.
b) To print following Inverted half pyramid using numbers.
   1 2 3 4 5
   1 2 3 4
   1 2 3
   1 2
   1
c) To print the Pascal triangle. A user will enter how many numbers of rows.

Exercise 5: Arrays

Design a C program for the following:

a) To print all unique elements in an array.
b) Computing mean and variance of a set of numbers.
c) To perform matrix multiplication using two dimensional arrays.

Exercise 6: Strings

Develop a C program for the following:

a) To check whether the given String is a Palindrome (Without using String Handling functions).
b) To insert sub-string into main string.

Exercise 7: Functions

Implement a C program for the following:

a) To convert decimal number to binary number using function.
b) To get the n^{th} largest element of an array using the function.
c) GCD of two non-negative integers using recursion.

Exercise 8: Pointers

Implement a C program for the following:

a) To print the sum of all elements of the array using pointers.
b) To count the number of vowels and consonants in a string using a pointer.
c) To find sum of n elements entered by user. To perform this program, allocate memory dynamically using malloc () function.

Exercise 9: Structures-I

Develop a C program for the following:

a) To implement a structure to read and display the name, salary and address of an Employee (Use nested structure for address).
b) To display the Name, Marks in five subjects and total marks of given number of students. (Using array of structures).

Exercise 10: Structures-II

Develop a C program thatuses functions to perform the following operations using structure:

i) Addition of two complex numbers
ii) Subtraction of two complex numbers.
iii) Multiplication of two complex numbers.
iv) Division of two complex numbers.

Exercise 11: Files

Implement a C program for the following:

a) To copy contents of one file to another.

b) To count the number of characters, words and lines in a given text file.

References

1. C Programming: A Problem-Solving Approach, Behrouz A Forouzan, E V Prasad, Richard F Gilberg, Cengage learning.
2. Programming in C, Pradip Dey, Manas Ghosh, 2nd Edition, Oxford Higher Education.
3. Programming in ANSI C, E Balaguruswamy, 7th edition, McGrawHill.
4. How to Solve it by Computer, R G Dromey, Prentice-Hall of India, 1999.

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Statistics using R Lab

I Year I Semester

Practical: 2 Internal Marks: 30
Credits: 1 External Marks: 70

Course Objectives:

- Understanding of descriptive statistics by practical application of quantitative reasoning and data visualization
- To familiarize with problem solving using R.

Course Outcomes

Upon completion of the course, the students will be able to

- Represent the data in graphical form to and make sense of it
- Compute measures of central tendency
- Compute measures of dispersion
- Implement characteristics of a distribution
- Implement regression analysis

Write R Programming for the following

1. Graphical representation of data.
2. Problems based on measures of central tendency.
3. Problems based on measures of dispersion.
4. Problems based on combined mean and variance and coefficient of variation.
5. Problems based on moments, skewness and kurtosis.
6. Fitting of polynomials, exponential curves.
7. Karl Pearson's correlation coefficient.
8. Correlation coefficient for a bivariate frequency distribution.
9. Lines of regression, angle between two lines of regression and estimated values of variables.
10. Spearman rank correlation with and without ties.
11. Partial and multiple correlations.
12. Planes of regression and variances of residuals for given simple correlations.

References

1. R for everyone: Advanced Analytics and Graphics(Addison-Wesley Data & Analytics Series) 2nd Edition
2. BeginningR the Statistical Programming Language, Dr. Mark Gardener.
3. Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7thEdn.), Pearson Education, Asia.
4. Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rdEdn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
5. Myer, P.L. (1970): Introductory Probability and Statistical Applications, Oxford & IBH Publishing, New D

PROFESSIONAL COMMUNICATION

(Common to CE, EEE, ME, ECE, CSE, IT, AI&DS, IoT)

I Year- II Semester

Lecture: 2	Internal Marks: 30
Credits: 2	External Marks: 70

Course Objectives

- To equip the students with common employability skills (the skills required for gaining employment and performing successfully in different careers) which can enable them to perform communication tasks of increasing length andcomplexity.
- To develop in them the interactional communication strategies and social graces which have the potential to add to the effectiveness of professional communication

Course Outcomes

Upon completion of Professional Communication, the students will be able to:

