**ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI**
**(AUTONOMOUS)**
**B.Tech-CSE(DATA SCIENCE)**
# (Effective for the batches admitted in 2022-23)

**Semester II (First year)**

| Sl. | Category | Course Code | Course Title | Hours per week | | | Credits | CIE | SEE | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | C | | | |
| 1 | BS | 20ABS9904 | Chemistry | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 2 | BS | 20ABS9911 | Probability and Statistics | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 3 | ES | 20AES0505 | Information Technology and Numerical Methods | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 4 | ES | 20AES0502 | Data Structures | 3 | 0 | 0 | 3 | 30 | 70 | 100 |
| 5 | ES | 20AES0509 | Python Programming | 1 | 0 | 4 | 3 | 30 | 70 | 100 |
| 6 | ES LAB | 20AES0506 | Computer Science and Engineering Workshop | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 7 | BS LAB | 20ABS9909 | Chemistry Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 8 | ES LAB | 20AES0504 | Data Structures Lab | 0 | 0 | 3 | 1.5 | 30 | 70 | 100 |
| 9 | MC | 20AMC9903 | Environmental Studies | 2 | 0 | 0 | 0 | 30 | 0 | 30 |
| | | | **Total credits** | | | | **19.5** | **270** | **560** | **830** |

AITS TPT - CSE (DS)

| Course Code | Chemistry | | L | T | P | C |
|---|---|---|---|---|---|---|
| 20ABS9904 | | | 3 | 0 | 0 | 3 |
| Pre-requisite | Basics of chemical formulas and equations | Semester | I – II | | | |

**Course Outcomes (CO):**

**CO1:** Interpret the behaviour and interactions between matter and energy at both the atomic and molecular levels between mater and energy at both the atomic and molecular levels
**CO2:** Apply the electrochemical principles to the construction of betteries, fuel cells and electrochemical sensors
**CO3:** Outline the preparation ,mechanism properties and applications of polymer and conducting polymer
**CO4:** Analyze the separation of gaseous and liquid mixtures using instrumental methods and their applications
**CO5:** Understand the disadvantages of using hardwater in domestically and industrially and select suitable treatment

| UNIT – I | Structure and Bonding Models | 10 Hrs |
|---|---|---|

Planck's quantum theory, Schrodinger wave equation, significance of $\Psi^1$ and $\Psi^2$ , applications to hydrogen, particle in a box and their applications for conjugated molecules, crystal field theory – salient features – energy level diagrams for transition metal ions – splitting of orbital's in tetrahedral and octahedral complexes, magnetic properties, molecular orbital theory – bonding in homo- and heteronuclear diatomic molecules – energy level diagrams of $O_2$ , $N_2$ and CO, calculation of bond order.

| UNIT – II | Electrochemistry and Applications | 10 Hrs |
|---|---|---|

Electrodes – concepts, reference electrodes (Calomel electrode, Ag/AgCl electrode and glass electrode) electrochemical cell, Nern'st equation, cell potential calculations, numerical problems, concept of pH, pH meter and applications of pH metry (acid-base titrations), potentiometry- potentiometric titrations (redox titrations), concept of conductivity, conductivity cell, conductometric titrations (acid-base titrations), photovoltaic cell – working and applications, photogalvanic cells with specific examples. Electrochemical sensors – potentiometric sensors with examples, amperometric sensors with examples.

**Primary cells** – Zinc-air battery, alkali metal sulphide batteries, button cells, Fuel cells, hydrogen-oxygen, methanol fuel cells – working of the cells.

**Secondary cells** – lead acid, nickel-metal hydride and lithium ion batteries- working of the batteries including cell reactions

| UNIT – III | Polymer Chemistry | 10 Hrs |
|---|---|---|

Introduction to polymers, functionality of monomers, chain growth and step growth polymerization, coordination polymerization, copolymerization (stereospecific polymerization) with specific examples and mechanisms of polymer formation.

Plastics - Thermoplastics and Thermo settings, Preparation, properties and applications of – Bakelite, urea-formaldehyde, Nylon-66, carbon fibres, Elastomers–Buna-S, Buna-N–preparation, properties and applications.

Conducting polymers – polyacetylene, polyaniline, polypyrroles – mechanism of conduction and applications.

| UNIT – IV | Instrumental Methods and Applications | 10 Hrs |
|---|---|---|

Beer-Lambert's law,, Principle and applications of UV-Visible spectrophotometer, Principle and applications of Colorometry, AAS, AES, Instrumentation ,Principles and applications of Chromatographic techniques(GC & HPLC), Methods for separation of gaseous mixtures and liquid mixtures.

| UNIT – V | Water Technology | 10 Hrs |
|---|---|---|

Introduction –Soft Water and hardness of water, Estimation of hardness by EDTA Method - Boiler troubles - scale and sludge, Industrial water treatment – specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electrodialysis.

