SAVITRIBAI PHULE PUNE UNIVERSITY

PUNE

CHOICE BASED CREDIT SYSTEM

Syllabus for Second Year B.Sc. (Information Technology)

(2022 Pattern)

(with effect from Academic Year 2023-24

Structure of S.Y.B.Sc.(IT)

SEMESTER -III

Course Type	Course Code	Paper Title	Credits		Evaluation		
			T	P	CA	UA	TOTAL
CC	IT-231	Data Structures	4	-	30	70	100
CC	IT-232	Exploratory Data analysis	4	-	30	70	100
CC	IT-233	Software Engineering	4	-	30	70	100
CC	IT-234	Lab Course on Data Structures	-	2	15	35	50
CC	IT-235	Lab Course on Exploratory Data Analysis	-	2	15	35	50
CC	IT-236	Lab Course on Content Management Systems	-	2	15	35	50
AECC-I	IT-237	Environment Science-I	2	-	15	35	50
AECC-II	IT-238	Soft Skills-I	2	-	15	35	50

Total Credits: 22

SEMESTER IV

Course Type	Course Code	Paper Title	Credits		Evaluation		
			T	P	CA	UA	TOTAL
CC	IT-241	Object Oriented Programming	4	-	30	70	100
CC	IT-242	Web Technologies	4	-	30	70	100
CC	IT-243	Multimedia Technologies and Tools	4	-	30	70	100
CC	IT-244	Lab Course on Object Oriented Programming	-	2	15	35	50
CC	IT-245	Lab Course on Web Technologies	-	2	15	35	50
CC	IT-246	Lab Course on Multimedia Technologies and Tools	-	2	15	35	50
AECC-III	IT-247	Environment Science-II	2	-	15	35	50
AECC-IV	IT-248	Soft Skills-II	2	-	15	35	50

Total Credits: 22

*CC: Core Course
*AECC: Ability Enhancement Compulsory Course

SEMESTER -III

Savitribai Phule Pune University
S.Y.B.Sc. (Information Technology)
IT-231
Title: Data Structures

Teaching Scheme	No.of Credits	Examination Scheme
4 Hours /week	4	CA:30 marks UA:70 marks

Prerequisites:
1. Basic knowledge of algorithms and problem solving
2. Knowledge of Python Programming Language
3. Basic Knowledge of Graphs

Course Objectives
1. To learn the systematic way of solving problem
2. To understand the different methods of organizing large amount of data
3. To efficiently implement the different data structures
4. To efficiently implement solutions for specific problems.

Course Outcomes : On completion of the course, student will be able to
1. Use well-organized data structures in solving various problems.
2. Differentiated the usage of various structures in the problem solution.
3. Implement the algorithms to solved problems using appropriate data structures.

Course Contents

Unit1	**Introduction to Data Structures**	**3hours**

1.1 Introduction
- 1.1.1 Concept
- 1.1.2 Data type, Data object, ADT, Data Structure
- 1.1.3 Need of Data Structure
- 1.1.4 Types of Data Structure

1.2 Algorithm analysis
- 1.2.1 Space complexity, time complexity
- **1.2.2** Best,Worst, Average case analysis, Asymptotic notation (Big O,Omega **Ω**, Theta **Θ)**

Unit 2	**Array as a Data Structure**	**8hours**

2.1 ADT of array, Operations
2.2 Searching : Linear, Binary
2.3 Sorting Technique
- 2.3.1 Bubble Sort
- 2.3.2 Insertion Sort
- 2.3.3 Selection Sort
- 2.3.4 Quick Sort
- 2.3.5 Merge Sort

Unit 3	Linked List	10 hours
3.1 List as a Data Structure 3.2 Dynamic implementation of Linked List 3.3 Types of Linked List–Singly, Doubly, Circular, 3.4 Operations on Linked List- create, traverse, insert, delete, search, reverse 3.5 Applications of Linked List–polynomial manipulation		
Unit 4	**Stack**	**8 hours**
4.1 Introduction 4.2 Representation-Static & Dynamic 4.3 Operations– init(),push(),pop(), isEmpty(), isFull(), peek() 4.4 Application–String reversal, Function Call, infix to postfix, infix to prefix, postfix Evaluation		
Unit 5	**Queue**	**10 hours**
5.1 Introduction 5.2 Representation-Static & Dynamic 5.3 Operations-init(),enqueue(),dequeue(),isEmpty(),isFull(),peek() 5.4 Types of Queue 5.4.1 Simple Queue 5.4.2 Circular Queue 5.4.2 Priority Queue 5.4.3 Double Ended Queue		
Unit 6	**Trees**	**12hours**
6.1 Concept & Terminologies 6.2 Binary tree, binary search tree 6.3 Representation–Static and Dynamic 6.4 Operations on BST 6.4.1 create, Insert, delete, 6.4.2 Tree traversals–recursive and non-recursive (preorder, inorder, postorder) 6.4.3 Counting leaf, non-leaf & total nodes 6.5 Heapsort 6.6 AVL tree		
Unit 7	**Graph**	**9hours**
7.1 Concept & Terminologies 7.2 Graph Representation– 7.2.1 Adjacency matrix, 7.2.2Adjacency list 7.2.3 Inverse Adjacency list 7.2.4 Adjacency multilist 7.3 Traversals–BFS and DFS 7.4 AOV network and Topological sort 7.5 Spanning Trees : Prims and Kruskals algorithm		
ReferenceBooks:		
1. Fundamentals of Data Structures--Horowitz, Sahani—Galgotia 2. Data Structures using C and C++--Yedidyah Langsam, MosheJ. Augenstein, Aaron M.Tenenbaum-- 3. Introduction to Algorithms—Thomas H.Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein—MIT Press 4. Fundamentals of Computer Algorithms--Horowitz,Sahani—Computer Science Press		

