Savitribai Phule Pune University

Degree Program
B.Sc. (Information Technology)

With

Major Course : Information Technology

(Faculty of Science and Technology)

Syllabi for
F.Y.B.Sc. (Information Technology)

Choice Based Credit System (CBCS) Syllabus
Under National Education Policy (NEP)

To be implemented from the Academic Year 2024-2025

Title of the Course : B.Sc.(Information Technology)

Preamble :

The B.Sc.(Information Technology) and B.Sc.(Information Technology) (Honors/Research) is specially structured three and four years program respectively with Information Technology as a major subject under the faculty of Science and Technology. The objective of the course is to think analytically, creatively and critically in developing robust, extensible and highly maintainable technological solutions to simple and complex problems or to pursue advance studies and research in Information Technology. The syllabus which comprises of Information Technology covers the key aspects of Information Technology and also develops the necessary professional skills and problem solving abilities using Information Technology.

Introduction:

Information Technology is the study of quantity, structure, space and change, focusing on problem solving, application development with wider scope of application in science, engineering, technology, social sciences etc. throughout the world in last couple of decades and it has carved out a space for itself like any other disciplines of basic Science and Technology. The students completing this programme will be able to present software application clearly and precisely, make abstract ideas precise by formulating them in the computer languages. Completion of this programme will also enable the learners to join teaching profession, enhance their employability for government jobs, jobs in software industry, banking, insurance and investment sectors, data analyst jobs and jobs in various other public and private enterprises.

At the First year, course is based on problem solving and programming. Primary Concepts of Python Programming, Computer Networking, Cloud Computing and DBMS are also introduced in course. The practical courses are designed to support the theoretical training in the year. Along with Information Technology (Major), VSC and SEC courses helps in building a personality. Another Aspect of this course is IKS which tells about the rich heritage and advancement of India in the field of computation.

At the second year, computational problem solving skills are further strengthened by course in Object Oriented Programming using python, Wireless Networking, Public Cloud, Software Engineering.

At the third year, all the courses are designed to fulfil core Information technology requirements as well as the needs of the IT industry. Major elective courses are taking care of recent trends in the field of Information Technology. Minor and skills Enhancement courses enable the students to acquire additional skills.

At the fourth year (Honors) and (Research), all the subjects are designed to fulfil core Information Technology requirements as well as meet the needs of the IT industry. Practical courses and field projects enable students to get hands on training. Numerous learning tracks are open through major elective courses. Research Methodology course will create interest among a student to bring research in the field of Information Technology.

Objectives:

- Equip students with the knowledge and skills to design, implement, and manage computer networks, ensuring secure and efficient communication.
- To apply their knowledge and skills to be employed and excel in IT professional careers and/or to continue their education in IT and/or related Post Graduate programs.
- It enables an IT graduate to start their own Software Development Company.
- To make the students industry ready by teaching them to apply the technologies in various fields of IT including Cloud Computing, Mobile applications, Web site Development and Management, Databases, and Computer Networks.

Eligibility:

• Higher secondary school certificate (10+2) Science or its equivalent examination with English.

OR

• Three-year diploma course from the board of technical education conducted by Government of Maharashtra or its equivalent.

OR

• Higher secondary school certificate (10+2) Examination with English and a vocational subject of +2 level (MCVC)

Program Outcome for B.Sc.(IT)

PO No.	**Outcomes**
PO1	Analyses a problem and identify and define the computing requirements appropriate to its solution
PO2	Focuses on preparing students for roles pertaining to computer applications and IT industry.
PO3	Developing programming skills, networking skills, learn applications, programming languages and modern techniques of IT
PO4	Get skills and information about computers and information technology .
PO5	Learn programming languages such as Python, SQL, Java etc.
PO6	Information about various computer applications and latest development in IT.
PO7	Gives overview of the topics in IT like software skills. Networking, web development and trouble shooting.
PO8	Ability to select appropriate techniques to tackle and solve problems in the discipline of Information Technology.

Savitribai Phule Pune University

Structure of UG Program as per NEP-2020

Name of Program: - B.Sc.(Information Technology)

Major Course:- Information Technology

Level:- 4.5 (First Year) Sem:-I

Course Type	**Course Code**	**Course Title**	**Course Credits**		**Teaching Scheme Hr/Week**		**Evaluation Scheme and Max Marks**		
			TH	PR	TH	PR	CE	EE	Total
Subject1	IT101MJ	Problem Solving using Python Programming	2		2		15	35	50
Subject 1 Practical	IT102MJP	Practical Based on IT101MJ		2		4	15	35	50
Subject2	IT103MJ	Basics of Computer Network	2		2		15	35	50
Subject 2 Practical	IT104MJP	Practical Based on IT103MJ		2		4	15	35	50
Subject3	IT105MJ	Fundamentals of Cloud Computing	2		2		15	35	50
Subject 3 Practical	IT106MJP	Practical Based on IT105MJ		2		4	15	35	50
GE/OE(2T)	OE101IT	MS Office Automation	2		2		15	35	50
SEC 2(T)	SEC101IT	Database Management System	2		2		15	35	50
IKS(2T)	IT101IKS	Generic IKS	2		2		15	35	50
AEC(2T)	AEC101ENG	English	2		2		15	35	50
VEC(2)	VEC101ENV	EVS-I	2		2		15	35	50
TOTAL			16	06	16	12			550

Level:- 4.5 (First Year) Sem:-II

Course Type	Course Code	Course Title	Course Credits		Teaching Scheme Hr/Week		Evaluation Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Subject1	IT151MJ	Advanced Python	2		2		15	35	50
Subject 1 Practical	IT152MJP	Practical Based on IT151MJ		2		4	15	35	50
Subject2	IT153MJ	Advanced Networking	2		2		15	35	50
Subject 2 Practical	IT154MJP	Practical Based on IT153MJ		2		4	15	35	50
Subject3	IT155MJ	Cloud Computing Architecture and Design	2		2		15	35	50
Subject 3 Practical	IT156MJP	Practical Based on IT155MJ		2		4	15	35	50
GE/OE(2P)	OE151ITP/ OE152ITP	Introduction to Google Apps / Tally Prime		2		4	15	35	50
SEC 2(P)	SEC102ITP	Practical Based on SEC101IT		2		4	15	35	50
AEC(2T)	AEC151ENG	English	2		2		15	35	50
VEC(2)	VEC151ENV	EVS-II	2		2		15	35	50
CC(2)	CC151PE/NSS/NCC	Course from University Basket	2		2		15	35	50
TOTAL			12	10	12	20			550

Exit option: Award of UG Certificate in Major with 44 credits and an additional 4 credits core as per university guidelines OR Continue with Major and Minor.

Continue option: Student will select one subject among the (subject 2 and subject 3) as minor and subject-1 will be major subject

In Second Year, the "Subject 1" will be Major Subject and the Minor subject will be chosen from "Subject 2 or Subject 3". Subject 2 and Subject 3 will not be available as Major Subjects in Second Year and Third Year.

Level:- 5.0 (Second Year) Sem:-III

Course Type	Course Code	Course Title	Course Credits		Teaching Scheme Hr/Week		Evaluation Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (4+2)	IT201MJ	Object Oriented Programming using Python	2		2		15	35	50
	IT202MJ	Wireless Networking	2		2		15	35	50
	IT203MJP	Practical Based on IT201MJ + IT202MJ		2		4	15	35	50
VSC 2(T/P)	IT221VSC	E-commerce	2		2		15	35	50
FP/OJT/ CEP(2)	IT231FP	Mini Project		2		4	15	35	50
Minor (2T+2P)	IT241MN	Public Cloud -Google, AWS, Azure	2		2		15	35	50
	IT242MNP	Practical Based on IT241MN		2		4	15	35	50
GE/OE (2T)	OE201IT	Content Writing / Script Writing	2		2		15	35	50
IKS	IT201IKS	From University Basket	2		2		15	35	50
AEC(2)	AEC201ENG	Soft Skill - I	2		2		15	35	50
CC(2)	CC201PE/NSS/NCC	Course from University Basket	2		2		15	35	50
TOTAL			16	06	16	12			550

Level:- 5.0 (Second Year) Sem:-IV

Course Type	Course Code	Course Title	Course Credits		Teaching Scheme Hr/Week		Evaluation Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (4+2)	IT251MJ	Exploratory Data Analysis	2		2		15	35	50
	IT252MJ	Cryptography & Network Security	2		2		15	35	50
	IT253MJP	Practical Based on IT251MJ + Practical Based on IT252MJ		2		4	15	35	50
VSC 2(T)	IT231VSC	Software Engineering	2		2		15	35	50
FP/OJT/ CEP(2)	IT282FP	Mini Project		2		4	15	35	50
Minor (2T+2P)	IT291MN	Automation tools for cloud Deployment	2		2		15	35	50
	IT292MNP	Practical Based on IT291MN		2		4	15	35	50
GE/OE (2P)	OE251ITP	Practical Based on Script Writing		2		4	15	35	50
SEC 2(T)	SEC251IT	Linux Operating System	2		2		15	35	50
AEC(2)	AEC251ENG	Soft Skill - II	2		2		15	35	50
CC(2)	CC251PE/NSS/NCC	From University Basket	2		2		15	35	50
TOTAL			14	08	14	16			550