**Textbooks:**


1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.
3. Engineering Chemistry by G V Subba Reddy, K N Jayaveera and C Ramachandraiah, Mc Graw Hill education(India) Private Limited.


**Reference Books:**


1. J. D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008.
2. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
3. Ben L. Feringa and Wesley R. Browne, Molecular Switches, 2/e, Wiley-VCH, 2011.
4. Willard Merritt Dean Settle, 7 th Edition Instrumental methods for analysis


**Mapping of course outcomes with program outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | | | | | | | | | | | | |
| CO2 | 3 | | | | 2 | | | | | | | | | |
| CO3 | 3 | | 2 | | | | | | | | | | | |
| CO4 | 3 | | | | 3 | | | | | | | | | |
| CO5 | 3 | | 2 | | | | | | | | | | | |

**(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)**

AITS R-19 CSE (UG)

| Course Code | Probability And Statistics | | L | T | P | C |
|---|---|---|---|---|---|---|
| 20ABS9911 | | | 3 | 0 | 0 | 3 |
| Pre-requisite | Probability | Semester | I - II | | | |

**Course Outcomes (CO):**

**CO1:** Interpret the characteristics through correlation and regression tools.
**CO2:** Make use of the concepts of probability and their applications.
**CO3:**Apply discrete and continuous probability distributions.
**CO4:** Inference the components of a classical hypothesis test for large sample
**CO5:** Inspect the components of a classical hypothesis test for small samples.

**UNIT – I** 10 Hrs

**Descriptive statistics and methods for data science**

Data science, Statistics Introduction, Population vs Sample, Collection of data, primary and secondary data, Type of variable: dependent and independent Categorical and Continuous variables, Data visualization, Measures of Central tendency, Measures of Variability (spread or variance) Skewness Kurtosis, correlation, correlation coefficient, rank correlation, regression coefficients, principle of least squares, method of least squares, regression lines

**UNIT – II** 8 Hrs

**Probability**

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous), probability density functions, properties, mathematical expectation.

**UNIT – III** 8 Hrs

**Probability distributions**

Probability distribution - Binomial, Poisson approximation to the binomial distribution and normal distribution-their properties.

**UNIT – IV** 8 Hrs

**Estimation and Testing of hypothesis, large sample tests**

Estimation-parameters, statistics, sampling distribution, point estimation, Formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors and power of the test. Large Sample Tests: Test for single proportion, difference of proportions, test for single mean and difference of means. Confidence interval for parameters in one sample and two sample problems

**UNIT – V** 8 Hrs

**Small sample tests**

Student t-distribution (test for single mean, two means and paired t-test), testing of equality of variances (F-test), x2 - test for goodness of fit.

**Textbooks:**


1. Miller and Freunds, Probability and Statistics for Engineers,7/e, Pearson, 2008.
2. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand & Sons Publications, 2012.


**Reference Books:**


1. S. Chand ,Probability and Statistics, Dr.T.K.V. Iyengar, Dr.B. Krishna Gandhi, S. Ranganatham, Dr.M.V.S.S.N. Prasad
2. S. Ross, a First Course in Probability, Pearson Education India, 2002.
3. W. Feller, an Introduction to Probability Theory and its Applications, 1/e, Wiley, 1968.


**Online Learning Resources:**

www.nptel.ac.in

**Mapping of course outcomes with program outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | | | | | | | | | | | | |
| CO2 | | 2 | | | | | | | | | | | | |
| CO3 | | 2 | | | | | | | | | | | | |
| CO4 | | | 3 | | | | | | | | | | | |
| CO5 | | | 3 | | | | | | | | | | | |

**(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)**

AITS TPT CSE (DS)

| Course Code | Information Technology And Numerical Methods | | L | T | P | C |
|---|---|---|---|---|---|---|
| 20AES0505 | | | 3 | 0 | 0 | 3 |
| **Pre-requisite** | **Basic Computer Knowledge** | **Semester** | **I - II** | | | |

**Course Outcomes (CO):**

**CO1:** Usage of Digital World and Exploring Cyber space
**CO2:** Explain the needs of hardware and software required for a computation task.
**CO3:** Peripheral devices, networking and internet concepts