- speak with a reasonable degree of fluency and accuracy in professional communication situations (such as arriving at a consensus through discussion, making a presentation, and taking part in a telephoneconversation)
- Add to the effectiveness of their oral communication by using communication strategies, conventions of politeness and courtesy, and stress andintonation.
- listen to short audio and video clips in native English accent (British and American), and gain both understanding of messages and sensitivity to native-speakeraccents
- read fluently, comprehending texts of different kinds using multiple strategies and higher-orderskills
- produce written discourses of different kinds (e.g. texts expressing opinions and making a convincing case for one's standpoint, professional emails, and summaries of lengthy texts) with attention to elements of writing such as content, organization, language, style, andmechanics
- guard against grammatical errors Indians typically make in their speech and writing in English

Unit – I

Listening: Listening Comprehension – Task 1 (IWE - Chapt VII)
Speaking: Communication Strategies: Conversation Amith& Mahesh (IWE – Chap VII)
Reading: Reading Comprehension – Task 1 (IWE – Chapt VII)
Vocabulary: (a) GRE Words – 1.3, (b) Collocations – 2.3 (VB)
Grammar: If Clause (IWE – Chapt VII)

Writing: Email writing (IWE – Chapt VII)

Unit-II
Listening: Listening comprehension – Task 2 (WR)
Speaking: Exercise on Communication Strategies (IWE – Chapt VII)
Reading: Reading Comprehension – Task 2 (DPM)
Vocabulary: Words often confused – 3.3, One-word substitutes – 4.3 (VB)
Grammar: Modal verbs (IWE – Chap VII)
Writing: Email writing and Argumentative Essay (IWE – Chapt VII)

Unit-III

Listening: Listening Comprehension – Task 3 (WR)
Speaking: Communication Strategies – Exercise (DPM)
Intensive Reading: Reading Comprehension Task – 3 (DPM)
Extensive Reading: Pride and Prejudice by Jane Austen
Vocabulary: (a) Idioms – 5.3, (b) Phrasal verbs – 6.3 (VB)
Grammar: Indianism (IWE – Chapt VII)
Writing: Argumentative Essay (DPM)

Unit-IV
Listening: Listening Comprehension – Task 4 (IWE - Chapt VIII)
Speaking: Communication Strategies and Presentation: Conversation between Suchitra, Lakshmi, Guhan and Karan ((IWE – Chapt VIII)
Reading: Reading Comprehension – Task 4 (DPM)
Vocabulary: (a) GRE words – 1.2, (b) Collocations – 2.2, (c) Words Often Confused – 3.2 (VB)
Grammar: Indefinite Articles (IWE – Chapt VIII)
Writing: Presentation – Analysis (DPM)

Unit-V
Listening: Listening comprehension – Task 5 (WR)
Speaking: Communication Strategies – Exercise (IWE – Chapt VIII)
Intensive Reading: Reading Comprehension – Task 5 (DPM)
Extensive Reading: Gulliver's Travels by Jonathan Swift
Vocabulary: (a) One-Word Substitutes – 4.4, (b) Idioms – 5.4, (c) Phrasal verbs – 6.4 (VB)
Writing: Presentation – Rewriting

References

- IWE – Innovate with English by T Samson (Foundation)
- Chapt – Chapter
- DPM – Department-produced materials (handouts)
- WR – Web-resources
- VB – Vocabulary Builder for Students of Engineering and Technology by Vijaya Lakshmi et al (Maruthi)

INTEGRAL TRANSFORMS AND VECTOR CALCULUS

(Common to CE, EEE, ME, ECE, IoT, CSE, AI&DS, IT)

I Year – II Semester

Lecture: 3+1 Internal Marks: 30

Credits: 4 External Marks: 70

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Course Objectives

- To gain the knowledge of Laplace and inverse transforms.
- To understand the concepts of Fourier series and Fourier Transforms.
- To know about vector differentiation and integration.

Course Outcomes

Upon completion of the course, the students will be able to

- evaluate improper integrals using laplace transforms.
- apply laplace transforms to find the solutions of initial and boundary value problems.
- find the Fourier series representation of a function in one variable and apply Fourier transform in various engineering problems.
- apply the concepts of vector differentiation in their engineering fields.
- verify the relation between line, surface and volume integrals using integral theorems.

UNIT–I: Laplace Transforms

Laplace transforms of standard functions – Shifting Theorems - Multiplication and division by t, transforms of derivatives and Evaluation of Improper Integrals - Unit step function – Dirac Delta function.

UNIT– II: Inverse Laplace Transforms

Inverse Laplace transforms – by partial fractions – Convolution theorem (without proof). Application: Solution of Initial value problems and Boundary value problems.