Exit Option: Award of UG Diploma in Major and Minor with 88 credits and an additional 4 credit score as per university guidelines OR Continue with Major and Minor

Level:- 5.5 (Third Year) Sem:-V

Course Type	Course Code	Course Title	Course Credits		Teaching Scheme Hr/Week		Evaluation Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (8T+4P)	IT301MJ	Data Mining	2		2		15	35	50
	IT302MJ	Internet Technology	2		2		15	35	50
	IT303MJ	Mobile Application Development	2		2		15	35	50
	IT304MJ	Emerging Technologies	2		2		15	35	50
	IT305 MJP	Practical Based on IT301MJ		2		4	15	35	50
	IT306MJP	Practical Based on IT303MJ		2		4	15	35	50
Major Elective (2T+2P)	IT307MJ	Core Java	2		2		15	35	50
	IT308MJP	Practical based on IT307MJ		2		4	15	35	50
	OR								
	IT309 MJ	VB dotnet	2		2		15	35	50
	IT310MJP	Practical Based on IT309 MJ		2		4	15	35	50
VSC 2(T)	IT321VSC	IT Service Management	2		2		15	35	50
FP/OJT/ CEP(2)	IT331FP	Project		2		4	15	35	50
Minor (2T)	T341MN	Cloud computing and visualization foundation	2		2		15	35	50
TOTAL			14	8	14	16			550

Level:- 5.5 (Third Year) Sem:-VI

Course Type	Course Code	Course Title	Course Credits		Teaching Scheme Hr/Week		Evaluation Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (8+4)	IT351MJ	Data Analysis Tool (power Bi)	2		2		15	35	50
	IT352MJ	Information Security Management and Data Privacy	2		2		15	35	50
	IT353MJ	Web Technologies	2		2		15	35	50
	IT354MJ	Public cloud, networking and security	2		2		15	35	50
	IT355MJP	Practical Based on IT351MJ		2		4	15	35	50
	IT356MJP	Practical Based on IT353MJ		2		4	15	35	50
Major Elective (2+2)	IT357MJ	Advanced Java	2		2		15	35	50
	IT358MJP	Practical Based on IT357MJ		2		4	15	35	50
	OR								
	IT359MJ	Dot net framework Using ASP	2		2		15	35	50
	IT360MJP	Practical Based on IT359MJ		2		4	15	35	50
VSC(2)	IT322VSCP	Practical Based on IT352MJ		2		4	15	35	50
FP/OJT/ CEP(4)	IT381OJT	On Job Training		4		8	30	70	100
TOTAL			10	12	12	24			550

Level:- 6.0 (Fourth Year) Sem:-VII (Research)

Course Type	Course Code	Course Title	Course Credits		Teaching Scheme Hr/Week		Evaluation Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (6T+4P)	IT401MJ	Advanced Operating System	2		2		15	35	50
	IT402MJ	Paradigm of Programming Language	2		2		15	35	50
	IT403MJ	Design and Analysis of Algorithm	2		2		15	35	50
	IT404MJP	Practical based on IT401MJ		2		4	15	35	50
	IT405MJP	Practical based on IT402MJ		2		4	15	35	50
Major Elective (2T+2P)	IT406MJ	Data science & Analytics	2		2		15	35	50
	IT407MJP	Practical based on IT406MJ		2		4	15	35	50
	OR								
	IT408MJ	Spring Boot & Hibernate	2		2		15	35	50
	IT409MJP	Practical based on IT408MJ		2		4	15	35	50
	OR								
	IT410MJ	Block Chain	2		2		15	35	50
	IT411MJP	Practical based on IT410MJ		2		4	15	35	50
Minor (4)	IT431RP	Research Project		4		8	30	70	100
RM 4T	IT451MN	Research Methodology	4		4		30	70	100
TOTAL			12	10	12	20			550

Level:- 6.0 (Fourth Year) Sem:-VIII (Research)

Course Type	Course Code	Course Title	Course Credits		Teaching Scheme Hr/Week		Evaluation Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (6+4)	IT451MJ	Software Architecture & Design Pattern	2		2		15	35	50
	IT452MJ	Artificial Intelligence	2		2		15	35	50
	IT453MJ	Cyber Security	2		2		15	35	50
	IT454MJP	Practical based on IT451MJ		2		4	15	35	50
	IT455MJP	Practical based on IT452MJ		2		4	15	35	50
Major Elective (2+2)	IT456MJ	Development & Operation	2		2		15	35	50
	IT457MJP	Practical based on IT456MJ		2		4	15	35	50
	OR	OR							
	IT458MJ	Machine Learning	2		2		15	35	50
	IT459MJP	Practical based on IT458MJ		2		4	15	35	50
	OR	OR							
	IT460MJ	Cloud Computing	2		2		15	35	50
	IT461MJP	Practical based on IT460MJ		2		4	15	35	50
Minor (8 RP)	IT481FP	Research Project		8		16	60	140	200
TOTAL			8	14	8	28			550

Level:- 6.0 (Fourth Year) Sem:-VII (Honors)

Course Type	Course Code	Course Title	Course Credits		Teaching Scheme Hr/Week		Evaluation Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (10T+4P)	IT401MJ	Advanced Operating System	2		2		15	35	50
	IT402MJ	Paradigm of Programming Language	2		2		15	35	50
	IT403MJ	Object Oriented Analysis & Algorithm	2		2		15	35	50
	IT404MJP	Practical based on IT401MJ		2		4	15	35	50
	IT405MJP	Practical based on IT402MJ		2		4	15	35	50
	IT406MJ	Data Centre Technologies	2		2		15	35	50
	IT407MJ	Machine Learning	2		2		15	35	50
Major Elective (2T+2P)	IT408MJ	Data Science & Analytics	2		2		15	35	50
	IT409MJP	Practical based on IT408MJ		2		4	15	35	50
	OR								
	IT410MJ	Spring Boot & Hibernate	2		2		15	35	50
	IT411MJP	Practical based on IT410MJ		2		4	15	35	50
	OR								
	IT412MJ	Block Chain	2		2		15	35	50
	IT413MJP	Practical based on IT412MJ		2		4	15	35	50
Minor(4)	IT441MN	Research Methodology	4		4		30	70	100
TOTAL			16	06	16	12			550

Level:- 6.0 (Fourth Year) Sem:-VIII (Honors)

Course Type	Course Code	Course Title	Course Credits		Teaching Scheme Hr/Week		Evaluation Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core (10T+4P)	IT451MJ	Software Architecture & Design Pattern	2		2		15	35	50
	IT452MJ	Artificial Intelligence	2		2		15	35	50
	IT453MJ	Cyber Security	2		2		15	35	50
	IT454MJP	Practical based on IT451MJ		2		4	15	35	50
	IT455MJP	Practical based on IT452MJ		2		4	15	35	50
	IT456MJ	Network Security	2		2		15	35	50
	IT457MJ	Internet Of Things	2		2		15	35	50
Major Elective (2T+2P)	IT458MJ	Development & Operation	2		2		15	35	50
	IT459MJP	Practical based on IT458MJ		2		4	15	35	50
	OR	OR							
	IT460MJ	Machine Learning	2		2		15	35	50
	IT461MJP	Practical based on IT460MJ		2		4	15	35	50
	OR	OR							
	IT462MJ	Cloud Computing	2		2		15	35	50
	IT463MJP	Practical based on IT462MJ		2		4	15	35	50
Minor(4)	IT481OJT	OJT		4		8	30	70	100
TOTAL			12	10	12	20			550

Semester - I

Savitribai Phule Pune University
F.Y.B.Sc. (Information Technology)
Subject Code : IT101MJ
Title : Problem Solving using Python Programming

Teaching Scheme	No. of Credits	Examination Scheme
2 hours / week	2	CE: 15 marks EE: 35 marks

Prerequisites :
Fundamental concepts of computers

Course Objectives: -

- To understand problem solving aspects.
- To learn problem solving using computers.
- To analyze a problem and devise an algorithm to solve it.
- To learn the basics of Python language.
- To acquaint with data types, input output statements, decision making, looping and functions in Python.

Course Outcomes: - Student will be able to: -

1. Inculcate and apply various skills in problem solving.
2. Choose most appropriate programming constructs and features to solve problems in diversified domains.
3. Demonstrate Python programming skills for problems that require the writing of well documented programs including use of the logical constructs of the language
4. Design algorithms, implement, test, debug and execute programs in the Python language.

Course Contents

Chapter 1	**Problem Solving using Computer**	**5 hours**

1.1 Problem Solving**:** General Problem-Solving Concepts, Problem solving using computers, Problem solving steps.
1.2 Program Design Tools**:** Algorithms, Flowcharts and Pseudo-codes, implementation of algorithms, algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum/maximum in a list, searching, etc.
1.3 The Python Programming Language, Installation, History, versions, features, Applications,

Chapter 2	**Basics of Python Programming**	**8 hours**

2.1 The Python programming environment, Basic Syntax, Writing and executing a Python program, Comments, Keywords and identifiers, Data types and Variables, Getting and setting the data type, Constants.
2.2 Lines and indentation, Input/output with print and input, Command line arguments,
2.3 Operatorsand expressions, Precedence of operators, type conversion.
Strings: declaration, manipulation, special operations, escape character, string formatting.