5. Introduction to Data Structures using C—Ashok Kamthane—Pearson Eduction
6. Data Structure and Algorithmic Thinking with Python:Data Structure and Algorithmic Puzzles by Karumanchi, Narasimha
7. Data Structures using Python 2021 Edition by Dr Shriram K. Vasudevan
8. Hands-On Data Structures and Algorithms with Python, Second Edition by Benjamin Baka, Dr. Basant Agarwal, Dr. Basant Agarwal

Savitribai Phule Pune University
S.Y.B.Sc. (InformationTechnology)
IT-232
Title: Exploratory Data Analysis

Teaching Scheme	No. of Credits	Examination Scheme
4 hours/week	4	CA:30 marks UA:70 marks

Prerequisites
Python, Fundamentals of statistics concepts.

Course Objectives:
This course is designed to teach students how to analyze different types of data using python. Students will learn how to prepare data for analysis, perform simple statistical analysis, create meaningful data visualizations and predict future trends from data. Exploratory Data Analysis (EDA) is an approach to data analysis that involves the application of diverse techniques to gain insights into a dataset. The course contains fundamental concept of Exploratory data analysis. The focus is given on analysis and illustration of data.

Following are objectives:

1. To understand the fundamental concepts of exploratory data analysis using Python.
2. To find missing values in data and identify the correlation between different variables.
3. To understand and interpret results obtained from graphical analysis
4. To understand how to create dashboard.

Course Outcomes(Cos) :
Upon successful completion of this course, **the students will be able to:**

- ❖ Understand the fundamentals of EDA
- ❖ Implement the data visualization using matplotlib and seaborn library.
- ❖ Understanding basics of python for performing data analysis.
- ❖ Understand the hypothesis testing and explore techniques of time-series analysis
- ❖ Identify and transform erroneous data using different data Wrangling techniques for Analyzing.
- ❖ Import, clean, and explore data to perform preliminary analysis.
- ❖ Understand Advance data visualization using tableau.

Course Contents

Chapter 1	**Fundamentals of EDA**	**12hours**

Meaning of exploratory data analysis, Why Is Data Analysis Important? different types of data analysis. Data analysis vs exploratory data analysis; Main phases/steps involved in exploratory data analysis, Advantages and Applications areas of EDA. The software tools required for/used in EDA. Different types of exploratory data analysis. EDA techniques :Univariate non-graphical, Multivariate non-graphical, Univariate graphical, Multivariate graphical. The EDA process.

Chapter 2	**Understanding Data Analysis**	**12 hours**

Significance of EDA – Making sense of data. types of data qualitative and quantitative data; measurement scales-Comparing EDA with classical and Bayesian analysis. **Python libraries :** Python libraries numpy, pandas, scipy . Data preprocessing: Steps involved in data preprocessing.
Data transformation techniques/Data Wrangling: functionalities of data Wrangling, Combining and Merging Datasets, filtering dataset, removing duplication, Reshaping and Pivoting.

Chapter 3	**Graphical exploratory data analysis**	**10 hours**

Python libraries for visualization: matplotlib and seaborn; Difference between seaborn and matplotlib libraries. **Visual Aids for EDA** : Categories of data visualization graphs. Implementing various types of Plots using matplotlib and seaborn. Line plot, Bar plot, Scatter plot, Bubble chart, Table chart, Box plot, Pair plot, Histogram plot ,Pie chart, Heat map.etc.

Chapter 4	EDA methods and techniques	10 hours

EDA methods: Data visualization, Correlation analysis and its types, Dimension reduction(PCA) ,Descriptive and inductive statistics, Clustering(k-means and hierarchical clustering),Outlier detection (Z-score ,IQR).Types of analysis, Understanding Univariate, Bivariate and Multivariate analysis. Multivariate analysis using Titanic dataset. Grouping dataset: Understanding groupby(), groupby mechanics, data aggregation-groupwise operation, groupwise transformation, pivot tables and cross tabulation.

Chapter 5	Descriptive Statistics	08 hours

Understanding statistics; types of statistics (descriptive and inferential) ,Frequency Distribution , Measures of central tendency(A.M,G.M, H.M, Weighted mean, Median, Mode);Measures of position; Measures of dispersion(Range, Variance & Standard deviation) ; Measures of Skewness and Kurtosis**.**

Chapter 6	Inferential Statistics and Time series analysis.	08 hours

Fundamentals of TSA, Components of time series analysis, Characteristic of Time series data, TSA with Open Power System Data.

Inferential Statistics: Hypothesis testing, Types of hypothesis testing, Z- test , T-test and ANOVA Regression Analysis, Types of regression(simple, multiple, polynomial, logistic).

Advance data visualization tool: Tableau-Connecting to data, Creating Sheets and Dashboards.

Text Books:

1. "Hands-On Exploratory Data Analysis with Python", Suresh Kumar Mukhiya, Usman Ahmed. Packt Publication.
2. "Python for Data Analysis", Wes Mckinney, O'REILLY Publication. 2017
3. Fundamental of mathematical statistics-S C Gupta & V K Kapoor Published by Sultan Chand & Sons.

Reference Books:

1. Data Science Fundamentals and Practical Approaches, Gypsy Nandi, Rupam Sharma, BPB Publications, 2020.
2. Hands-On Introduction to Data Science ,Chirag Shah, University of Washington Cambridge University Press.