UNIT–III: Fourier Series and Fourier Transforms

Fourier series: Fourier series in an arbitrary interval, Half-range sine and cosine series. Fourier integral theorem (only statement). Fourier transforms and inverse Fourier transforms, Fourier sine and cosine transforms and inverses. A property of Fourier transforms.

UNIT–IV: Vector Differentiation

Gradient – unit normal – angle between surfaces – directional derivative. Divergence – solenoidal vector. Curl – irrotational vector – scalar potential. Laplacian operator.

UNIT–V: Vector Integral theorems

Greens theorem, Stokes theorem and Gauss Divergence Theorem- related problems. Applications: Work done, flux across the surface.

Text Books

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th edition, MaitreyPrintech Pvt. Ltd, Noida, 2013.
2. B.S. Grewal, Higher Engineering Mathematics, 43 nd edition, Khanna Publishers, New Delhi, 2014.

Reference Books

1. Schaum's Series, Differential Eqtions, Tata-Mc Graw Hill Company Limited.
2. Bali &Iyengar,Text Book of Engineering Mathemtics, Laxmi Publications (P) Ltd.

LINEAR ALGEBRA
I Year- II Semester

Lecture: 2 +1 Internal Marks: 30
Credits: 3 External Marks: 70

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Course Objectives

- To discuss the consistencyof the system of equations and to find the solution.
- To know the procedure of finding the coordinates of a vector for a given basis.
- To understand the kernel and image of a Linear Transformation.
- To know about the orthogonal projection and orthonormal basis.
- To understand the procedure of diagonalization.

Course Outcomes

Students will be able to

CO1: Iidentify whether the given system of equations are consistent or not. If so, ableto find the solution.
CO2: Describe the coordinates of a vector for a given basis.
CO3:Find the kernel and image of a Linear Transformation.
CO4:Compute the orthogonal projection and find the orthonormal basis by Gram–Schmidt orthogonalization process.
CO5:Perform the diagonalization of matrices.

UNIT – 1: System of Linear Equations

Matrices and elementrary row operations, Rank, Echelon form, Normal form, System of linear equations – Homogeneous, Non -homogeneous equations, Consistency.

UNIT – 2: Vector Spaces

Vector Spaces and Subspaces, Linear combination of vectors, Linear dependence, Basis and Dimension, Definition of a Line, Introduction to Affine Spaces, Quotient Space.

UNIT – 3: Linear Transformations

Representation of Linear Maps by matrices, Kernel and Image of a Linear Transformation, Linear Isomorphism, and Geometric Ideas.

UNIT – 4 : Inner Product Spaces

The Euclidean Plane and the Dot Product, General Inner Product Spaces, Orthogonality, Orthogonal Projection onto a line, Orthnormal Basis, Orthogonal Complements and Projections, Coordinates Associated with an Orthonormal Basis, Some Geometric Applications.

UNIT – 5: Diagonalization(Theorems and properties are without proofs)

Rotation of Axes of Conics, Eigenvalues and Eigenvectors, and its properties, Cayley-Hamilton Theorem, Diagonalization of Symmetric Matrices.

Text Books

1. S. Kumaresan, Linear Algebra-A Geometric Approach, PHI publication, Eastern Economy Edition.
2. V. Krishnamurthy, V.P Mainsa and I.L. Arora, An Inroduction to Linear Algebra, Affiliated East-West press, Reprint 2005.

Reference Books

1. B. S. Grewal, Higher Engineering Mathematics, 42nd editionKanna publications.
2. Seymour Lipschutz, Linear Algebra, Schaum's solved problem series, Tata McGraw Hill Edition.
3. Gilbert Strang, Introduction to Linear Algebra, Wellesley-Cambridge Press(2016)

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PYTHON PROGRAMMING
(Common to CSE, AI&DS)
I Year II Semester

Lecture: 3 Internal Marks: 40
Credits: 3 External Marks: 60

Course Objectives

- To introduce scripting language.
- To explore variousproblems solving approaches in python programming.
- To apply object-oriented programming concepts in problem solving.

Course Outcomes

Upon completion of the course, the students will be able to

- demonstrate the basic elements of python and analyze different ways of building logic for executing programs.
- use functions and modules to develop python programs.
- differentiate mutable and immutable data types.
- develop code to handle exceptions and files.
- apply object-orientedconcepts to develop programs.

UNIT–I: Basics of Python Programming and Control Statements

Features and history of python,literal constants, data types, variables, operators,operator precedence,expressions, type conversion,command line arguments,input and output operation.

Conditional Statements: simple-if, if-else, nested-if and if-elif-else.