Chapter 3	Control Statements and Functions	8 hours
3.1 Conditional Statements: if, if-else, nested if, if-elif-else statements. 3.2 Looping- for, while, nested loops, the break, continue, pass, else statement used with loops.Understanding and using Ranges 3.3 Functions – Need for functions, Function: definition, call, variable scope and lifetime, the returnstatement, passing arguments, arbitrary arguments, keyword arguments, 3.4 default arguments, recursion, Lambda or anonymous function,		
Chapter 4	**Built-in structures**	**5 hours**
4.1 List: Concept, creating and accessing elements, traversing a List, List operations: modifying,adding, deleting items, Built-in List functions, List comprehension and slicing **4.2 Tuple:** Concept, Creating and Accessing a tuple, Basic tuples operations, unpacking a tuple, Concatenation, Repetition, in Operator, Iteration, Built-in tuple functions, indexing, slicing **4.3 Dictionary:** Concept, Creating and Accessing dictionary elements, Updating 4.3Dictionary, DeletingElements from Dictionary, Properties of Dictionary keys, Operations in Dictionary, Built-In Dictionary Functions, Built-in Dictionary Methods. **4.4 Set:**Concept, set operations (Adding, Union, intersection), working with sets.		
Chapter 5	**Files & Modules**	**4 hours**
5.1 Files: Introduction, File path, Types of files, Opening and Closing files, Reading and Writing files. 5.2 Introduction to modules, standard library modules, Importing modules in python program, using the dir(). 5.3 Working with Random Modules. E.g. - time, date time, calendar, sys, etc.		

Reference Books:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, CengageLearning, ISBN: 978-1111822705
2. R. G. Dromey, "How to Solve it by Computer", Pearson Education India; 1st edition, ISBN10: 8131705625, ISBN-13: 978-8131705629 Maureen Spankle, "Problem Solving and Programming Concepts", Pearson; 9th edition, ISBN-10: 9780132492645, ISBN-13:978- 0132492645
3. Python Programming: A modular approach, Taneja Sheetal and Kumar Naveen, First edition, Pearson India, 2017, ISBN: 978-9332585348

E-Books and Online Learning Material

1. https://www.w3schools.com/python/
2. The Joy of Computing using Python - https://nptel.ac.in/courses/106/106/106106182/
3. Programming, Data Structures and Algorithms using Python https://nptel.ac.in/courses/106/106/106106145/

Savitribai Phule Pune University
F.Y.B.Sc.(Information Technology)
Subject Code: IT102MJP
Title: Practical Based on Problem Solving using Python Programming (IT101MJ)

Teaching Scheme	No. of Credits	Examination Scheme
4 hours / week	2	CE : 15 marks EE: 35marks

Prerequisites

1.Problem solving with Python

Course Objectives:-

- To apply problem solving aspects.
- To analyze a problem and devise an algorithm to solve it.
- To use the Python programming environment
- To execute Python programs

Course Outcomes:-Student will be able to:-

- CO1:Applyvariousskillsinproblem solving.
- CO2: Solve simple problems by choosing the most appropriate programming constructs and features in Python.
- CO4:Implement, test, debug and execute programs in the Python language.

Practical Assignments

Assignment1:

- Write a Python Program to print a value using variable.
- Write the correct syntax to print the length of string
  X = “Hello, World!
- Write the correct syntax to convert the value of X to upper case and lower case.
- Write a program to replace python with java of string (txt = "I am a python developer!

Assignment2:

- Write a python program to perform arithmetic operation using variable.
- Write a program to print output of 5+9*4 expression. also print which operator has higher precedence.

Assignment 3:

- Write a python function take name & roll no. as an argument & pass the value for the same.
- Write a program to create a variable inside a function, with the same name as the global variable.

Assignment 4:

- Write a program to change the value “banana” & cherry with the value “Blackcurrant & watermelon”
  Fruit = [“apple”, ”banana”, “Cherry”, “Mango”, ”Kiwi”, ”dragon”].
- Program to Print values of dictionary. Also print value of any key in dictionary

Assignment 5:

- Display the Addition, Subtraction, Multiplication & Division of 20+50, using two variables: x and y.
- Write the correct syntax to perform following task (X = “I am python developer”!)
  a) Get the characters from index 2 to index 4
  b) To find the length of variable X

Assignment 6:

- Write a program to read & print file content.
- Write a program to print year & short version of month.

Assignment 7:

- Write a program to read & print first 5 character of a file content.
- Write a program to calculate the Area of circle Take all inputs from users.

Assignment 8:

- Write a Program to insert and delete from dictionary.
- Write a program to create a variable inside a function, with the same name as the global variable.

Assignment 9:

- Write a program to concatenate/join two string using operator. Take input from user.
- Write a program to perform all arithmetic operations. Take input from user.

Assignment 10:

- Write a program to check whether the given number is even or odd
- Write a program to print factorial of a given number

Assignment 11:

- Write a program to print all the elements of the list that are less than 10.
- Write a program to generate random numbers between the range 1 to 100.

Assignment 12:

- Write a program to print second last item of tuple.
- Write a program to return 3, 4 and 5^{th} item of tuple.

Assignment 13:

- Write a program to print year & short version of month.
- Write a program to print second last item of the list create a module for the same.

Assignment 14:

- Write a program to print year & short version of month.
- Write a python program to print character from index number 3 to 6 from a given string (x = “I am a Python developer”)

Assignment 15:

- Write a program to read & print file content.
- Write a program Program to Merge Two Lists and Sort it.

References :

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning, ISBN: 978-1111822705
2. Python Programming: A modular approach, Taneja Sheetal and Kumar Naveen, Firstedition, Pearson India, 2017, ISBN: 978-9332585348

Savitribai Phule Pune University
F.Y.B.Sc. (Information Technology)
Subject Code : IT103MJ
Title : Basics of Computer Network

Teaching Scheme	No. of Credits:	Examination Scheme
2 hours / week	2	CE :15 marks EE : 35 marks

Course Objectives: -

- To understand basic terms of computer networks and the internet environment.
- Become familiar with layered communication architectures (OSI and TCP/IP).

Course Outcomes: -

1. To familiarize the student with the basic taxonomy and terminology of computer networks.
2. To prepare the student for advanced courses in computer networking.
3. To understand data transmission across the network.
4. Gather knowledge of various types of networks and topologies.
5. Get an overview of the Internet, its applications and various browsers available to access the Internet.
6. Connect to the Internet using various modes of connections/devices available.

Course Contents

Chapter 1	**Introduction to Networking Fundamentals**	**09 Hours**

1.1 Beginnings of Networking and data communication, ARPnet
1.2 Understanding Network Basics (N/W Components, N/W Device Roles)
1.3 Network Topologies : Bus, Ring, Star and Mesh Topologies
1.4 Transmission Modes (Simplex, Half Duplex, Full Duplex)
1.5 Types of Computer Networks (PAN, LAN, MAN, WAN)
1.6 Network Architectures (Centralized, Decentralized and Distributed)
1.7 Difference between Internet, Intranet and Extranet

Chapter 2	**Introduction to Physical Layer**	**07 Hours**

2.1 **Network Models:** TCP/IP protocol suite, OSI Model
2.2 **Switching:** Packet , Message and Circuit Switching
2.3 **Physical Layer:** Guided Transmission media: twisted pairs, coaxial cable, fiber optics, Wireless transmission.
2.4 Analog and Digital signal, Analog to Digital transmission
2.5 Bandwidth utilization: Multiplexing and Spectrum Spreading

Chapter 3	**Introduction to Data Link Layer**	**07 Hours**

3.1 Function of data link layer,
3.2 Data framing techniques: Character Count, Character stuffing, Bit stuffing
3.3 Link layer addressing, Data Link layer design Issue
3.4 Error detection and correction : Parity, Checksum
3.5 Elementary data link protocol: Stop and wait, Sliding window protocol-Go back N:ARQ, Selective repeat ARQ
3.6 MAC Sublayer
3.7 Random Access Protocol: ALOHA,CSMA, CSMA/CD, CSMA/CA
3.8 Data link layer devices: Bridges, Switches

Chapter 4	**Network Layer**	**07 Hours**

4.1 Function of network layer
4.2 Network service type: virtual circuit and datagram

4.3 Routing algorithm: shortest path routing, Flooding , Distance vector routing, Link state routing, hierarchical routing
4.4 Congestion control: algorithm and congestion prevention policies
4.5 Internet protocols: Ip frame format, IP addressing, subnets
4.6 Internet control protocols: ICMP, ARP, DHCP
4.7 Internetworking: network layer device-router

Reference Books:

1. Computer Networks and Internets, 5th Edition, Douglas E. Comer, Pearson
2. Networking Basics, 2nd Edition, Patrick Ciccarelli, Christina Faulkner, Jerry Fitzgerald, Alan Dennis, David Groth and Toby Skandier with Frank Miller, Wiley
3. Internetworking with TCP/IP, Volume I, 5th Edition, Douglas E. Comer, PHI.
4. Internetworking with TCP/IP, Volume II, 3rd Edition, Douglas E. Comer, D.L. Stevens, PHI
5. TCP/IP Illustrated, Eastern Economy Edition, N.P. Gopalan, B. Siva Selvan, PHI
6. Computer Networking by Ed Tittel, McGRaw Hills Companies

Savitribai Phule Pune University
F.Y.B.Sc.(Information Technology)
Subject Code :IT104MJP
Title: Practical Based on Basics of Computer Network (IT103MJ)

Teaching Scheme	No. of Credits	Examination Scheme
4 hours/week	2	CE:15 marks EE:35 marks

Prerequisites :
Basics of Computer network

Course Objectives:-

- Become familiar with layered communication architectures (OSI and TCP/IP).
- To get the basic knowledge and terminologies of computer networks

Course Outcomes:-Student will be able to:-

- Understand data transmission across the network.
- Understand various types of networks and topologies.
- Understand various types of network devices.
- Understand different Routing Algorithm.