**UNIT – I** — 8 Hrs

**INTRODUCTION TO INFORMATION TECHNOLOGY Your Digital World:** The Practical User: How Becoming Computer Savvy Benefits You, Information Technology & Your Life: The Future Now, Infotech Is All Pervasive: Cell phones, Email, the Internet, & the E-World, The "All-Purpose Machine": The Varieties of Computers, Understanding Your Computer: How Can You Customize (or Build) Your Own PC?, Where Is Information Technology Headed?
**THE INTERNET & THE WORLD WIDE WEB Exploring Cyberspace:** Connecting to the Internet: Narrowband, Broadband, & Access Providers, How Does the Internet Work? The World Wide Web, Email & Other Ways of Communicating over the Net, The Online Gold Mine: Telephony, Multimedia, Webcasting, Blogs, E-Commerce, & the Social Web, The Intrusive Internet: Snooping, Spamming, Spoofing, Phishing, Pharming, Cookies, & Spyware.

**UNIT – II** — 9 Hrs

**SOFTWARE Tools for Productivity & Creativity:** SOFTWARE: TOOLS FOR PRODUCTIVITY & CREATIVITY, **System Software:** The Power Behind the Power, The Operating System: What It Does? Other System Software: Device Drivers & Utility Programs, Common Features of the User Interface, Common Operating Systems, Application Software: Getting Started, Word Processing, Spreadsheets, Database Software, Specialty Software
**HARDWARE:** THE CPU & STORAGE How to Choose a Multimedia Computer System: HARDWARE: THE CPU & STORAGE: HOW TO CHOOSE A MULTIMEDIA COMPUTER SYSTEM, Microchips, Miniaturization, & Mobility, the System Unit: The Basics, More on the System Unit, Secondary Storage, Future Developments in Processing & Storage

**UNIT – III** — 8 Hrs

**HARDWARE: INPUT & OUTPUT Taking Charge of Computing & Communications:** Input & Output, Input Hardware, Output Hardware, Input & Output Technology & Quality of Life: Health & Ergonomics, The Future of Input & Output
**COMMUNICATIONS, NETWORKS, & SAFEGUARDS The Wired & Wireless World:** From the Analog to the Digital Age, Networks, Wired Communications Media, Wireless Communications Media, Cyber Threats, Hackers, & Safeguards

**Mapping of course outcomes with program outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | | | 2 | | | | | | | 2 | 2 | |
| CO2 | 3 | 3 | 2 | | | | | | 2 | | | 2 | 2 | |
| CO3 | 3 | 2 | | | 2 | | | | | | | 2 | | |

**(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)**

| 20AES0505 | Numerical Methods | |
|---|---|---|
| **Pre-requisite** | **Basic Statistics** | I-I |

**Course Outcomes:**

**CO4:** Analyze the concepts of Errors, Algebraic & Transcendental Equations to solve different Engineering problems
**CO5:** Analyze Interpolation using the concepts of the numerical methods and apply the Integration in numerical methods
**CO6:** Apply the concepts of O.D.E on numerical method

**UNIT – I** — 8 Hrs

**Errors in Numerical computations:** Errors and their Accuracy, Mathematical Preliminaries, Errors and their Analysis, Absolute, Relative and Percentage Errors, A general error formula, Error in a series approximation.
**Solution of Algebraic and Transcendental Equations:** The Bisection Method – The Method of False Position– Newton-Raphson Method, Solution of linear simultaneous equation: Crout's triangularisation method, Gauss - Seidal iteration method.

**UNIT – II** — 8 Hrs

**Interpolation:** Newton's forward and backward interpolation formulae – Lagrange's formulae. Gauss forward and backward formula, Stirling's formula, Bessel's formula.
**Curve fitting:** Fitting of a straight line – Second degree curve – Exponential curve-Power curve by method of least squares. Numerical Differentiation for Newton's interpolation formula. Numerical Integration: Trapezoidal rule – Simpson's 1/3 Rule – Simpson's 3/8 Rule.