Online Resources:

1) https://www.coursera.org/lecture/data-analysis-with-python/exploratory-data-analysis-iNeWs
2) https://www.tableau.com/learn/tutorials/on-demand/getting-started
3) https://www.w3schools.com/python/
4) https://www.slideshare.net/JamieDornan2/exploratory-data-analysis-a-comprehensive-guide-to-edapdf
5) https://www.geeksforgeeks.org/exploratory-data-analysis-eda-types-and-tools/

Savitribai Phule Pune University
S.Y.B.Sc. (InformationTechnology)
IT-233
Title: Software Engineering

Teaching Scheme	No. of Credits	Examination Scheme
4 hours / week	4	CA : 30 marks UA : 70 marks

Prerequisites

Knowledge of DBMS

Course Objectives: -

- To learn and understand the principles of System and Software Engineering
- To understand the technique of visualizing and analyzing the software requirements.
- To understand and practice the design processes

Course Outcomes: - Student will be able to: -

- Compare and contrast various Software Engineering models
- To know about the system engineering
- To gain thorough knowledge of designing DFD

Course Contents

Chapter 1	**Introduction to System Engineering**	**5 Lectures**

1.1 Definition
1.2 Basic Components
1.3 Elements of the system
1.4 System Components
1.5 Types of System

Chapter 2	**Introduction to Software Engineering**	**10 Lectures**

2.1 Definition of Software Engineering
2.2 Characteristics of Software
2.3 General Principles
2.4 Software Application Domain
2.5 Need for software Engineering
2.6 Software Engineering : A layered technology

Chapter 3	**Software Development Life Cycle (SDLC)**	**10 Lectures**

3.1 Introduction
3.2 Activities of SDLC
3.3 A Generic Process Model
3.4 Software Paradigms
  3.4.1 Waterfall Model
  3.4.2 Incremental Process Models
  3.4.3 Evolutionary process Models (Prototyping and Spiral Model)
  3.4.4 RAD Model
  3.4.6 Concurrent Models

Chapter 4	Requirements Engineering	10 Lectures

4.1 Introduction
4.2 Requirements Engineering Tasks
- 4.2.1 Inception
- 4.2.2 Elicitation
- 4.2.3 Elaboration
- 4.2.4 Negotiation
- 4.2.5 Specification
- 4.2.6 Validation
- 4.2.7 Requirements Management

4.3 Initiating the Requirements Engineering Process
- 4.3.1 Identifying the Stakeholders
- 4.3.2 Recognizing Multiple Viewpoints
- 4.3.3 Working toward Collaboration

4.4 Fact Finding Techniques
- 4.4.1 Interview
- 4.4.2 Questionnaire
- 4.4.3 Record Review
- 4.4.4 Observation

Chapter 5	Analysis and Design Engineering	15 Lecture

5.1 Introduction to DFD
5.2 Basic Notations
5.3 Context Level DFD
5.4 1st Level DFD
5.5 2nd Level DFD
5.6 Data Dictionary (DD)
- 5.6.1 Elements of DD
- 5.6.2 Advantages and Disadvantages of DD

5.7 Input and Output Screen Design
5.8 Cover atleast three case studies on above topics

Chapter 6	Agile Development	10 Lectures

6.1 Introduction to Agile Development
6.2 Agile Process
6.3 Principles and Values of Agile
6.4 Human Factors
6.5 Extreme Programming (XP)
6.6 Adaptive Software Development (ASD)
6.7 Scrum
6.8 Dynamic System Development Model (DSDM)

Reference Books :

1. Software Engineering : A Practitioner's Approach (Seventh Edition) by Roger S. Pressman, McGraw Hill International Edition
2. System Analysis, Design and Introduction to Software Engineering (SADSE) - S. Parthsarthy, B.W. Khalkar
3. System Analysis and Design (Second Edition) by Elias M. Awad, Galgotia Publications Pvt. Ltd.

Savitribai Phule Pune University
S.Y.B.Sc.(Information Technology)

IT-234

Title: Lab Course on Data Structures

Teaching Scheme	No. of Credits	Examination Scheme
3 hours /week	2	CA:15marks UA:35marks

Course Objectives:-The course should enable the student:

- To acquire a knowledge of data structures
- To make use of Python programming and implements the data structures dynamically.

Course Outcomes: The student should be able to:

- Correctly implement the right data structure for a given problem.
- Apply or create a suitable algorithm to solve a particular problem.

Practical List

Assignment No. 1: Sorting (2 slots)

Write a Python program for sorting integer array using:

Bubble Sort, Selection sort, Insertion Sort, Quick Sort, Merge sort

Assignment No 2: Searching(1slots)

Write a Python program to search an element in an integer array using:
Linear Search, Sentinel Search, Binary Search

Assignment No 3 : Linked List (2 slots)

Dynamic implementation of Singly Linked List and Doubly Linked List, Performed all operations on the Linked List.

Assignment No 4: Stack (2 slots)

Write Python program for dynamic implementation of Stack with all the operations.

Write a Python program for conversion of Infix expression to Postfix

Assignment No 5 :Queue (2 slots)

Python program for Static and Dynamic implementation of Queue. Performed all the operations on Queue.

Assignment No 6:Tree (3 slots)

Implement Binary Search Tree (BST) to perform following operations on BST–Create, Recursive Traversals -Inorder, Preorder, Postorder
Implement a BST to perform following operations : insert, delete and create mirror image of BST.
Implement BST for counting leaf, non-leaf and total nodes.

Assignment No 7:Graph (2 slots)

Implement Graph in Python to perform following operations-Create, Adjacency Matrix, Adjacency List, Indegree, Outdegree

Savitribai Phule Pune University
S.Y.B.Sc.(Information Technology)
IT-235
Title: Lab Course on Exploratory Data Analysis.

Teaching Scheme	No. of Credits	Examination Scheme
3 hours/week	2	CA:15 marks UA:35 marks

Prerequisites
IT-232 -Exploratory Data Analysis, Python

Course Objectives:-

1. To understand the fundamental concepts of exploratory data analysis using Python.
2. To find missing values in data and identify the correlation between different variables.
3. To understand and interpret results obtained from graphical analysis.
4. To understand how to create dashboard.