Practical Assignments

1. Explain Physical topologies of LAN and WAN.
2. Difference between PAN and MAN.
3. Write a note on Bus and Ring Topology.
4. Explain real life example of Mesh Topology.
5. Study of following Network Devices in Detail
   - Repeater
   - Hub
   - Switch
   - Bridge
   - Router
   - Gate Way
6. Explain the modes of Transmission medium.
7. Explain physical layer protocols with example.
8. How to convert Analog to Digital signal?
9. Explain the functions performed by Physical layer.
10. Write a note on functions and responsibilities of data link layer.
11. Difference between connection oriented and connectionless services.
12. Write a note on bridges and switches.
13. Explain different Routing Algorithm.
14. Write a short note on Internet protocols.
15. Write a short note on Internet Control protocols.

Reference Books :

1. Computer Networks and Internets, 5th Edition, Douglas E. Comer, Pearson

2. Networking Basics, 2nd Edition, Patrick Ciccarelli, Christina Faulkner, Jerry Fitzgerald, Alan Dennis, David Groth and Toby Skandier with Frank Miller, Wiley

3. Computer Networking by Ed Tittel, McGRaw Hills Companies

Savitribai Phule Pune University
F.Y.B.Sc. (Information Technology)
Subject Code : IT105MJ
Title: Fundamentals of Cloud Computing

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

Prerequisites :
Programming Skills, Familiarity with Operating System and Databases, Basics of Networking Security

Course Objectives:

- To study cloud computing concepts, technologies, architecture and applications.
- To understand issues in application deployment and implementations in cloud environment.
- To learn recent trends in cloud computing.

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

- Explain the core issues in cloud computing such as security, privacy, and interoperability.
- Compare and contrast various cloud services
- Choose the appropriate technologies and approaches for the given application.

Course Contents

Chapter 1	**Introduction to Cloud Computing**	**5 hours**

1.1 Overview of Cloud
1.2 Layers and Types of Cloud
1.3 Desired Features of a Cloud
1.4 Benefits and Disadvantages of Cloud Computing
1.5 Cloud Infrastructure Management

Chapter 2	**Abstraction and Virtualization**	**6 hours**

2.1 Understanding Abstraction and Virtualization
2.2 Types of Virtualization
2.3 Advantages, Limitations of Virtualization
2.4 Load Balancing and Virtualization
2.5 Understating Hypervisors – Virtual Machine types
2.6 Exploring PaaS- force.com
2.7 Exploring SaaS – salesforce.com
2.8 Exploring IaaS – Amazon EC2

Chapter 3	**Programming Environment**	**6 hours**

3.1 Features of Cloud Computing, Grid Computing
3.2 Difference between Cloud Computing and Grid Computing
3.3 Programming Support of Google App Engine
3.4 Programming on Amazon AWS
3.5 Microsoft Azure
3.6 Emerging Cloud Software Environments

Chapter 4	Cloud Platforms and Cloud Applications	6 hours

4.1 Amazon Web Services (AWS): Amazon Web Services and Components, Amazon Simple DB, Elastic Cloud Computing (EC2), Amazon Storage System, Amazon Database services (Dynamo DB).
4.2 Microsoft Cloud Services: Azure core concepts, SQL Azure
4.3 Microsoft Cloud Services
4.4 Google Cloud Applications
4.5 Amazon Cloud Services
4.6 Cloud Applications

Chapter 5	Security in Cloud Computing	02 hours

5.1 Risks in Cloud Computing: Risk Management, Types of Risks in Cloud Computing.
5.2 Cloud Security Services: Confidentiality, Integrity and Availability, Security Authorization
5.3 Challenges in the Cloud, Security Issues in Cloud Computing.

Chapter 6	Emerging Trends in Cloud	05 hours

6.1 Future Trends in cloud Computing: Mobile Cloud
6.2 Multi-Cloud Vs Omni-Cloud
6.3 Integrated Blockchain technology
6.4 Cloud AI
6.5 Intelligent SaaS

Text Books:

1) Srinivasan, J. Suresh, "Cloud Computing: A Practical Approach for Learning and Implementation", Pearson, ISBN: 978-81-317-7651-3
2) Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, "Mastering Cloud Computing", McGraw Hill Education, ISBN-13:978-1-25-902995-0
3) Cloud Computing: Principles and Paradigms, Editors, Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wiley,2011.
4) Enterprise Cloud Computing - Technology, Architecture, Applications, Gautam Shroff, Cambridge University Press, 2010.

Reference Books:

1) Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010.
2) Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley- India,2010.
3) Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center, Brian J. S. Chee and Curtis Franklin.
4) Microsoft Azure: Planning, Deploying, and Managing Your Data Center in the Cloud, Anthony Puca, Mike Manning, Marshal Copeland, Julian Soh, David Gollob.

E-Books:

1) https://openlibrary.org/
2) https://nlist.inflibnet.ac.in/
3) https://archive.org/

Savitribai Phule Pune University

F.Y.B.Sc. (Information Technology)
Subject Code : IT106MJP
Title : Practical based on Fundamentals of Cloud Computing (IT105MJ)

Teaching Scheme	No. of Credits:	Examination Scheme
4 hours / week	2	CE :15 marks EE : 35 marks

Course Objectives: -

- Learn and apply virtualization techniques with hypervisors.
- -Implement and evaluate different load balancing strategies.
- -Explore, Utilize and use various Amazon Web Services (AWS).
- -Set Up a Basic Cloud Environment, Configure and manage a basic cloud setup.
- -Understand IaaS, PaaS, and SaaS; deploy a sample application.
- -Understand and analyze emerging trends in cloud computing.
- -Learn and apply security best practices in cloud environments.

Course Outcomes: -

- Identify and analyze current and emerging trends in cloud computing and their business and technological implications.
- -Implement and manage virtualization solutions using Type 1 and Type 2 hypervisors.
- -Implement and compare various load balancing algorithms in different cloud environments.
- -Analyze real-world use cases of cloud computing across various industries.
- -Implement security best practices in cloud computing, including encryption and access control.
- -Utilize various AWS services to develop practical solutions.
- -Set up, configure, and manage a basic cloud environment with virtual machines, storage, and networking.
- -Understand and deploy applications using IaaS, PaaS, and SaaS models.
- -Explore and implement examples or simulations of future trends in cloud computing, such as mobile cloud, containers, and Kubernetes.

Practical Assignments

Assignment 1: Introduction to Cloud Computing

- compare at least two cloud service providers (e.g., AWS, Azure, Google Cloud).
- Sign up for a free tier account on AWS, Azure, or Google Cloud.
- Create a basic virtual machine (VM) instance.
- Connect to the VM instance via SSH (for Linux) or Remote Desktop (for Windows).

Assignment 2:Hypervisors in Cloud Computing

- -Install a Type 1 hypervisor (e.g., VMware ESXi)
- -Install a Type 2 hypervisor (e.g., VirtualBox or VMware Workstation) on your system.

Assignment 3:Virtualization in Cloud Computing

- Create and configure multiple virtual machines.
- Demonstrate the process of creating snapshots and cloning VMs.

Assignment 4: Cloud Service Models--SaaS

- SaaS: Use Google Docs or Office 365 and document your experience.

Assignment 5: Cloud Service Models---PaaS

- Deploy a simple web application on a PaaS platform like Google App Engine or Azure App Service. Use a basic web app template (e.g., a simple "Hello World" app)

Assignment 6: Cloud Service Models---IaaS

- Set up a web server on a VM instance. Install a web server (Apache or Nginx) and host a static website.

Assignment 7 : AWS Services Exploration

- AWS: Create an S3 bucket and upload some files. Use EC2 to launch a VM instance.
- Implement a sample application that uses Amazon Storage Service for data storage.