Iterative statements: while, for and else with for and while, un-conditional branching: break, continue and pass statement.

UNIT–II: Functions and Modules

Functions-Function definition, call, return statement, local and global variables, Types of arguments, Types of Functions: Anonymous, Fruitful, Recursive function and Passing functions as arguments.

Modules - The from…import statement, making your own modules, dir() function, modules and namespaces, types of namespaces: global, local and built-in, packages and modules, introduction to PIP, installing packages via PIP.

UNIT–III: Data Structures

Mutable and Immutable data structures, declaring and using numeric data types: int, float, complex.Strings, list, tuple, dictionary.

Set and string: usage, conversions, built-in methods and differences, list and dictionary comprehensions.

UNIT-IV: Exception and File Handling

Exception Handling-Difference between an error and exception, handling Exception, try except block, raising exceptions and user defined exceptions.

File Handling - Significance of files, types of files, file path, file modes.

Understanding read functions: read(), readline() and readlines().

Understanding write functions: write() and writelines(), manipulating file pointer using seek.

UNIT-V: Object Oriented Concepts

OOP principles,classes, objects, 'self' variable, methods, constructor method, inheritance,

overriding methods, data hiding.

Text Books

1. "Python Programming – Using Problem Solving Approach ",Reema Thareja, Oxford University Press, 2014 Edition.
2. "Python Programming: A Modern Approach", Vamsi Kurama, Pearson.

Reference Books

1. "Core Python Programming" Wesley J. Chun, 2nd Edition, Prentice Hall.
2. "Python: The Complete Reference", Martin C. Brown, 2001 Edition, McGraw Hill.
3. 'Fundamentals of Python – First Programs", Kenneth A. Lambert, 2012 Edition, Cengage.
4. "Python Crash Course:AHands-on, Project-Based Introduction to Programming", Eric Matthes.

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DATA STRUCTURES
(Common to CSE,AI &DS and IT)
I Year II Semester

Lecture: 3 Internal Marks: 30
Credits: 3 External Marks: 70

Course Objectives

- To impart the basic concepts of data structures.
- To solve problems with the help of fundamental data structures.

Course Outcomes

Upon completion of the course, the students will be able to

- write algorithms for searching and sorting techniques.
- implement stacks, queues and linked list.
- develop algorithms for systematic traversal of a graph.
- apply hashing techniques for efficient storage of data.
- perform the operations on binary search trees.

UNIT – I: Sorting and Searching

Introduction- Concept of data structures, overview of data structures.
Searching: Linear Search, Binary Search.
Sorting (Internal): Basic concepts, Sorting by: insertion (Insertion sort), selection (selection sort), and exchange (Bubble sort).

UNIT – II: Linked Lists

Linked Lists- Basic concepts, operations on Single Linked List, Circular Linked List and Double Linked List.

UNIT – III: Stacks and Queues

Stack: Introduction, representation using Arrays and Linked List, operations on Stack, Applications of Stacks- Expression Conversion and evaluation – corresponding algorithms.
Queue: Introduction, representation using Arrays and Linked List, operations on Queue, Circular Queue.

UNIT - IV: Trees

Binary Trees: Basic tree concepts, Properties, Representation of Binary Trees using Arrays and Linked List, Binary Tree Traversals, Creation of Binary Tree from in-order and pre (post) order traversals.
Binary Search Trees: Basic concepts, BST operations: Search, Insertion, Deletion and Traversals.
Heap Trees: Basic Concepts, operations, Application-Heap sort.

UNIT - V: Graphs and Hashing

Graphs- Basic concepts, representations of graphs, graph traversals-Breadth First Search and Depth First Search techniques.
Hashing: Basic concepts, Hashing Functions (Division Method, Multiplication Method), Collision Resolution Techniques- Open Hashing and Closed Hashing.

Text Books

1. Horowitz, Sahani, Anderson Freed, "Fundamentals of Data Structure in C", 2nd Edition, University Press.
2. Richard F, Gilberg, Forouzan, "Data Structures", 2ndEdition, Cengage.

Reference Books

1. G. A. V. Pai, “Data Structures and Algorithms”, TMH, 2008.
2. Debasis Samanta, “Classic Data Structures“, 2nd Edition, PHI, 2011.

PROFESSIONAL COMMUNICATION LAB
(Common to CE, EEE, ME, ECE, CSE, IT, AI&DS, IoT)
I Year- I Semester

Practical: 4 Internal Marks: 30
Credits: 2 External Marks:70

Course Objectives

Professional Communication (Lab) is a career-oriented programme. It seeks to develop in the students the competence required to perform professional communication tasks of increasing length and complexity, which can help them secure employment and perform successfully in their careers.