Course Outcomes:-Student will be able to:-

On completion of the course, student will be able to–

- ❖ Understand the fundamentals of EDA
- ❖ Implement the data visualization using matplotlib and seaborn library.
- ❖ Understanding basics of python for performing data analysis.
- ❖ Understand the hypothesis testing and explore techniques of time-series analysis
- ❖ Identify and transform erroneous data using different data Wrangling techniques for Analyzing.
- ❖ Import, clean, and explore data to perform preliminary analysis.
- ❖ Understand Advance data visualization using tableau.

Assignments

1. Write a Program in Python to Read and write different types of Files (csv, json, txt etc).
2. Python program to import libraries for loading & read a dataset. (Use head(), tail(), shape, info(), describe() ,columns)
3. Write a python program to reshaping data- Convert categorical data into numerical value using dataset.
4. Implementation of data cleaning –finding ,missing data ,removing and filling missing data.
5. Write a python program implement data wrangling operations- filtering and removing duplication of data.
6. Python program to Implement data transformation -Combine data frames/datasets using join(), merge(), concat() etc.
7. Using the inbuilt mtcar dataset perform the following
    a. Display all the cars having 4 gears
    b. Display all the cars having 3 gears and 2 carburetor.
8. Using inbuilt dataset women perform the following
    a. display all rows of dataset having height greater than 120
    b. display all rows of dataset in ascending order of weight
9. Using the inbuilt airquality dataset perform the following
    a. Find the temperature of day 30 of month 8
    b. Display the details of all the days if the temperature is greater than 90
10. Using iris inbuilt dataset perform the following
    a. Display details of all flowers of type virginica in ascending order of petal length.
    b. Display details of first five flowers of type setosa having maximum petal length.
11. Write a python program to representation of data using Histogram.
12. Using airquality dataset

a. Create a scatter plot to show the relationship between ozone and wind values by giving appropriate value to color argument
b. Create a bar plot to show the ozone level for all the days having temperature greater than 70

13. Using inbuilt mtcars dataset
    a. Create a bar plot that shows the number of cars of each gear type.
    b. Draw a scatter plot showing the relationship between wt and mpg for all the cars having 4 gear
14. Write a python program to representation of data using Pie chart.
15. Write a python program to representation of data using Pair plot/chart.
16. Write a python program for analysis of data through Scatter plot.
17. Write a python program to representation of data using Bar plot.
18. Write a python program to implement Univariate analysis.
19. Write a python program to implement Bivariate analysis.
20. Write a python program to implement Multivariate analysis.
21. Write a python program to implement correlation matrix and plotting a correlation graph using dataset.
22. Write a python program to implement cross tabulation using crosstab( ) function.
23. Python program to implement data transformation - grouping data using group by.
24. Implementation of measures of central tendency (mean, median and mode) using python.
25. Implementation of measures of dispersion (range, variance) using python.
26. Program to get statistical characteristics of dataset using pandas.
27. Python program to implement Simple regression analysis.
28. Create simple dashboard using tableau.
29. Implementation of hypothesis testing –> T-test using python.
30. To compute weighted averages in Python either defining your own functions or using Numpy.

ReferenceBooks:

4. "Hands-On Exploratory Data Analysis with Python", Suresh Kumar Mukhiya, Usman Ahmed. Packt Publication.
5. "Python for Data Analysis", Wes Mckinney, O'REILLY Publication. 2017.

Online Resources:

5) https://www.tableau.com/learn/tutorials/on-demand/getting-started
6) https://www.w3schools.com/python/

Savitribai Phule Pune University
S.Y.B.Sc. (Information Technology)
IT-236
Title : Lab Course on Content Management Systems

Teaching Scheme	No. of Credits	Examination Scheme
3 hours/week	2	CA : 15 marks UA : 35 marks

Pre requisites
IT-122 -Web Designing using HTML and CSS

Course Objectives:-

1. To Understand what is Content Management System
2. How it differs from traditional, flat websites

Course Outcomes: Students should be able to:

- To create professional-looking websites
- How to use Plug-ins.

Assignments

Create the following Assignments in **WordPress :**

1. Create a website for online shopping of bicycles by using hyperlinkwhich shows varieties of bicycle.
2. Create a website for your college courses and Add a New Page which shows Details of New Course of BSc(IT).
3. Create a website for Toys which shows Hyperlink to different types of Toys.
4. Create a Post on 76th year of Independence and make comment on it.
5. Create a New User and create a NEWS page for Maharashtra Times newspaper.
6. Set a Theme 'Twenty Twenty-Two' for your website.
7. Create a website for Indian Football Team and Create New User to create a page which displays the details of current match
8. Create a website for books of all subjects which shows Navigation to computer booksand modify details (author, publisher, version) of books.
9. Create a Post on Health and write suggestion in comments box .
10. Add pages and set the given Menus - Home , About Us, Contact Us, Gallary for Website.
11. From the given Menus, Quick Edit the 'Title' From Contact Us to TOPIC for Pages.
12. Create a website for a computer hardware which shows information about hardware and perform following operations :
    i) Insert images of hardware.
    ii) Delete an page showing information of CD.
13. Create a website for Tata Motors Showroom which shows different model's information about cars and update the model of cars with its price.
14. Create a website for Ready-made Garments with its images and show details of categories of Garments by using hyperlink.
15. Create a Website for Singers and add Audio File of your favourite singer..
16. Create a website for Books and add one .doc or .pdf file .
17. Create a website which shows information of different Hotels in Pune and perform following operations :
    i) Insert the new Hotel
    ii) Delete the Old Hotels

18. Create a website for Mobile Gallery and delete the page for any old model of Mobile.
19. Create a website for Institute which shows information about different recent courses (Use Plug-in).
20. Create a website for Hotel page which change color of background (Use Plug-in).