Assignment 8: Cloud Computing Applications in Various Domains

- Develop a cloud-based solution using relevant cloud services (e.g., Google App Engine for social networking applications).
- Install and configure Google App Engine.
- Develop application for Google App Engine Create hello world app and other simple web applications using python/java using Google Cloud.

Assignment 9: Load Balancing Techniques:

- Implement and test at least two load balancing techniques (e.g., Round Robin and Least Connections. etc).

Assignment 10: Cloud Security Implementation

- Implement security measures such as encryption and access control on a cloud platform.
- Implement basic security measures on a cloud platform, such as setting up IAM roles and policies in AWS or Azure.
- Create a secure storage bucket and configure permissions.
- Write a Program to Create, Manage and group User accounts in your own Cloud by Installing Administrative Features.

Assignment 11: **Understanding of Cloud Storage Apps**

- Dropbox
- Google Drive
- OneDrive

Assignment 12:**Kubernetes**

- Set up a Kubernetes cluster using a managed service (e.g., Google Kubernetes Engine, Azure Kubernetes Service).

Assignment 13: **Deploy Docker Container**

- Deploy a Docker container on a cloud platform

Assignment 14: **JustCloud**

- Installation and configuration of JustCloud

Assignment 15: **Exploring Future Trends in Cloud Computing**

- Understanding about Mobile Cloud or Kubernetes
- Implement a basic example or simulation related to the chosen topic (e.g., set up a containerized application using Docker and Kubernetes).

Reference Books:

1) Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley- India,2010.
2) Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center, Brian J. S. Chee and Curtis Franklin.

Savitribai Phule Pune University
F.Y.B.Sc. (Information Technology)
Subject Code : OE101IT
Title : MS Office Automation

Teaching Scheme	No. of Credits	Examination Scheme
2 hours / week	2	CE: 15 marks EE: 35 marks

Prerequisites :
Knowledge of using Personal Computers, Input and output devices

Course Objectives:

This course provides an in-depth training to use MS office automation tools. The course also helps the candidates to get the knowledge of internet and how to use different internet tools.

Following are objectives:

- To familiarize the students with MS Windows Operating System
- To enable the students in crafting MS Word documents
- To enable the students to create Excel Spreadsheets
- To enable the students to create power point presentations

Course Outcomes :

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

- interact with Windows OS in command mode
- create, edit documents in MS Word, WordPad and Notepad
- create spreadsheet and accounting operations using basic and advanced concepts of MS Excel
- create Seminar Presentations using MS PowerPoint

Course Contents

Chapter 1	Introduction to MS Windows Operating System	06 hours

1.1 What is Operating System (OS)
1.2 Functions of OS
1.3 Types of OS
1.4 Types of User Interface
- 1.4.1 CUI (Comma User Interface): DOS Commands
- 1.4.2 GUI(Graphical User Interface): Desktop, Types of Menus, Icons, Dialog Boxes, Task bar etc

1.5 Working with WordPad and Notepads
1.6 Creating and editing images with MS Paint

Chapter 2	MS Office Application I : MS Word	06 hours

2.1 Working with Documents: Opening & Saving files, Editing text documents, Inserting, Deleting, Cut, Copy, Paste, Undo, Redo, Find, Search, Replace, Converting files to different formats, Importing & Exporting documents.

2.2 Formatting Documents: Formatting page & setting Margins, Setting Font styles, Font selection- style, size, colour etc, Type face - Bold, Italic, Underline, Case settings, Highlighting, Special symbols, Setting Paragraph style, Alignments, Indents, Line Space, Margins, Bullets & Numbering

2.3 Setting Page style: Formatting Page, Page tab, Margins, Layout settings, Paper tray, Border & Shading, Columns, Header & footer, Setting Footnotes & end notes – Shortcut Keys; Inserting manual page break, Column break and line break, Page Numbering.

2.4 Creating Tables: Table settings, Borders, Alignments, Insertion, deletion, Merging, Splitting.

2.5 MS Word Tools : Word Completion, Spell Checks, Mail merge

Chapter 3	**MS Office Application II : MS Excel**	**08 hours**

3.1 Spread Sheet & its Applications

3.2 Working with Spreadsheets: opening, Saving files, Spread sheet addressing - Rows, Columns & Cells, Referring Cells & Selecting Cells, Shortcut Keys. setting Margins

3.3 Entering & Deleting Data: Entering data, Cut, Copy, Paste, Undo, Redo, Filling Continuous rows, columns, Highlighting values, Find, Search & replace, Inserting Data, Insert Cells, Column, rows & sheets, Symbols, Data from external files, Frames, Clipart, Pictures, Files etc

3.4 Setting Formula: finding total in a column or row, Mathematical operations (Addition, Subtraction, Multiplication, Division, Exponentiation), Using other Formulae

3.5 Formatting Spreadsheets: Labeling columns & rows, Formatting- Cell, row, column & Sheet, Category - Alignment, Font, Border & Shading, Hiding/ Locking Cells, Anchoring objects, Formatting layout for Graphics, Clipart etc., Worksheet Row & Column Headers, Sheet Name, Row height & Column width, Visibility - Row, Column, Sheet, Security, Sheet Formatting & style, Sheet background, Colour etc, Borders & Shading – Shortcut keys

3.6 MS Excel basic and Advanced tools: Creating Charts, Sorting, Filtering, Validation, Consolidation, Subtotal, Commonly used inbuilt Functions(Date Time Functions, Mathematical Functions, Statistical Functions)

Chapter 4	**MS Office Application III : MS Power Point**	**06 hours**

1.1 Introduction to presentation: Opening new presentation, Different presentation templates, Setting backgrounds, Selecting presentation layouts.

1.2 Creating a presentation - Setting Presentation style, Adding text to the Presentation.

1.3 Formatting a Presentation: Adding style, Colour, gradient fills, Arranging objects, Adding Header & Footer, Slide Background, Slide layout. Adding Graphics to the Presentation- Inserting pictures, movies, tables etc into presentation, Drawing Pictures using Draw.

1.4 Adding Effects to the Presentation: Setting Animation & transition effect, Printing Handouts, Generating Standalone Presentation viewer.

Chapter 5	**Introduction to Internet and Applications**	**04 hours**

5.1 Definition and History of Internet

5.2 Uses, Advantages and disadvantages of Internet

5.3 Browsers and its types

5.4 Introduction to various google applications: Google Forms, Google Class Room, Google Meet, Google Docs, Google Sheets, Google Slides

Reference Books:

1. Office Automation A Complete Guide - 2020 Edition by Gerardus Blokdyk
2. Office Automation Clerk Gifts by RMP Amazing Press House

Online Resources:

1) https://www.javatpoint.com/ms-word-tutorial
2) https://www.javatpoint.com/excel-tutorial
3) https://www.javatpoint.com/powerpoint-tutorial
4) https://www.javatpoint.com/internet
5) https://www.tutorialspoint.com

Savitribai Phule Pune University
F.Y.B.Sc. (Information Technology)
Subject Code: SEC101IT
Subject: Database Management System

Teaching Scheme	No. of Credits	Examination Scheme
2 hours / week	2	CE: 15 Marks EE: 35 Marks

Prerequisites:

- Knowledge of fundamental concepts and principles of organizing, storing, and retrieving data.

Course Objectives:

1. To understand Database Management System conceptually.
2. To understand how user requirements can be mapped to schemas.
3. To introduce core principles and techniques required in the design and implementation of database systems.
4. To become skilled at how to organize, maintain and retrieve - efficiently and effectively information from a DBMS.

Course Outcomes:

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

1. Take the most important responsibility as a Database Administrator.
2. Design an Entity-Relationship model from a realistic problem specification.
3. Improve the database design by applying normalization techniques to normalize the database.
4. Formulate SQL queries on database.

Course Contents

Chapter 1	**Introduction to DBMS**	**4 hours**

1.1 Introduction to Data, Database and Database Management System(DBMS)
1.2 File System Vs DBMS
1.3 Structure of DBMS
1.4 DBMS users and their roles
1.5 Levels of abstraction and Data independence
1.6 Advantages and Disadvantages of DBMS

Chapter 2	**Database Design and Normalization**	**8 hours**

2.1 Overview of DB design
2.2 Introduction to Data models (Hierarchical, Network, Relational)
2.3 E-R data model (Types of entities, attributes, relations, entity sets, relationship sets)
2.4 Extended features (Generalization, Specialization, Aggregation)
2.5 Structure of Relational Databases (table, row, column, attribute, key)
2.6 Concept of Normalization - Normal forms 1NF, 2NF, 3NF with Example, BCNF only definition
2.7 Case Studies

Chapter 3	SQL	14 hours

3.1 Introduction to SQL, Features, Advantages, Data types
3.2 Introduction to Database Languages (DDL, DML, DCL, TCL)
3.3 DDL and DML commands with examples, DCL and TCL commands introduction
3.4 Constraints (Not Null, Unique, Check, Primary Key, Referential, Key)
3.5 Basic structure of SQL query, Nested Sub-queries
3.6 Set operations, Aggregate functions, Date functions, String functions, Logical operators, Range Searching, Pattern Matching, clause (distinct, order by, group by, having)
3.7 SQL mechanisms for joining relations (inner joins, outer joins and their types)
3.8 Views
3.9 Case Studies

Chapter 4	Introduction to Emerging Databases	4 hours

4.1 NoSQL databases (Introduction, Advantages and Disadvantages, Applications)
4.2 Cloud databases (Introduction, Advantages and Disadvantages, Applications)
4.3 Big data (Introduction, Advantages and Disadvantages, Applications)

Reference Books:

1. Henry F. Korth, Abraham Silberschatz, S. Sudarshan, "Database System Concepts", Tata McGraw-Hill Education
2. Raghu Ramakrishnan and Johannes Gehrke, "Database Management Systems", McGraw-Hill
3. Beginning Databases with PostgreSQL: From Novice to Professional, Richard Stones, Neil Matthew, ISBN:9781590594780, Apress
4. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence by Pramod J. Sadalage, Martin Fowler
5. An Introduction to Cloud Databases by Vlad Vlasceanu, Wendy A. Neu, Andy Oram, Sam Alapati
6. Big Data: Concepts, Technology and Architecture, Balamarugan Balusamy, Nandhini Abirami R, Seifedine Kadry and Amir Gandomi.