**UNIT – III** — 8 Hrs

ATSTRI CET (OS)

**Numerical solution of Ordinary Differential equations:** Solution by Taylor's series-Picard's Method of successive Approximations-Euler's Method- Runge - Kutta Methods. Numerical solutions of Laplace equation using finite difference approximation. Initial Value Problem, Eigen Value Problem and Boundary-value Problem

**Textbooks:**

1. Using Information Technology 9th Edition By Brian Williams and Stacey Sawyer, Mcgraw Hill Publications
2. "Computer Oriented Numerical Methods" by V Rajaraman

**Reference Books:**

1. Uttam K Roy, ―Web Technologies‖, Oxford University Press, 1st Edition, 2010.
2. HTML and CSS: Design and Build Websites 1st Edition by Jon Duckett (Author) india price
3. Steven Holzner, ―The Complete Reference PHP‖, Tata McGraw-Hill, 1st Edition, 2007.
4. HTML & CSS: The Complete Reference, Fifth Edition (Complete Reference Series)
5. Deitel and Deitel and Nieto, ―Internet and World Wide Web - How to Program‖, Prentice Hall, 5 th Edition, 2011.
6. Numerical Methods by E Balaguruswamy

**Online Learning Resources:**

1. http://www.scoopworld.in
2. http://www.sxecw.edu.in
3. http://www.technofest2u.blogspot.com
4. http://www.ptutorial.com/php-example/php-upload-image
5. http://www.ptutorial.com/php-example/php-change-case
6. https://www.math.ust.hk/~machas/numerical-methods.pdf

**Mapping of course outcomes with program outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO4 | 3 | | | | | | | | | | | | | |
| CO5 | 3 | | | | | | | | | | | | | |
| CO6 | 3 | | | | | | | | | | | | | |

**(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)**

AITS TPT - CSE (DS)

| Course Code | Data Structures | | L | T | P | C |
|---|---|---|---|---|---|---|
| 20AES0502 | | | 3 | 0 | 0 | 3 |
| Pre-requisite | C Programming, Mathematics | Semester | I - II | | | |

**Course Objectives:**

- To teach the representation of solution to the problem using algorithm
- To explain the approach to algorithm analysis
- To introduce different data structures for solving the problems
- To demonstrate modelling of the given problem as a graph
- To elucidate the existing hashing techniques

**Course Outcomes (CO):**

**CO1:** Analyze and evaluate the efficiency of an algorithm
**CO2:** Implement linear data structures
**CO3:** implement non -linear data structures
**CO4:** Solve the problem of efficiently using graphs and Hashing techniques
**CO5:** Implement advanced sorting and organizing the file

**UNIT – I** 9 Hrs

**Introduction**
Algorithm Specification, Performance analysis, Performance Measurement. Arrays: Arrays, Dynamically Allocated Arrays. Structures and Unions. Sorting: Motivation, Quick sort, how fast can we sort, Merge sort, Heap sort

**UNIT – II** 9 Hrs

**Stack, Queue and Linked lists**
Stacks, Stacks using Dynamic Arrays, Queues, Circular Queues Using Dynamic Arrays, Evaluation of Expressions, Multiple Stacks and Queues. Linked lists: Singly Linked Lists and Chains, Representing Chains in C, Linked Stacks and Queues, Additional List Operations, Doubly Linked Lists.

**UNIT – III** 9 Hrs

**Trees**
Introduction, Binary Trees, Binary Tree Traversals, Additional Binary Tree Operations, Binary Search Trees, Counting Binary Trees, Optimal Binary search Trees, AVL Trees. B-Trees: B- Trees, B + Trees.

**UNIT – IV** 9 Hrs

**Graphs and Hashing**
The Graph Abstract Data Type, Elementary Graph Operations, Minimum Cost Spanning Trees, Shortest Paths and Transitive Closure
Hashing: Introduction to Hash Table, Static Hashing, Dynamic Hashing.

**UNIT – V** 9 Hrs

**Files and Advanced sorting**
File Organization: Sequential File Organization, Direct File Organization, Indexed Sequential File Organization. Advanced sorting: Sorting on Several keys, List and Table sorts, Summary of Internal sorting, External sorting.

**Textbooks:**

1. Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures in C", 2nd Edition, Galgotia Book Source, Pvt. Ltd., 2004.
2. Alan L. Tharp, "File Organization and Processing", Wiley and Sons, 1988.

**Reference Books:**

1. D. Samanta, "Classic Data Structures", 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
2. Peter Bras, "Advanced Data Structures", Cambridge University Press, 2016
3. Richard F.Gilberg, Behrouz A.Forouzan, "Data Structures A Pseudo code Approach with C", Second Edition, Cengage Learning 2005.