SEMESTER -IV

Savitribai Phule Pune University
S.Y.B.Sc. (Information Technology)
IT-241
Title: Object Oriented Programming

Teaching Scheme	No. of Credits	Examination Scheme
4 hours / week	4	CA: 30 marks UA: 70 marks

Prerequisites :

Course Objectives:

- Learn about java programming using oops concepts.
- Understand fundamentals of java program such as control structures, tokens, string, arrays, etc.
- Learn fundamental features of object oriented language and JAVA.
- Understand how to develop Encapsulation, Inheritance and polymorphism using programming examples.
- To understand how to design applications with thread.

Course Outcomes :

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

- Understand object-oriented programming applications .
- Understand and use of encapsulation, inheritance and polymorphism as implemented in Java
- understand and use multithreading concept in java.
- understand and use the file and exception handling mechanism of Java

Course Contents

Chapter 1	**Fundamentals of Object Oriented Programming (OOPs) Using C++ and Java**	**06 hours**

1.1 Fundamentals of Object Oriented Programming(OOP)
1.2 difference between Procedural and Object oriented programming
1.3 basic OOP concept –
  1.3.1 Object
  1.3.2 Classes
  1.3.3 Abstraction
  1.3.4 Encapsulation
  1.3.5 inheritance
  1.3.6 Polymorphism Applications of OOPs.

Chapter 2	**Overview of JAVA Language**	**12 hours**

2.1 History of Java
2.2 features of Java
2.3 JDK Environment
2.4 Java Virtual Machine
2.5 Java Runtime environment Structure of java program
2.6 Simple Java program,
  2.6.1 More of Java Statements,
  2.6.2 Implementing a Java Program
  2.6.3 Programming Style.
2.7 Classes and objects:
  2.7.1 Defining classes
  2.7.2 Creating objects,
  2.7.3 Fields
  2.7.4 Methods ,
  2.7.5 Constructors and its types ,
2.8 Access class members.
  2.8.1 Modifiers & access control(De fault, public, private, protected, private protected).

Chapter 3	Operators and Control structures	10 hours

3.1 Tokens:
- 3.1.1 Identifiers,
- 3.1.2 Keywords
- 3.1.3 Constants,
- 3.1.4 Variables
- 3.1.5 Data Types.

3.2 Operators and Expressions:
- 3.2.1 Introduction,
- 3.2.2 Arithmetic Operators
- 3.2.3 Relational Operators
- 3.2.4 Logical Operators,
- 3.2.5 Assignment Operators,
- 3.2.6 Increment and Decrement Operators,
- 3.2.7 Conditional Operators,
- 3.2.8 Bitwise Operators,
- 3.2.9 Special Operators.

3.3 Arrays :
- 3.3.1 Creating an Array,
- 3.3.2 One-dimensional Arrays,
- 3.3.3 Multi- Dimensional Arrays and Strings.

3.4 Control structures:
- 3.4.1 Selection statements, Iteration statement,
- 3.4.2 Jump statements.

Chapter 4	Inheritance and polymorphism	12 hours

4.1 Inheritance:
- 4.1.1 Super class & subclass,
- 4.1.2 Types of inheritance.
- 4.1.3 abstract method and classes,
- 4.1.4 Method overriding,
- 4.1.5 Method overloading,
- 4.1.6 final keyword,
- 4.1.7 super keyword,
- 4.1.8 This keyword ,
- 4.1.9 dynamic method dispatch.

4.2 Interfaces:
- 4.2.1 Introduction,
- 4.2.2 Defining Interfaces,
- 4.2.3 Extending Interfaces,
- 4.2.4 Implementing Interfaces,
- 4.2.5 Accessing Interface Variables.

Chapter 5	Multithreading and packages	10 hours

5.1 Multithreading:
- 5.1.1 Multithreading Concept,
- 5.1.2 thread life cycle,
- 5.1.3 creating multithreading application,
- 5.1.4 thread priorities ,
- 5.1.5 thread synchronization, and inter thread communication.

5.2 Packages:
- 5.2.1 Introduction ,
- 5.2.2 types of package,
- 5.2.3 creating and importing user defined packages.

Chapter 6	**File and Exception Handling**	**10 hours**

6.1 Exception :Meaning of exception,
- 6.1.1 Exception handling mechanism ,
- 6.1.2 Using try catch and multiple catch
- 6.1.3 generic catch
- 6.1.4 Nested try
- 6.1.5 throw
- 6.1.6 throws and finally
- 6.1.7 Creating user defined Exceptions

6.2 File Handling :
- 6.2.1 meaning of file and its types.
- 6.2.2 Concept of Streams -Byte Stream Classes & Character Stream .
- 6.2.3 File IO basics,
- 6.2.4 File operations Creating file Reading file,
- 6.2.5 Writing file .

Text Books:

1. Programming with JAVA - E Balgurusamy
2. The Complete Reference – JAVA Herbert Schildt

References:

1.Core Java Volume I – Fundamentals, By Cay S. Horstmann, Prentice Hall.
2.Object Oriented Programming with Java: Somashekara M.T., Guru, D.S., Manjunatha K.S, 1st Edition, PHI Learning 2017

Online Resources:

https://www.javatpoint.com/java-tutorial
https://www.w3schools.com/java/

Savitribai Phule Pune University
S.Y.B.Sc (Information Technology)
IT-242
Title: Web Technologies

Teaching Scheme	No. of Credits	Examination Scheme
4 Hours / week	4	CA : 30 Marks UA : 70 Marks

Prerequisites

To learn and understand Basics of HTML & CSS

Course Objectives: -

- To Design informative & effective Dynamic Web Application
- To understand Server-Side Scripting Language
- Understanding POST and GET in form submission
- Read and process data in a MySQL database.