Online Learning Material

https://www.w3schools.com/postgresql/
https://www.geeksforgeeks.org/dbms/

Semester - II

Savitribai Phule Pune University
F.Y.B.Sc. (Information Technology)
Subject Code : IT151MJ
Title: Advanced Python

Teaching Scheme	No. of Credits	Examination Scheme
2 hours / week	2	CE: 15 marks EE: 35 marks

Prerequisites :
Problem solving with Python

Course Objectives: -

- To learn how to write loops and decision statements in Python.
- To define the structure and components of a Python program.
- To learn GUI programming.
- To learn the Advanced of Python language.
- Python's threading module provides mechanisms for parallel execution, making it suitable for tasks that can benefit from concurrency.

Course Outcomes: - Student will be able to: -

5. Demonstration of more advanced topics like object-oriented programming, modules, files handling, and exception handling.
6. Build basic programs using fundamental programming constructs like variables, conditional logic, looping, and functions.
7. The fundamental programming skills they'll learn in this course are transferrable between programming languages and problem domains.
8. To handle abnormal termination of a program using exception handling.

Course Contents

Chapter 1	**Working with files**	**5 hours**

Working with files: Files, opening and closing a file, working with text files containing strings, knowing whether a file exists or not, working with binary files, with statement, the seek() and tell() methods, random accessing of binary files, zipping and unzipping files, working with directories, running other programs from python program

Chapter 2	**Regular expressions and Threads in python**	**8 hours**

What is a regular expression?, sequence characters in regular expressions, quantifiers in regular expressions, special characters in regular expressions, using regular expression on files, Difference between process and thread, types of threads, benefits of threads, creating threads, single tasking and multitasking, thread synchronization, deadlock in threads, daemon threads.

Chapter 3	**Classes and objects**	**5 hours**

Creating a class, the self-variable, types of variables, namespaces, types of methods, instance methods, class methods, static methods, passing members of one class to another class, inner classes

Chapter 4	Inheritance and polymorphism	8 hours
Inheritance in python, types of inheritance- single inheritance, multilevel inheritance, hierarchical inheritance, multiple inheritance, constructors in inheritance, overriding super class constructors and methods, the super() method, method resolution order (mro), polymorphism, duck typing, operator overloading, method overloading, method overriding		
Chapter 5	**Graphical user interface**	**4 hours**
Creating a GUI in python, Widget classes, Working with Fonts and Colours, working with Frames, Layout manager, Event handling		

Reference Books:

1. Kenneth A. Lambert, The Fundamentals of Python: First Programs, 2011, Cengage Learning, ISBN: 978-1111822705
2. Programming through Python, M. T Savaliya, R. K. Maurya, G M Magar, Revised Edition,
3. Sybgen Learning India, 2020 Paul Gries , Jennifer Campbell, Jason Montojo, Practical Programming: An Introduction to Computer Science Using Python 3, Pragmatic Bookshelf, 3rd Edition, 2018

E-Books and Online Learning Material

4. https://www.geeksforgeeks.org/advanced-python-tutorials/
5. https://realpython.com/tutorials/advanced/
6. https://www.scaler.com/topics/python/

Savitribai Phule Pune University
F.Y.B.Sc.(Information Technology)
Subject Code : IT152MJP
Title: Practical Based on Advanced Python (IT151MJ)

Teaching Scheme	No. of Credits	Examination Scheme
4 hours / week	2	CE: 15 marks EE: 35marks

Prerequisites

Problem solving with Python

Course Objectives:-

- To apply Functional programming techniques.
- To analyse a problem and devise an algorithm to solve it.
- To use the Python programming environment
- To execute Python programs

Course Outcomes:-Student will be able to:-

- CO1:Applyvariousskillsinproblem solving.
- CO2:Solve simple problems by choosing the most appropriate programming constructs and features in Python.
- CO4:Implement, test, debug and execute programs in the Python language.

Practical Assignments

Assignment 1:

- Python program to implement various file operations.
- WriteaprogramtoPythonprogramtodemonstrateuseofregularexpressionforsuitable application.

Assignment 2:

- Write a Python script that opens a file named "example.txt" in write mode, writes the string "Hello, World!" to it, and then closes the file.
- Write a program that reads all the lines from a file named "data.txt" and prints each line to the console.

Assignment 3:

- Write a script that checks if a file named "config.ini" exists in the current directory. If it exists, print "File exists", otherwise print "File does not exist".
- Create a program that reads a binary file named "image.png" and writes its content to another file named "copy_image.png".

Assignment 4:

- WriteaprogramtoPythonprogramtodemonstrateuseofregularexpressionforsuitable application.
- Write a Program to demonstrate concept of threading and multitasking in Python.

Assignment 5:

- Write a Python program using a regular expression to find all occurrences of the sequence "abc" in a given string.
- Write a Python program that uses regular expressions to find sequences of digits in a given string where the sequence length is exactly 3.

Assignment 6:

- Write a Python program that reads a file named "log.txt" and uses regular expressions to extract all IP addresses from it.
- Write a Python script that creates two threads. One thread should print numbers from 1 to 5 with a delay of 1 second between each print, and the other thread should print letters from 'A' to 'E' with the same delay.

Assignment 7:

- Create a class Employee with instance variables name and salary, and a class variable company_name. Add methods to display the details of an employee and to change the company name for all employees.

- Write a class Car with instance variables make and model, and a class variable wheels. Demonstrate the use of the instance and class namespaces by creating two car objects and modifying their attributes.

Assignment 8

- Write a Python class Person with attributes name and age. Include a method display that prints the name and age of the person. Demonstrate creating an instance of Person and calling the display method.
- Write two classes, Student and Course. The Student class should have attributes name and age, and a method display. The Course class should have attributes course_name and students (a list of Student objects). Add a method to Course that adds a student to the course and displays all students in the course.

Assignment 9

- Create a class Library with an inner class Book. The Library class should have attributes library_name and books (a list of Book objects). The Book class should have attributes title and author. Demonstrate adding books to the library and displaying the library details.

Assignment 10:

- Write a Python program that demonstrates single inheritance by creating a base class Animal with a method sound(), and a derived class Dog that overrides the sound() method.
- Create a base class Person with a constructor that initializes name and age. Create a derived class Student that initializes name, age, and student_id. Demonstrate creating an instance of Student.

Assignment 11:

- **Single Inheritance:**
  Create a base class Vehicle with an attribute speed and a method drive(). Derive a class Car from Vehicle and add an attribute fuel_type. Demonstrate creating an instance of Car.
- **Multilevel Inheritance:**
  Write a Python program demonstrating multilevel inheritance by creating a base class Animal, a derived class Mammal from Animal, and another derived class Dog from Mammal. Add appropriate attributes and methods to each class.

Assignment 12:

- **Hierarchical Inheritance:**
- Create a base class Shape with a method area(). Derive two classes Circle and Rectangle from Shape. Implement the area() method in both derived classes.
- **Multiple Inheritance**:
- Write a Python program that demonstrates multiple inheritance by creating two base classes Person and Employee, and a derived class Manager that inherits from both Person and Employee.

Assignment13:

- Write a Python GUI program to import Tkinter package and create window and set its title
- Write a Python GUI program to import Tkinter package and create a window. Set its title and add a label to the window.

Assignment14:

- Write a Python program using Tkinter to create a simple window with the title "Hello World" and a size of 300x200 pixels.
- Create a Tkinter application that includes the following widgets: a label, a button, an entry field, and a text box. Add appropriate text to each widget.

Assignment15:

- Write a Python program that creates a Tkinter window with a label displaying the text "Hello, Tkinter!" in red color and with a font size of 20.
- Create a Tkinter application with a button that changes the text of a label when clicked. Implement the event handling for the button click.