Course Outcomes

Upon completion of Professional Communication (Lab), the students will be able to

- enhance the effectiveness of their communication through body language;
- take part in interactional communication (i.e. communication that serves the purpose of social interaction or small talk) with fluency
- take part in transactional communication (i.e. communication that serves the purpose of carrying out functions such as giving directions, complaining, and apologizing) with fluency
- speak professionally in telephone conversations;
- make effective presentations using a range of strategies, including a good organization of the content, impressive opening and closing, the use of suitable visual aids, the use of stories/anecdotes to illustrate a point, effective use of body language, and good handling of the question-and-answer session;
- take part in group discussions and debates successfully;
- answer questions at an elementary level in job interviews (e.g. Can you tell us something about yourself? What kinds of things do you worry about? What are your key skills? What skills do you need to improve? What do you see as your strengths? What do you like doing in your spare time? How would you describe the way you work? Tell us about a time when you showed strong leadership skills. Tell us about a time when you had to make a difficult decision. How do you see yourself in five years' time?) ;and
- use team-building skills with impact in different situations.

1. **Body Language**
    a) Knowing how to use body language in communication
    b) Interpreting non-verbal symbols

2. **Dialogues**
    a) Starting a conversation
    b) Useful functions
    c) Telephone etiquette
    d) Making small talk

3. **Presentation Skills**
    a) Presentation: Learning the dynamics
    b) Individual presentations (oral)
    c) Group presentations using PPTs

4. **Group Discussion**
    a) Group discussion: Learning the dynamics
    b) Performing: Guided group discussion
    c) Performing: Free group discussion

5. **Interviews**
    a) Learning various types of interviews & answering some frequently asked questions
    b) Participating in mock interviews
    c) Participating in telephonic Interviews
6. **Debates**
    a) Debating: Learning the dynamics
    b) Participating in guided debates
    c) Participating in free debates

References

HariPrasad,M.,SalivendraRaju,J.,andSuvarnaLakshmi,G.(2013).Strengthen Your Communication Skills. Hyderabad: Maruthi Publications

Software used

1. 'Multimedia Language Lab': K-Van Solution,Hyderabad
2. 'Foundation Course in Communication Skills': Andhra Pradesh State Council of Higher Education (APSCHE)

Note

1. To be done in 56-58 periods.
2. Each laboratory session consists of 2 periods of 50 minutes each; there are two lab sessions in a week.
3. Where a section requires more number of periods than suggested above for one component and fewer for another, adjustments may be made in consultation with the Head of the Department

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PYTHON PROGRAMMING LAB
(Common to CSE, AI&DS)
I Year II Semester

Practical: 4 | Internal Marks: 30
Credits: 2 | External Marks: 70

Course Objectives

- To familiarize with the basic commands of the Python.
- To develop Python programs to solve problems.

Course Outcomes

Upon completion of the course, the students will be able to

- learn different IDE used for python programming.
- apply problem solving steps to solve a problem.
- develop a python program for a given problem.
- apply object-oriented concepts to develop programs.

Exercise 1: Basics and operations

a) Write a python program to find sum of two numbers using command line arguments.
b) Write a python program to compute distance between two points taking input from the user. Formula for Pythagorean theorem for compute distance between two points is: $\sqrt{((x2 - x1) ** 2) + ((y2 - y1) ** 2)}$.

Exercise 2: Selection statements

a) Write a python program to test whether a given number is even or odd using if-else statement.
b) To calculate grade of students in python, you have to ask from user to enter marks obtained in 5 subjects and calculate the sum of all the marks and then average marks to find the grade according to the average marks obtained by student as shown in the given below.

Percentage	Grade
≥ 90	O
≥ 80 & < 90	A+
≥ 70 & < 80	A
≥ 60 & < 70	B+
≥ 50 & < 60	B
≥ 45 & < 50	C
≥ 40 & < 45	P
< 40	F

Exercise 3: Iterative Control Statements

a) Write a python program to print out the decimal equivalents of 1/2, 1/3, 1/4, . . . ,1/10 using for loop.
b) Write a python program to find the sum of all the primes below hundred.

Exercise 4: Functions

a) Write a python program to compute cumulative product of a list of numbers (write function cumulative_product).
b) Write a python program that uses function to find the sum of the even-valued terms in the Fibonacci sequence whose values do not exceed ten thousand.