Course Outcomes: - Student will be able to: -

- Understand how to develop dynamic and interactive Web application
- Build Dynamic web site using server-side PHP Programming and Database connectivity
- To authenticate user by validating them

Course Contents

Chapter 1	**Basics of PHP**	**6 Lectures**

1.1 Overview of HTML & CSS
1.2 Lexical Structure of PHP
1.3 Working of PHP
1.4 PHP Basics: Use of PHP Language
1.5 Variables, Data Types and strings
1.6 Calculations with PHP

Chapter 2	**Study of Object-Oriented Concepts**	**6 Lectures**

2.1 Classes
2.2 Objects
2.3 Introspection
2.4 Serialization
2.5 Inheritance
2.6 Interfaces
2.7 Encapsulation

Chapter 3	**Array, control Structure & Looping in PHP**	**12 Lectures**
3.1	Introduction to Control structure	
3.2	Identifying elements of an array	
3.3	Variable parameters, Missing parameters & Default parameters	
3.4	Arrays and its Types	
3.5	Extracting multiple values	
3.6	Traversing arrays, Sorting Using arrays	
Chapter 4	**Functions in PHP**	**08 Lectures**
4.1	PHP's Built-in functions	
4.2	Defining and calling a function	
4.3	Default parameters & Variable parameters	
4.4	Missing parameters, Variable function	
4.5	Types of strings functions in PHP	
4.6	Comparing strings	
4.7	Manipulating and searching strings	
Chapter 5	**Designing forms with GET & POST**	**08 Lectures**
5.1	Working with GET & POST	
5.2	Differences between POST and GET	
5.3	Study of checkboxes, Radiobuttons, retriving with value	
5.4	Validating and restricting data	
5.5	Working with Email	
Chapter 6	**Session & Cookies**	**08 Lectures**
6.1	Setting and Reading session & Cookies	
6.2	Working model of Session & Cookies	
6.3	Protecting Online Files	
6.4	Understanding Session Variables	
Chapter 7	**Database Connectivity**	**12 Lectures**
7.1	To access a database Using PHP	
7.2	Connectivity with SQL	
7.3	PEAR DB basics	
7.4	Advanced database techniques	

Reference Books –

1. Php : A Beginner's Guide 1st Edition McGraw-Hill Osborne Media; 1 edition by Vikram Vaswani
2. Programming PHP By Rasmus Lerdorf and Kevin Tatroe, O'Reilly publication
3. Murach’s PHP and MySQL (2nd Edition) by Joel Murach and Ray Harris
4. PHP: The Complete Reference Paperback – 1 Jul 2017by Steven Holzner (Author)
5. PHP for Beginners, SPD publication

Savitribai Phule Pune University
S.Y.B.Sc. (Information Technology)
IT- 243
Title : Multimedia Technologies and Tools

Teaching Scheme	No. of Credits	Examination Scheme
4 hours /week	4	CA : 30 marks UA : 70 marks

Prerequisites

Knowledge in Computer Network and Operating System..

Course Objectives:

Multimedia has become an important part of our daily life. In this course, students will be introduced to principles and current technologies of multimedia systems. Issues in effectively representing, processing, and retrieving multimedia data, such as sound and music, graphics, image and video, will be addressed

Following are objectives:

1. To learn the fundamental concepts of multimedia.
2. To understand how to create story board.
3. To develop multimedia application using Scratch.

Course Outcomes :

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

- ❖ Disciplinary knowledge in fields related to Multimedia.
- ❖ Use multimedia applications and user interface for effective animation.
- ❖ Analyze and use various multimedia communication models.
- ❖ Identify the various audio, video formats and compression techniques for better transformation media over the network.

Course Contents

Chapter 1	**Introduction to Multimedia**	**08 Lectures**

1.1 What is multimedia?
1.2 History of Multimedia systems
1.3 Multimedia communications Model.
1.4 Components of Multimedia Systems
1.5 User requirements.
1.6 Network requirements.
1.7 Hypertext and Hypermedia
  1.7.1 What is Hypertext and Hypermedia
  1.7.2 Characteristics of Hypertext and Hypermedia
1.8 Applications of Multimedia System

Chapter 2	**Multimedia Application Development**	**12 Lectures**

2.1 Introduction
2.2 Story
2.3 Flowline
2.4 Script
2.5 Storyboard
  2.5.1 What is Storyboard
  2.5.2 General Guidelines
  2.5.3 Guidelines for Visual Elements
  2.5.4 Guidelines for Animation
  2.5.5 Guidelines for Text
  2.5.6 Guidelines for Audio
2.6 Multimedia Software tools.
  2.6.1-Music sequencing Notation.
  2.6.2-Digital Audio.

2.6.3-Graphics & Image editing.
2.6.4-Video editing.
2.6.5-Animation.