References :

1. Programming through Python, M. T Savaliya, R. K. Maurya, G M Magar, Revised Edition,
2. Sybgen Learning India, 2020 Paul Gries , Jennifer Campbell, Jason Montojo, Practical Programming: An Introduction to Computer Science Using Python 3, Pragmatic Bookshelf, 3rd Edition, 2018

Savitribai Phule Pune University
F.Y.B.Sc. (Information Technology)
Subject Code : IT153MJ
Title : Advanced Networking

Teaching Scheme	No. of Credits:	Examination Scheme
2 hours / week	2	CE :15 marks EE : 35 marks

Course Objectives: -

- To understand basic understanding and application of complex networking concepts, technologies, and protocols..
- Student will demonstrate understanding in: Internet Protocol and Routing in the Internet.

Course Outcomes: -

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

1. Understand the Internet Protocol, Routing Protocol.
2. Explore protocols at application layer.
3. Analyze the fundamentals concepts of computer security and network security.

Course Contents

Chapter 1	**Introduction**	**07 Hours**

1.1 Communication models- OSI Overview, TCP/IP Overview
1.2 Communication protocol overview
1.3 Bridging and Switching Overview
1.4 Virtual Private Networks Overview
1.5 LAN, WAN Review

Chapter 2	**TCP/IP Protocol Overview**	**09 Hours**

2.1 Over of IP Addressing-Architecture
2.2 Class of Address- Example of Addressing, Special Addresses
2.3 Addressing and Networks
2.4 Introduction to Subnetting - Simple Subnets, Complex subnets , Variable Length Subnets
2.5 IP Addressing Design

Chapter 3	**Network Layer protocol**	**07 Hours**

3.1 IP Addressing: Address Space, Notations, Classfull addressing,
3.2 Classless addressing, Network address Transaltion
3.3 Internet protocol-Datagram format, fragmentation
3.4 ICMPv4- Messaging, Debugging tools, ICMP checksum
3.5 Mobile IP-Addresses, agents, three phases, inefficiency in Mobile IP

Chapter 4	**Next generation of IP**	**07 Hours**

4.1 IPv6 Addressing: Representation, address space, address space allocation
4.2 Transition from IPv4 to IPv6:Dual stack, Tunneling, Header Translation
4.3 IPv6 packet format

Reference Books:

1. TCP / IP Protocol Suite Fourth Edition – Behrouz A. Forouzan
2. Computer Networks Fourth Edition – Andrew Tanenbaum
3. Cryptography & Network Security – William Stallings

Savitribai Phule Pune University
F.Y.B.Sc. (Information Technology)
Subject Code :IT154MJP
Title : Practical based on Advanced Networking (IT153MJ)

Teaching Scheme	No. of Credits	Examination Scheme
4 Hours / week	2	CE:15 marks EE: 35 marks

Prerequisites:

- Fundamentals of computer network

Course Objectives:

1. To link devices and enable smooth communication and data exchange between them
2. Collaborative Learning and Teamwork:
3. The Advanced Networking course delves into advanced concepts, protocols, and technologies in computer networking.
4. Skill Development in Network Configuration and Management

Course Outcomes:

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

1. Learn how to design and manage a typical corporate telecommunication network
2. Will gain the basic competencies of a network administrator.
3. To analyze the classification of network services, protocols and architectures
4. To understand key Internet applications and their protocols

Practical Assignments

1. Identify the IP address of a workstation
2. Identify the class of IP address and configure the IP Address on a workstation.
3. Configure IPv4, IPv6 and learn Quality, security and other services
4. Define Mobile IP and describe how it enables seamless mobility for mobile devices.
5. Discuss the components of Mobile IP, including Home Agent (HA), Foreign Agent (FA), and Mobile Node (MN).
6. Explain the concept of a Home Network and a Foreign Network in the context of Mobile IP.
7. Describe the process of configuring Mobile IP on a mobile device.
8. Explain the steps involved in the handover process when a mobile device moves from one network to another.
9. Simulate the handover process using a network emulator or simulation tool like GNS3 or Cisco Packet Tracer.
10. Given an IPv4 network address and subnet mask, calculate the number of subnets and hosts per subnet.
11. Practice subnetting using the "slash notation" (CIDR) and traditional subnetting methods (subnet masks).
12. Verify subnet calculations using online subnet calculators or spreadsheet tools.
13. Configure routers and hosts with subnetted IP addresses and test connectivity between subnets.
14. Given an IPv6 network address and prefix length, subnet the network into smaller subnets.

15. Calculate the number of subnets and hosts per subnet for IPv6 networks.
16. Configure routers and hosts with IPv6 subnet addresses and test connectivity between subnets.
17. Compare and contrast IPv4 and IPv6 subnetting approaches, including address representation and notation.

Reference Books :

1. TCP / IP Protocol Suite Fourth Edition – Behrouz A. Forouzan
2. Computer Networks Fourth Edition – Andrew Tanenbaum
3. Cryptography & Network Security – William Stallings

Savitribai Phule Pune University
F.Y.B.Sc. (Information Technology)
Subject Code : IT155MJ
Title: Cloud Computing Architecture and Design

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

Prerequisites

To start learning cloud computing one should have better knowledge in Virtualization concepts, operating system, Networking, and coding skills

Course Objectives:

- To study cloud computing concepts, technologies, and architectures.
- Get understanding of Cloud Data center Infrastructure framework
- Understand components which help achieve cloud infrastructure
- To understand the implementation of Virtualization in Cloud Computing.
- To learn the application and security of cloud computing.
- To study risk management in cloud computing.
- To understand the advanced technologies and recent trends in cloud computing

Course Outcomes (Cos) :

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

- ❖ Identify the architecture, infrastructure and delivery models of cloud computing
- ❖ Apply suitable virtualization concept.
- ❖ Choose the appropriate cloud player, Programming Models and approach.
- ❖ Address the core issues of cloud computing such as security, privacy and interoperability and design Cloud Services and Set a private cloud
- ❖ Understand the different Cloud Computing environment.

Course Contents

Chapter 1	**Cloud computing architecture and design**	**10 hours**

1.1 Virtual data center concepts.
1.2 Cloud data center concepts.
1.3 Cloud data center building blocks, like cloud virtualization, cloud networking, cloud storage, cloud databas Cloud self service portal.
1.4 Cloud management software introduction – Openstack, Cloudstack, Microsoft system center, VMware cloud management software.

Chapter 2	**Hybrid cloud architecture**	**10 hours**

2.1 Cloud Deployment Models: Public Cloud, Private Cloud, Community Cloud, Hybrid Cloud.
2.2 Hybrid cloud architecture: on-premise to public cloud (hybrid architecture) AWS and Google cloud (hybrid architecture), Connecting multi clouds, Multi cloud management concepts (discuss software like manage IQ).
2.3 Docker: Docker concepts, docker and virtualization differences, docker hub, docker networking, docker volume, docker image, docker compose, docker swarm , docker enterprise edition.

Chapter 3	Implementing Cloud Solutions	5 hours
3.1 Cloud Services: Software as a service (SaaS), Platform as a service (PaaS), Infrastructure as a service (Iaa **3.2 Cloud Service Implementation:** Setting Up Cloud Environments, Managing Resources and Services, Automation And Orchestration. **3.3 Cloud Application Development:** Cloud-Native Application Design, DevOps and CI/CD in the Cloud, Microservices And Serverless Architectures.		
Chapter 4	**Security and SLA Management**	**5 hours**
4.1 Data in cloud, and how much security is required, responsibilities of each service model, Security strategies areas of focus on security, **4.2** Define SLA's and factors that impact SLA.		

Reference Books:

1) Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010.
2) Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley- India,2010.
3) Microsoft Azure: Planning, Deploying, and Managing Your Data Center in the Cloud, Anthony Puca, Mike Manning, Marshal Copeland, Julian Soh, David Gollob.
4) Cloud Computing: Concepts, Technology & Architecture (The Prentice Hall Service Technology Series from Thomas Erl) Hardcover – May 20, 2013 ,by Thomas Erl (Author)
5) Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS) Hardcover – January 28, 2014 by Michael J. Kavis (Author)
6) Mastering Citrix® XenServer® by Martez Reed
7) VMware vsphere 5.5 or above official documentation

Online Resources:

https://openlibrary.org/
https://nlist.inflibnet.ac.in/
https://archive.org/
https://books.google.co.in/
https://en.wikibooks.org/wiki/Main_Page

Savitribai Phule Pune University
F.Y.B.Sc. (Information Technology)
Subject Code : IT156MJP
Title: Practical based on Cloud Computing Architecture and Design (IT155MJ)

Teaching Scheme	No. of Credits	Examination Scheme
4 hours/week	2	CE :15marks EE :35marks

Prerequisites: To start learning cloud computing one should have better knowledge in Virtualization concepts, operating system, Networking, and coding skills.

Course Objectives:

MS office tools would enable the students

2. Learn how to install and configure the VMware ESXi hypervisor.
3. Install and configure VMware vCenter Server, which centralizes management for multiple ESXi hosts.
4. Create and manage Linux virtual machines on an ESXi host.
5. Create and manage Windows virtual machines on an ESXi host.