Exercise 5: Packages and Modules

a) Create and access a user defined package ArithmeticPackage where the package contains a module named ArithmeticDemo, which inturn contains a method called sumtwo() , subtwo(), multwo() and divtwo() which takes two numbers as parameter and returns the result.
b) Write a python program to compute GCD, LCM of two numbers (Each function shouldn't exceed one line use predefined module).

Exercise 6: Strings

a) Write a python program to accept a string from a user and re-display the same after removing vowels from it.
b) Write a python programto calculate the length of a string using recursion and check whether the given number is palindrome or not.

Exercise 7: Data Structures-Tuple, List and Dictionary

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) <= (sum of their radii) then (they are colliding)
b) Write a python program to find mean, median, mode for the given set of numbers in a list.
c) Write a python program to count the number of characters in the string and store them in a dictionary.

Exercise 8: Exceptional Handling

a) Write a python program to handle multiple errors with one except statement.
b) Write a python program to create a user-defined exception named "ShortInputException" that raises when the input text length is less than 3.

Exercise 9: File Handling

a) Write a program to print each line of a file in reverse order.
b) To install the package pandas write a pythonprogram to calculate the mean and standard deviation for list of numbers stored in excel file named data.xlsx.(Use JupyterNotebook or Spyder tool in Anaconda Navigator)

Exercise 10: Object Oriented Programming

a) Write a python program to store the name and marks of students using classes. (Use list to store marks in 3 subjects).
b) WeCare insurance company wants to calculate premium of vehicles. Vehicles are of two types – "Two-Wheeler" and "Four-Wheeler". Each vehicle is identified by vehicle id, type, cost and premium amount.Premium amount is 2% of the vehicle cost for two wheelers and 6% of the vehicle cost for four wheelers. Calculate the premium amount and display the vehicle details.Write a python program to implement the class chosen with its attributes and methods.
   Note:
   1. Consider all instance variables to be private and methods to be public
   2. Include getter and setter methods for all instance variables.

References

1. “Python Programming – Using Problem Solving Approach “,Reema Thareja, Oxford University Press, 2014 Edition.
2. “Python Programming: A Modern Approach”, Vamsi Kurama, Pearson.

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DATA STRUCTURES LAB
(Common to CSE,AI &DS and IT)
I Year II Semester

Practical:4 Internal Marks:30
Credits:2 External Marks: 70

Course Objectives

- To implement different searching and sorting algorithms.
- To implement linear and non-linear data structures.

Course Outcomes

Upon completion of the course, the students will be able to

- implement sorting and searching algorithms.
- develop suitable code to simulate the operations on linked lists.
- implement stacks and queues using arrays and linked lists.
- write code using a stack for arithmetic expressions evaluation and conversion.
- perform operations on binary search trees and graphs.
- create a hash table and perform operations on it.

Write a C program for the following

Exercise - I

1. Develop recursive and non-recursive functions to perform search for a Key value in a given list using
   (i) Linear Search
   (ii) Binary Search

Exercise - II

2. Implement the following sorting techniques to sort a given list of integers in ascending order
   (i) Bubble sort
   (ii) Insertion sort
   (iii) Selection sort

Exercise - III

3. Use functions to
   (i) Create a singly linked list.
   (ii) Insert an element into a singly linked list.
   (iii) Delete an element from a singly linked list.

Exercise- IV

4. Use functions to
   (i) Create a circular linked list.
   (ii) Insert an element into a circular linked list.
   (iii) Delete an element from a circular linked list.

5. Use functions to
   (i) Create a Doubly linked list.
   (ii) Insert an element into a doubly linked list.
   (iii) Delete an element from a doubly linked list.

Exercise - V

6. Implement stack (its operations) using arrays.
7. Implement Queue (its operations) using linked lists.

Exercise - VI

8. To Convert infix expression into postfix expression.
9. To evaluate postfix expression.

Exercise – VII

10. Create a Binary Search Tree of integers and perform the following operations
    (i) insert (ii) delete (iii). Search (iv) traversals (pre-order, in-order, post-order)

Exercise - VIII

11. Implement the DFS and BFS Traversals on Graphs.

Exercise - IX

12. Implement Heap sort to sort given set of integers.
13. Create a Hash Table to perform the following operations
    (i) Insertion
    (ii) Deletion
    (iii) Search

References

1. Horowitz, Sahni, Anderson Freed, "Fundamentals of Data Structure in C", 2nd edition, University Press.
2. Richard F, Gilberg ,Forouzan, "Data Structures", 2nd edition, Cengage.