Chapter 3	**Graphics & Digital Image representation**.	**12 hours**

3.1 Introduction of Digital Representation
3.2 Types of Digital Representation
  3.2.1 Analog Representation
  3.2.2 Digital Representation
  3.2.3 Analog to digital Conversion
  3.2.4 Digital to Analog Conversion
3.3 Digital Image Representation
  3.3.1 1-bit: Black and White Images
  3.3.2 8 – bits: Gray Scale Images
  3.3.3 24 –bits: Color Images(RGB)
3. 4 Dithering
3.5 Image Data Structure
  3.5.1 8-bit color image
  3.5.2 24-bit color image
3.6 Standard System Independent Formats
  3.6.1 GIF 7.
  3.6.2 TIFF
  3.6.3 JPEG
3.7 Graphics Image data types.
3.8 Fil Formats

Chapter 4	**Audio Visual Integration**	**12 hours**

4.1 Introduction.
4.2 Basics of Digital Audio
  4.2.1 What is Sound?
  4.2.2 Characteristics of Sound
  4.2.3 Digital Audio
4.3 Synthesizers
  4.3.1 Types of Synthesizers
  4.3.2 Characteristics of Synthesizers
4.4 Introduction to MIDI
  4.4.1 What is MIDI
  4.4.2 Components of MIDI
  4.4.3 MIDI Messages
  4.4.4 Channel Messages
  4.4.5 System Messages
  4.4.6 General MIDI
4.5 Sound Card
  4.5.1 Basic Components
  4.5.2 I/O Ports
  4.5.3 Processing Audio Files
    - Wav files
    - MIDI files
4.6 -Media Interaction
4.7-Bimodality of Human Speech.
4.8-Lip reading.
4.9 -Lip Synchronization.
4.10-Lip tracing.

Chapter 5	Video Standards for multimedia Communication	**08 hours**

5.1 Introduction of Video
5.2 Video Signal Formats
  5.2.1 Component Video
  5.2.2 Composite Video
  5.2.3 S-Video
5.3 Television Broadcasting Standards
  5.3.1 NTSC
  5.3.2 PAL
  5.3.3 SECAM
5.4 Digital Video
5.5 Digital Video Standards
  5.5.1 EDTV
  5.5.2 CCIR Recommendations
  5.5.3 HD Video and HDTV
5.6-Reference Model.
  5.6.1-Standards relating to interpersonal communications.
  5.6.2- Standards relating to interactive applications over the Internet.
5.7-Standarads for entertainment applicants.

Chapter 6	**Digital Communication Basics**	08 **Lectures**

6.1-Introduction.
6.2-Transmission media.
6.3-Sources of signal impairment.
6.4-Asunohronus transmission.
6.5-Synchronous transmission.
6.6-Error detection methods.
6.7-Protocol Basics.
6.8-HDLC Protocol.

Reference Books:

1. Multimedia Communications By- Fred Halsall (PEARSON)
2. Principles of Multimedia – Ranjan Parekh
3. Fundamental of multimedia by- Ze-Mian Li & Mark Drew (PHI Publications)

Online Resources:

1. www.scratchjr.org

Savitribai Phule Pune University
S.Y.B.Sc. (Information Technology)
IT-244
Title: Lab Course on Object Oriented Programming

Teaching Scheme	No. of Credits	Examination Scheme
3 hours / week	2	CA:15 marks UA: 35 marks

Prerequisites

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Course Objectives: -

1. Set up Java JDK environment to create, debug and run simple Java Programs.
2. Understand how to write, compile and execute java programs.
3. Study the concepts of importing of packages and error handling mechanism.

Course Outcomes: On completion of the course, student will be able to–

- Implement Object oriented programming concepts.
- Implement File Handling mechanism of Java.
- Understand and use of inheritance and polymorphism as implemented in Java.
- Understand and use the exception handling mechanism of Java

Assignments

1. Write a Java program to accept a number from command prompt and generate multiplication table of a number.
2. Write a Java program to print the factors of a number.
3. Write a Java program to display Fibonacci series using recursion.
4. Write a Java program to accept a number from user and print all prime numbers upto that number(Use Buffered Reader class)
5. Write a Java program to display the pattern like a right angle triangle with a number.
6. Write a Java program to print the sum of elements of the array.
7. Write a Java program to create a class called "Person" with a name and age attribute. Create two instances of the "Person" class, set their attributes using the constructor, and print their name and age.
8. Write a Java program to create a class called "Employee" with a name, job title, and salary attributes, and methods to calculate and update salary.
9. Write a Java program to create a class called Vehicle with a method called drive(). Create a subclass called Car that overrides the drive() method to print "Repairing a car".
10. Write a Java program to create a class called Animal with a method named move(). Create a subclass called Cheetah that overrides the move() method to run.
11. Write a Java program that throws an exception and catch it using a try-catch block.
12. Write a Java program to create a method that takes an integer as a parameter and throws an exception if the number is odd.
13. Write a Java program to create a method that takes a string as input and throws an exception if the string does not contain vowels.
14. Write a Java program to create an interface Shape with the getArea() method. Create three classes Rectangle, Circle, and Triangle that implement the Shape interface. Implement the getArea() method for each of the three classes.
15. Write a Java program to create an interface Playable with a method play() that takes no arguments and returns void. Create three classes Football, Volleyball, and Basketball that implement the Playable interface and override the play() method to play the respective sports.

16. Write a Java program to create a base class Animal (Animal Family) with a method called Sound(). Create two subclasses Bird and Cat. Override the Sound() method in each subclass to make a specific sound for each animal.
17. Write a Java program to create a base class Shape with a method called calculateArea(). Create three subclasses: Circle, Rectangle, and Triangle. Override the calculateArea() method in each subclass to calculate and return the shape's area.
18. Write a program to create a directory and check whether the directory is created.
19. Write a program to create a file and write data into it using the methods OutputStream class.
20. Write a program to accept specified number of characters as input and converts them into uppercase characters.

Savitribai Phule Pune University
S.Y.B.Sc. (Information Technology)
IT-245
Title: Lab Course on Web Technologies

Teaching Scheme	No. of Credits	Examination Scheme
3 hours / week	2	CA:15 marks UA: 35 marks

Prerequisites

- Basic Knowledge of HTML, CSS.