Course Outcomes :

On completion of the course**, student will be able to–**
This course aims to provide practical, hands-on experience with virtualization technologies, focusing on VMware ESXi and Xen Server platforms. By completing these assignments, students will gain the skills necessary to install, configure, and manage virtual environments, as well as implement high availability solutions.

Practical Assignments

Assignment 1.

1. Install VirtualBox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs.

Assignment 2.

1. Install Google App Engine. Create hello world app and other simple web applications using python/java.
2. Use GAE launcher to launch the web applications

Assignment 3.

1. Write a Google app engine program to generate n even numbers and deploy it to Google cloud.
2. Google app engine program multiply two matrices.

Assignment 4.

1. Google app engine program to validate user; create a database login (username, password) in mysql and deploy to cloud.
2. Write a Google app engine program to display n^{th} largest no from the given list of numbers and deploy it into Google cloud.

Assignment 5.

1. Simulate a cloud scenario using Cloud Sim and run a scheduling algorithm that is not present in Cloud Sim.

2. Find a procedure to transfer the files from one virtual machine to another virtual machine.

Assignment 6.

1. Setup single node Hadoop cluster.
2. Setup multi node Hadoop cluster.

Assignment 7.

1. Install Hadoop single node cluster and run simple applications like wordcount.
2. Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version).

Assignment 8.

1. Installation and Configure ESXi Hypervisor.
2. Installation and Configure vCenter.

Assignment 9.

1. Create and Manage Virtual Machine (Linux) on ESXi.
2. Create and Manage Virtual Machine (Windows) on ESXi.

Assignment 10.

1. Installation and Configure Xen Server.
2. Installation and Configure Xen Center.

Assignment 11.

1. Create and Manage Virtual Machine (Linux) on Xen server.
2. Create and Manage Virtual Machine (Windows) on Xen Server.

Assignment 12.

1. Configure Cluster and High Availability on Xen Server.

Assignment 13.

1. Working and installation of Microsoft Azure
2. Installation and Configuration of Justcloud

Assignment 14.

1. Develop a new Web Service for Calculator.
2. Develop new OGSA-compliant Web Service.

Assignment 15.

1. Program to creates one Grid resource with three machines
2. Program to create one or more Grid users. A Grid user contains one or more Gridlets.

Reference Books:

1. Mastering VMware vSphere 7" by Nick Marshall, Ryan Johnson, G. Blair Fritz, and Lauren Malhoit.
2. VMware vSphere 6.7 Clustering Deep Dive" by Frank Denneman and Niels Hagoort.
3. Mastering XenApp®" by Andy Paul.

Online Resources:

4. VMware ESXi Installation and Setup
5. How to Install vCenter Server Appliance (VCSA) 7.0
6. XenServer 7 Installation (YouTube)

Savitribai Phule Pune University
F.Y.B.Sc. (Information Technology) -
Subject Code : OE151ITP
Subject : Introduction to Google Apps

Teaching Scheme	No. of Credits	Examination Scheme
02 Hrs/ week	2	IE : 15 marks UE: 35 marks

Prerequisites

- Basic knowledge of Computer concepts is assumed.
- Knowledge of Computer as operational tool is required.
- Knowledge of Internet is required

Course Objectives

- To introduce the foundations of various Google tools.
- To develop the ability to analyses and use the tools effectively

Course Outcomes

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

- Use the google tools for the day to day life
- Explore various applications available in the google tools.
- Develop the skills to implement the skills available in the google tools.

Course Contents

Chapter 1	**Gmail**	**2 Hrs**
1.1 Configuring an E-mail Account 1.2 Composing and Sending Mail 1.3Receiving, Replying to and Forwarding Mail 1.4 Attachments to email		
Chapter 2	**Google Drive**	**3 Hrs**
2.1 Opening the Drive 2.2 Creating folders, google docs, google sheets, google slides 2.3 Managing Files and folders 2.4 Sharing files and folders and managing permissions 2.5 Downloading the files and folders 2.6 Uploading files and folders 2.7 Printing files		
Chapter 3	**Google Docs, Sheets and Slides**	**8 Hrs**
3.1 Creating Google docs, sheets and slides 3.2 Formatting the documents 3.3 Managing the document permissions 3.4 Uploading/downloading the documents 3.5 Special features in the docs, sheets and slides		

Chapter 4	**Google Forms**	**7 Hrs**
4.1 Creating a google form 4.2 Adding various styles of the questions 4.3 settings of the google form 4.4 Creating the links of the google form and sharing the link 4.5 Creating and managing the permissions 4.6 Managing the data collected through google form		
Chapter 5	**Other Google tools**	**10 Hrs**
5.1 Google Calendar 5.2 Google Meet 5.3 Google Chat 5.4 Google Contacts 5.5 Google Photos 5.6 Google Maps		
Reference Books: 1. Complete Beginners guide to Google Apps Script by Daniel Lawrie.		
2.Google Apps made easy by James Bernstein 3. My Google Apps by Sherry Kinkoph Gunter		

Savitribai Phule Pune University
F.Y.B.Sc. (Information Technology)
Subject Code : OE152ITP
Subject : Tally Prime

Teaching Scheme 4 hours / week	No. of Credits 2	Examination Scheme CE :15 marks EE: 35 marks

Prerequisites :
Help.tallysolutions.com

Course Objectives: -

- To understand Fundamentals of Accounts
- To study Basic Principles of Accounts (Golden Principles of Accountancy)
- To study Ledger, Transaction Entries.
- To understand the final effect of each transaction in Balance Sheet and Profit & Loss Accounts.

Course Outcomes: -

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

- Create Ledgers in Tally Prime
- Pass the transaction Entries of Payment, Receipt, Contra, Sales, Purchase
- Pass the entries with automatic calculation of GST.
- Maintain Accounts only and Accounts with Inventory

Practical Assignments

Assignment 1.
Creation of Company
Set up a new company in Tally Prime.

Assignment 2
Creation of Ledgers under appropriate groups of Tally Prime.

Assignment 3
Pass an entry of Capital brought by cash of Rs. 200000 in Reciept.

Assignment 4
To Create Multiple ledgers under a single group.

Assignment 5
Create necessary ledgers for Purchase Invoice using New Reference Billwise option.. Creation of ledger of Party ,Purchase

Assignment 6
Creation of GST ledgers

Assignment 7
Pass the entry of Purchase in voucher.

Assignment 8
To Pass a payment entry against the Purchase Invoice using against reference option and check the reports of outstandings.

Savitribai Phule Pune University
F.Y.B.Sc. (Information Technology)
Subject Code: SEC102ITP
Subject: Practical based on Database Management System (SEC101IT)

Teaching Scheme	No. of Credits	Examination Scheme
4 hours / week	2	CE:15 marks EE: 35 marks

Prerequisites:

- Fundamentals of Database

Course Objectives:

1. To understand the practical applicability of database management system concepts to solve different level problems & to learn its applications.
2. To work on database design, relational database creation, database query formulation.

Course Outcomes:

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

5. Apply normalization techniques for development of tables to solve realistic problems.
6. Formulate SQL queries using DDL/DML commands.

DBMS Practical Assignments

Assignment 1: Entity-Relationship (ER) Model

- Case study on simple E-R diagram, Identify Entities, Attributes of entities and Relationship between entities.

Assignment 2: Extended Entity-Relationship (EER) Model

- Case study on E-R diagram using Generalization, Specialization and Aggregation.

Assignment 3: DDL Command: (create command)

- Database creation
- Simple table creation (include all data types)
- Table creation with primary key and foreign key constraint
- Table creation with constraints (check, unique, not null, default)

Assignment 4: DDL Commands: (alter and drop command)

- Alter Command: add (column, constraint, primary key, foreign key), alter, drop, rename.
- Drop Command: drop (table, database)

Assignment 5: DML Command: (insert command)

- Insert single record into tables.
- Insert multiple records into tables.

Assignment 6: DML Command: (select command)

- Select records from tables created in previous assignments by using different operators (and, or, between, not, in, is null, like) in where clause.

Assignment 7: DML Command: (update command)

- Update single record.
- Update multiple records.

Assignment 8: DML Command: (delete command)

- Delete all records.
- Delete specific records.

Assignment 9: Aggregate Functions

- SQL queries using aggregate functions: avg, count, max, min, sum

Assignment 10: String Functions and Date functions

- SQL queries using string functions: lower, upper, replace, ltrim, rtrim, substring, length
- SQL queries using date functions: now, age, current_date, current_time, date_part, to_date

Assignment 11: Clauses

- SQL queries using different clause: limit, distinct, order by, group by, except, having, exists, not exists

Assignment 12: Nested queries

- Nested SQL queries with select/insert/update/delete statement

Assignment 13: Joins

- SQL queries using joins (inner joins, outer joins and their types)

Assignment 14: Set Operation

- SQL queries using set operation (union, union all, intersect, except/minus)

Assignment 15: Views

- SQL queries using create view, update view and drop view

Reference Book :

Beginning Databases with PostgreSQL: From Novice to Professional, Richard Stones, Neil Matthew, ISBN:9781590594780, Apress