**Online Learning Resources:**

www.nptel.ac.in

**Mapping of course outcomes with program outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | | | | | | | | | | 2 | 2 | |
| CO2 | 3 | 2 | 2 | | 2 | | | | | | | 1 | 2 | 1 |
| CO3 | 3 | 2 | 2 | | 2 | | | | | | | 1 | 2 | 1 |
| CO4 | 3 | 2 | 2 | 2 | | | | | | | | 1 | 2 | 2 |
| CO5 | 3 | 2 | 2 | 2 | 2 | | | | | | | 1 | 2 | 2 |

**(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)**

AIS IPT-CSE(DS)

| Course Code | Python Programming | | L | T | P | C |
|---|---|---|---|---|---|---|
| 20AES0509 | | | 1 | 0 | 4 | 3 |
| Pre-requisite | Problem Solving and Programming | Semester | I - II | | | |

**Course Outcomes (CO):**

**CO1:** Understand the Python syntax, semantics, basic programming constructs to be used to write the programs

**CO2:** Utilize the methods of various data structures to manipulate the data

**CO3:** Apply various packages to work with real need

**CO4:** Apply the appropriate Object-Oriented Programming principle for a given scenario

**CO5:** Develop bug free applications by handling different types of exceptions

**UNIT – I** 9 Hrs

**Basics of Python Programming:** Features and applications of Python, Comparison with C, Literals, variables and identifiers, data types, comments, reserved words, indentation, operators, Input and Output Statements, type conversion.

- Write a program to demonstrate different representations of numbers in Python.
- Write a program to perform different Operations on operators in Python

**UNIT – II** 9 Hrs

**Decision Control Statements:** Introduction, selection/conditional branching statements, basic loop structures/iterative statements, nested loops, break, continue and pass statements, else statement used with loops.

**Strings:** operations and methods, Lists: accessing and updating values in list, nested and cloning lists, basic list operations, list methods, list comprehensions, looping in lists, Tuples, Sets, Dictionaries and Operations.

- Develop programs to demonstrate decision making and looping structures in python.
- Write a program to create, append, and remove lists in Python.
- Write a program to demonstrate working with tuples in python.
- Write a program to demonstrate working with dictionaries in python.

**Case study on Loops:**

- A perfect number is a number for which the sum of its proper divisors is exactly equal to the number. For example, the sum of the proper divisors of 28 would be 1 + 2 + 4 + 7 + 14 = 28, which means that 28 is a perfect number. A number n is called deficient if the sum of its proper divisors is less than n and it is called abundant if this sum exceeds n. Write a program for the given large n, find the sum of all perfect numbers, sum of all deficient numbers and sum of abundant numbers separately. Print all perfect numbers along with its sum, deficient numbers along with its sum and abundant numbers along with its sum.

**UNIT – III** 9 Hrs

**Functions:** Introduction, Declaration and definition, calling a function, returning values from function, pass by object reference, arguments, Local and Global variables, recursive functions, lambda functions, fruitful functions.

**Libraries:** NumPy, pandas, Keras.

- Develop Python programs using recursive and non-recursive functions
- Write a program to demonstrate a) arrays b) array indexing such as slicing, integer array indexing and Boolean array indexing along with their basic operations in NumPy

**Case study on Functions:**

- Write a function mult_lists(a, b) that takes two lists of numbers of the same length, and returns the sum of the products of the corresponding elements of each.

**UNIT – IV** 9 Hrs

**Classes and Objects:** Introduction, classes and objects, constructor, encapsulation, Class method and self-argument, __init__() method, class variables and object variables, __del__() method, other special method, public and private data members, private methods, built-in class functions and attributes, overloading methods, overriding methods.

- Write a program to demonstrate how to create classes and objects in the application.

**Case study on Classes**

- Design a class named QuadraticEquation for a quadratic equation $ax^2+bx+c=0$. The class contains:
  - The private data fields a, b, c that represents three coefficients.
  - A constructor for the arguments for a, b and c
  - Three get methods for a, b and c
  - A method named getDiscriminant() that returns the discriminant, which is $b^2-4ac$.
  - The methods named getRoot1() and getRoot2() for returning the two roots of the equation using the formulas:
    $R_1 = -b + (\sqrt{b^2-4ac})/2a$ and $R_2 = -b - (\sqrt{b^2-4ac})/2a$.
  - These methods are useful only if the discriminant is non negative. Let these methods return 0 if the discriminant is negative.
  - Write a test program that prompts the user to enter values for a, b, c and displays the result based on discriminant.

**UNIT – V** 9 Hrs

AITS-CSE(DS)

**Inheritance:** Introduction, inheriting classes in python, types of inheritance, complex objects, abstract classes and interfaces. **Error and Exception Handing:** Types of Errors, Exceptions, Handling Exceptions, types of exceptions **Files & Database:** Introduction to File Input and Output, Using Loops to Process Files, Introduction to database, standard methods, working with oracle database, case study (create employees table in the oracle database).