Course Objectives: -

4. To understand the fundamental concepts of the terms Object, Class, Inheritance, Encapsulation etc.
5. How to design an effective Dynamic Web Application.
6. To get expertise in form Designing.
7. To understand and interpret results using PHP Concepts.
8. Students should be able to know how to make Database connectivity.

Course Outcomes: On completion of the course, student will be able to–

- ❖ Understand the concept of OOP Language very well.
- ❖ Ready to design the attractive & informative forms using PHP Language.
- ❖ Implement the programs based on Session, Cookies & Server-side Scripting Language.
- ❖ Students should understand the database connectivity.
- ❖ Implement the programs based on the concept of Class, Array, Functions, Strings etc.

Assignments

1. Write a program in PHP to Display Armstrong number.
2. Create a simple HTML form and accept the user's name and display the name through PHP echo Statement.
3. Write a PHP program to remove special characters from a string.
4. Write an PHP program to validate an Email address, Name through PHP echo statement.
5. Create a PHP script which displays the capital and country name from the above array "$Country_name". Sort the list by the name of the capital.
6. Write a PHP Program to display the Array to String Conversion (Favourite colours chosen by users)
7. Write an PHP program to calculate area of rectangle by using switch case create Simple Calculator.

8. Write a PHP program to Calculate a Electricity Bill by considering classname as “CBill”.
9. Write a PHP Script which will convert temperatures from Celsius(C)to Fahrenheit (F). (Hint: C=5.0/9(F-32).
10. Write a PHP Script to display the surface area and volume of a cuboid.
    (Hint: surface area=2(lb+lh+bh), volume = l*b*h)
11. Write a PHP Script to display the grade of the student according to percentage. Use the following conditions: Percentage Grade=”Fail” Percentage >= 40 and Percentage <=50 => Grade= “Pass Class” Percentage >=50 and Percentage <=60 => Grade= “Higher Second Class” Percentage >60 and Percentage <=70 => Grade= “First Class” Percentage >70 => Grade= “First Class with Distinction”
12. Write a PHP program to perform the following operations on an associative array:
    a. Display the elements of an array along with the keys.
    b. Display the size of an array
    c. Delete an element from an array from the given index.
    d. Reverse the order of each element’s key-value pair
13. Write a PHP script to perform the following operations on string :
    i) Compare string 2 with string3.
    ii) Convert all the strings to Upper case
    iii) Convert all the strings to Lowercase
14. Write a PHP Script to create a class vegetable that contains data members as Name, Color and Price. Write a member function to accept and display details of Vegetable.
15. Write a PHP script to swap two numbers using a function (Use Call by value and Call by reference)
16. Write a PHP Script to create a class employee that contains data members as, Emp_id, Emp_Name, and Salary. Write member functions to accept employee information.
17. Write a PHP script to check Aadhar Card number entered by the customer is valid or not and display an appropriate message.
18. Write a PHP script to accept employee details (name, address) and earning details (basic, DA, HRA). Display employee details and earning details in the proper format.
19. Write a PHP script to accept username and password. If in the first three chances, username and password entered is correct, then display the welcome message on the second form, otherwise display an error message.
20. Create an online Railway registration form. On the first page accept name, address, birthdate, and mobile number. On the second page accept Train details (Train_name, source, destination, departure date-time and charges). If the user does not enter information within a specified time limit, expire his session and give a warning otherwise display details using sessions on the third page.

Reference Books:

1. Murach’s PHP and MySQL (2nd Edition) by Joel Murach and Ray Harris
2. PHP: The Complete Reference Paperback – 1 Jul 2017by Steven Holzner (Author)
3. PHP for Beginners, SPD publication

Online Resources:

1) https://www.w3schools.com/php/
2) https://www.javatpoint.com/php-programs

Savitribai Phule Pune University
S.Y.B.Sc. (Information Technology)
IT-246
Title: Lab Course on Multimedia Technologies and Tools

Teaching Scheme	No. of Credits	Examination Scheme
3 hours / week	2	CA:15 marks UA: 35 marks

Prerequisites

Knowledge in Computer Network and operating System.

Course Objectives: -

1. To understand the fundamental concepts of Multimedia Technologies and Tools.
2. To provides an interaction between users and digital information
3. To understand and create own interactive stories, games and animations.
4. To develop logical thinking skills

Course Outcomes: On completion of the course, student will be able to–

- Know about to work on animation and timeline.
- Develop competencies in designing and producing instructional multimedia.
- Learn Audio Visual Integration.
- Design and draw customized GUI components

Assignments

1. Design a Scratch application to empty coke bottle.
2. Design a Scratch application to bounce a ball.
3. Design a Scratch application to move the object from one location to other.
4. Design a Scratch application to display fade-in and fade-out application.
5. Design a Scratch application for Waterfall effect.
6. Design a Scratch application for Screen saver.
7. Design a Scratch application for Smoke effect.
8. Design a Scratch application for Rain fall.
9. Design a Scratch application for Bubble effect.
10. Design a Scratch application on dancing doll.
11. Design a Scratch application on Sparrow Jumping Game.
12. Design a Scratch application on Catching Apple in a Bowl.
13. Design a Scratch application to make a Mouse Trail.
14. Design a Scratch application to make a Virtual Town.
15. Design a Scratch application to make a Virtual Pet.
16. Design a Scratch application to make Clicker Game.
17. Design a Scratch application to apply Day and Night mode.
18. Design a Scratch application to add Audio and Video.
19. Design a Scratch application to make a Dancing Girl and add background Music to it.
20. Design a Scratch application to make a Story with two Sprites and two Backgrounds.
21. Design a Scratch application to Moonrise after sunset.
22. Develop a Scratch application to Run a race.
23. Develop a Scratch application to make a Car Steering Simulation.
24. Develop a Scratch application to make a Snake Game.
25. Develop a Scratch application to make Fish-Shark Game.