- Develop Python programs to exemplify the concepts of inheritance and overloading.
- Write a program to create user defined exception and handle the exception in the application.

**Case study on Files**

- Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be the input that to be written to the second file.

**Textbooks:**

1. Allen B. Downey, "Think Python", 2nd edition, SPD/O'Reilly, 2016.
2. Reema thareja, Python Programming using problem solving approach, Oxford University Press.

**Reference Books:**

1. Dietel and Dietel, Python How to Program.
2. Kenneth A. lambert, B.L. Juneja, Fundamentals of Python, Cengage Learning
3. James Payne, Beginning Python using Python2.6 and Python3

**Online Learning Resources:**

3. 1. https://www.python.org
   2. https://learnpython.org

**Mapping of course outcomes with program outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | | | | | | | | | | | 2 | 2 |
| CO2 | 3 | | 2 | | 2 | | | | | | | | 2 | 2 |
| CO3 | | 2 | | 2 | 2 | | | | | | | | 2 | 2 |
| CO4 | | | | 2 | 2 | | | | | | | | 2 | 2 |
| CO5 | | | 1 | | | | | | | | | | 2 | 2 |

**(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)**

AITS TPT - CSE (DS)

| Course Code | Computer Science And Engineering Workshop | | L | T | P | C |
|---|---|---|---|---|---|---|
| 20AES0506 | | | 0 | 0 | 3 | 1.5 |
| Pre-requisite | Basic Computer Knowledge | Semester | I - II | | | |

**Course Outcomes (CO):**

**CO1:** Assemble and disassembling parts of a computer
**CO2:** Develop Documents using Word processors
**CO3:** Develop presentations using the presentation tool
**CO4:** Perform computations using spreadsheet tool
**CO5:** Design Graphics, Videos and Web pages

**Preparing your computer**

**Task 1: Assembling a Computer:** Disassemble and assemble the PC back to working condition. Students should be able to trouble shoot the computer and identify working and non-working parts. Student should identify the problem correctly by various methods available (eg: beeps). Students should record the process of assembling and trouble shooting a computer.

**Task 2: Install Operating system:** Student should install Linux on the computer. Student may install another operating system (including proprietary software) and make the system dual boot or multi boot. Students should record the entire installation process.

**Productivity tools**

**Task 3: Word Processor:** Students should be able to create documents using the word processor tool. Some of the tasks that are to be performed are inserting and deleting the characters, words and lines, Alignment of the lines, Inserting header and Footer, changing the font, changing the colour, including images and tables in the word file, making page setup, copy and paste block of text, images, tables, linking the images which are present in other directory, formatting paragraphs, spell checking, etc. Students should be able to prepare project cover pages, content sheet and chapter pages at the end of the task using the features studied. Students should submit a user manual of the word processor considered.

**Task 4: Spreadsheet:** Students should be able to create, open, save the application documents and format them as per the requirement. Some of the tasks that may be practiced are Managing the worksheet environment, creating cell data, inserting and deleting cell data, format cells, adjust the cell size, applying formulas and functions, preparing charts, sorting cells. Students should submit a user manual of the Spreadsheet application considered.

**Task 5: Presentations:** creating, opening, saving and running the presentations, selecting the style for slides, formatting the slides with different fonts, colours, creating charts and tables, inserting and deleting text, graphics and animations, bulleting and numbering, hyperlinking, running the slide show, setting the timing for slide show. Students should submit a user manual of the Presentation tool considered.

**IoT**

**Task 6: Raspberry Pi**

Study the architecture of Raspberry pi, configure software, Install SD card, Connect the cables, Install Raspbian (or any other) operating system, Configure Wi-Fi, Remotely connect to your Raspberry Pi.

**Story Telling**

**Task 7: Storytelling**

Use Adobe spark or any other tool to create Graphics, Webpages, and Videos.

**Reference Books:**


1. B. Govindarajulu, "IBM PC and Clones Hardware Trouble shooting and Maintenance", 2nd edition, Tata McGraw-Hill, 2002
2. "MOS study guide for word, Excel, Powerpoint & Outlook Exams", Joan Lambert, Joyce Cox, PHI.
3. "Introduction to Information Technology", ITL Education Solutions limited, Pearson Education.
4. Rusen, "Networking your computers and devices", PHI
5. Bigelows, "Trouble shooting, Maintaining & Repairing PCs", TMH.


**Online Learning Resources:**

1. https://www.adobe.com
2. https://www.raspberrypi.org

**Mapping of course outcomes with program outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | | | | | | | 2 | | | 2 | 2 | |
| CO2 | 3 | 2 | 2 | | 2 | | | | 1 | | | 2 | 2 | 2 |
| CO3 | 3 | 2 | 2 | | 2 | 2 | | | 1 | | | 2 | 2 | 2 |
| CO4 | 3 | 2 | 2 | | 2 | 2 | | | 1 | | | 2 | 2 | |
| CO5 | 3 | 3 | 2 | | | 2 | | | 2 | | | 2 | 2 | 2 |

**(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)**

AITS TIRUPATI (CSE(DS))

| Course Code | Chemistry Lab | | L | T | P | C |
|---|---|---|---|---|---|---|
| 20ABS9909 | | | 0 | 0 | 3 | 1.5 |
| Pre-requisite | Basics of chemical formulas and equations | Semester | I - II | | | |

**Course Outcomes (CO):**

**CO1:** To familiarize the students with the basic concepts of chemistry of materials
**CO2:** Prepare advanced polymer materials
**CO3:** Measure the strength of an acid present in secondary batteries
**CO4:** To familiarize with digital and instrumental methods of analysis

**List of Experiments:**

1. Determination of Hardness of a groundwater sample.
2. Estimation of iron (II) using Diphenylamine indicator (Dichrometry – Internal indicator method)
3. Determination of pH metric titration of strong acid vs. strong base,
4. Conductometric titration of strong acid vs. strong base
5. Determination of Fe(II) in Mohr's salt by potentiometric method.
6. Determination of percentage of Iron in Cement sample by colorimetry
7. Determination of Strength of an acid in Pb-Acid battery
8. Preparation of phenol-formaldehyde resin
9. Preparation of $TIO_2$/ZnO nano particles
10. Estimation of Calcium in port land Cement
11. Adsorption of acetic acid by charcoal
12. Thin layer chromatography

**Mapping of course outcomes with program outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | | | | | | 2 | | | | | | |
| CO2 | 3 | | 1 | | | | | 2 | | | | | | |
| CO3 | 3 | 1 | 1 | | | | | 2 | | | | | | |
| CO4 | 3 | | 2 | | | | | 2 | | | | | | |

**(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)**

AITS TPT-CSE (DS)

| Course Code | Data Structures Lab | | L | T | P | C |
|---|---|---|---|---|---|---|
| 20AES0504 | | | 0 | 0 | 3 | 1.5 |
| Pre-requisite | Basic Mathematics | Semester | I - II | | | |

**Course Objectives:**

- To introduce to the different data structures
- To elucidate how the data structure selection influences the algorithm complexity
- To explain the different operations that can be performed on different data structures
- To introduce to the different search and sorting algorithms.

**Course Outcomes (CO):**

- **CO1:** Select the data structure appropriate for solving the problem
- **CO2:** Implement searching and sorting algorithms
- **CO3:** Derive new data types
- **CO4:** Illustrate the working of linear and non linear data structure
- **CO5:** Organize the data using Files structure

**Laboratory Experiments**

1. String operations using array of pointers
2. Searching Algorithms (With the Number of Key Comparisons) Sequential, Binary and Fibonacci Search Algorithms.
3. Sorting Algorithms: Insertion Sort, Selection Sort, Shell Sort, Bubble Sort, Quick Sort, Heap Sort, Merge Sort, and Radix Sort. Using the system clock, compute the time taken for sorting of elements. The time for other operations like I/O etc should not be considered while computing time.
4. Implementation of Singly Linked List, Doubly Linked List, Circular Linked List
5. Stack implementation using arrays
6. Stack implementation using linked lists
7. Queue implementation using arrays. Implement different forms of queue. While implementing you should be able to store elements equal to the size of the queue. No positions should be left blank.
8. Queue implementation using linked lists
9. Creation of binary search tree, performing operations insertion, deletion, and traversal.
10. Breadth first search
11. Depth first search
12. Travelling sales man problem
13. File operations
14. Indexing of a file
15. Reversing the links (not just displaying) of a linked list.
16. Consider a linked list consisting of name of a person and gender as a node. Arrange the linked list using 'Ladies first' principle. You may create new linked lists if necessary.
17. An expression can be represented in three ways: infix, prefix and postfix. All the forms are necessary in different contexts. Write modules to convert from one form to another form.
18. A table can be defined as a collection of rows and columns. Each row and column may have a label. Different values are stored in the cells of the table. The values can be of different data types. Numerical operations like summation, average etc can be performed on rows/columns which contain numerical data. Such operations are to be prevented on data which is not numeric. User may like to insert row/columns in the already existing table. User may like to remove row/column. Create table data type and support different operations on it.

**Textbooks:**


1. Ellis Horowitz and Sartaj Sahni, "Fundamentals of Data Structures in C", 2nd Edition, Galgotia Book Source, Pvt. Ltd., 2004.
2. Alan L. Tharp, "File Organization and Processing", Wiley and Sons, 1988.


**Reference Books:**


1. D. Samanta, "Classic Data Structures", 2nd Edition, Prentice-Hall of India, Pvt. Ltd., India, 2012.
2. Richard F.Gilberg, Behrouz A.Forouzan, "Data Structures A Pseudo code Approach with C", Second Edition, Cengage Learning 2005.


**Online Learning Resources:**

https://www.youtube.com/watch?v=zWg7U0OEAoE&list=PLBF3763AF2E1C572F

**Mapping of course outcomes with program outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | | 2 | | | | | | | | 2 | 2 | |
| CO2 | 3 | 2 | 2 | 2 | 2 | | | | | | | 1 | 2 | 2 |
| CO3 | 3 | 2 | 2 | 2 | | | | | | | | 1 | 2 | 1 |
| CO4 | 3 | 2 | 2 | 2 | 2 | | | | | | | 1 | 2 | |
| CO5 | 3 | 2 | 2 | 2 | | | | | | | | 1 | 2 | |

**(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)**

AITS-R-CSE(DS)

| Course Code | Environmental Studies | | L | T | P | C |
|---|---|---|---|---|---|---|
| 20AMC9903 | | | 3 | 0 | 0 | 0 |
| Pre-requisite | Basic Environmental Knowledge | Semester | I - II | | | |

**Course Outcomes (CO):**

- **CO1:** To recognize and to understand the importance and scope of Environmental Studies.
- **CO2:** To understand the importance of protecting natural resources, ecosystem for future generation by communication each other in the society crate the awareness
- **CO3:** Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.
- **CO4:** By studying Environmental Science, students are exposed to the environment the enables one to find out solution of various environmental problems, encountered on and often.
- **CO5:** At the end of the course, it is expected that student will be able to identify and analyze environmental problems as well as the risks associated with these problems and efforts to be taken to protect the environment from getting polluted. These will enable every human being to live in a more sustainable manner.

**UNIT – I** 18 Hrs

**Multidisciplinary Nature** o**f Environmental Studies:** Introduction – Multidisciplinary Nature of Environmental Studies – Definition, Scope and Importance – Need for Public Awareness.
**Natural Resources:** Renewable and non-renewable energy resources – Natural resources and associated problems.
**Forest resources:** Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people.
**Water resources**: Use and over utilization of surface and sub-surface – Floods, drought, conflicts over water, dams – benefits and problems.
**Mineral resources:** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
**Food resources:** World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, case studies.
**Energy resources:** Renewable and non-renewable energy resources.

**UNIT – II** 20 Hrs

**Ecosystems:** Concept of an ecosystem. – Structure and functions of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).
**Biodiversity And Its Conservation :** Introduction- Definition: genetic, species and ecosystem diversity – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man – wildlife conflicts – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

**UNIT – III** 10 Hrs

**Environmental Pollution:** Definition, Causes, effects and its control measures of : Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards.
**Solid Waste Management:** Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone, Tsunami and landslides.

**UNIT – IV** 15 Hrs

**Social Issues and the Environment:** From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting and watershed management – Resettlement and rehabilitation of people – Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies– Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Public awareness.

**UNIT – V** 10 Hrs

**Human Population and the Environment:** Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

**Textbooks:**


1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Kaushik, New Age Publishers.
3. Environmental Studies by Sri Krishna Hitech publishing Pvt. Ltd.


**Reference Books:**


1. Environmental studies by R.Rajagopalan, Oxford University Press.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.


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3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.
4. Environmental studies by A. Ravi Krishnan, G. Sujatha Sri Krishna Hitech publications.

**Online Learning Resources:**

www.nptel.ac.in

**Mapping of course outcomes with program outcomes**

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 1 | | | 1 | 3 | | | | | | | |
| CO2 | 3 | 1 | 1 | | | 1 | 3 | | | | | | | |
| CO3 | 3 | 1 | 1 | | | 1 | 3 | | | | | | | |
| CO4 | 3 | 1 | 1 | | | 1 | 3 | 2 | | | | | | |
| CO5 | 3 | 1 | 1 | | | 1 | 3 | 2 | | | | 1 | | |

**(Levels of Correlation, viz., 1-Low, 2-Moderate, 3 High)**

AITS TPT - CSE (DS)