

Course Type	Course Code	Course Title	Credits		Teaching Scheme Hr/Week		Evaluation Scheme and Max Marks		
			T	P	T	P	C	E	Total
Major Core T(2+2 or 4), (T/P)(2)	24CsBCAU3101	Data Structure	2		2		2	3	50
	24CsBCAU3102	Object Oriented Programming using CPP	2		2		2	3	50
	24CsBCAU3103	Lab Course on 24CsBCAU3101 and 24CsBCAU3102		2		4	2	3	50
VSC P(2)	24CsBCAU3501	Lab on Advanced spreadsheet concepts using R package		2		4	2	3	50
IKS (T/P)(2)	24CsBCAU3901	Vedic Maths and Computer Fundamentals	2		2		2	3	50
FP P(2)	24CsBCAU3002	Field Project I		2		4	2	3	50
Minor (T/P)(2+2 or 4)	24CsBCAU3301	Project Management - III (Object Oriented Software Engineering)	4		4		4	6	100
GE/OE (T/P) (2)	24CsCopU3401	Cyber Security	2		2		2	3	50
AEC T(2)	24CpCopU3703	English Communication Skills II	2		2		2	3	50
CC T(2)	24CpCopU3001	Online Course on Yoga	2		2		2	3	50
Total			16	0	16	12			550

Course Type	Course Code	Course Title	Credits		Teaching Scheme Hr/Week		Evaluation Scheme and Max Marks		
			TH	PR	TH	PR	CE	EE	Total
Major Core T(2+2 or 4), (T/P)(2)	24CsBCAU4101	Operating Systems	2		2		20	30	50
	24CsBCAU4102	Python Programming-I	2		2		20	30	50
	24CsBCAU4103	Lab Course on Operating system and Python Programming-I (24CsBCAU4101 & 24CsBCAU4102)		2		4	20	30	50
VSC P(2)	24CsBCAU4501	Lab on Web Technologies-I		2		4	20	30	50
CEP P(2)	24CsCopU4003	Community Engagement Project		2		4	20	30	50
Minor (T/P)(2+2 or 4)	24CsBCAU4301	Project Management - IV (Software Project Management)	4		4		40	60	100
GE/OE (T/P) (2)	24CsCopU4401	Web Designing		2		4	20	30	50
SEC T(2)	24CsBCAU4601	Introduction to Data Science	2		2		20	30	50
AEC T(2)	24CpCopU4701 / 24CpCopU4702	MIL-II (Hindi) / MIL-II (Marathi)	2		2		20	30	50
CC T(2)	24CpCopU4001	Health and Wellness	2		2		20	30	50
Total			14	08	14	16			550

**Progressive Education Society's
Modern College of Arts, Science and Commerce, (Autonomous)
Shivajinagar, Pune – 5
SYBCA (Science)
(2024 Course under NEP)**

Course Code : 24CsBcaU3101

Course Name : Data Structure

Teaching Scheme: 2 Lectures/Week

Credits: 02

Examination Scheme: CIA : 20 Marks

End-Sem: 30 Marks

Desirable Prerequisite:

- Students should be able to program in a standard programming language.
- Some mathematical maturity also will be expected; students should have some idea of what constitutes a mathematical proof and how to write one.

Course Objectives:

- To understand the concepts of ADTs
- To Learn linear data structures – lists, stacks, and queues
- To understand sorting, searching and hashing algorithms
- To apply Tree and Graph structures

Course Outcomes:

- **After successful completion of this course students will able to :**

CO No	Course Outcomes (COs)	Blooms Cognitive level
CO 1	List different types of data structures and identify appropriate algorithms by developing problem solving skills by analysing a problem.	1,3
CO 2	Demonstrate the usage of various structures in approaching the problem solution.	2
CO 3	Make use of Use effective and efficient data structures in solving various domain problems.	3
CO 3	Make use of Use effective and efficient data structures in solving various domain problems.	3
CO 4	Analyze the problems to apply suitable algorithm and data structure.	4
CO 5	Compare all algorithmic strategies for better efficiency	5
CO 6	Design the algorithms to solve the programming problems.	6

Course Contents

Unit No.	Title	Lectures
Unit 1	Introduction to data structures	2
	1.1. Data type and data object 1.2. Abstract Data Type (ADT) 1.3. Types of data structure 1.4. Algorithm analysis Space and Time complexity	
Unit 2	Array as a data structure	4
	2.1. Array representation- Row and column major	

	2.2. Sorting techniques Bubble sort, Insertion sort 2.3. Merge sort, Quick sort 2.4. Searching techniques with time Complexity: Linear search, Binary search	
Unit 3	Linked List	6
	3.1. Introduction 3.2. Representation -Static &Dynamic 3.3. Types of linked lists- singly, doubly, circular 3.4. Operations-create, display, insert, delete, reverse, search	
Unit 4	Stack	5
	4.1. Introduction 4.2. Representation -Static &Dynamic 4.3. Operations– push, pop 4.4. Applications – Infix to postfix, Infix to prefix, postfix evaluation	
Unit 5	Queue	5
	5.1 Introduction 5.2. Representation -Static &Dynamic 5.3. Operations– insert, delete 5.4. Circular queue 5.5. Applications	
Unit 6	Tree and Graph	8
	6.1. Introduction 6.2. Tree terminologies- all definitions: root, leaf, level, height, depth 6.3. Binary tree 6.4. Types of Binary Tree 6.5. Binary Search Tree (BST) 6.6. Graph terminologies 6.7. Representation – Adjacency matrix, Adjacency list 6.8. Traversal– DFS, BFS	

Reference books:

1. Fundamentals of Data Structures in C by Ellis Horowitz, Sartaj Sahni and Susan Anderson-Freed, 2nd Edition, University Press, 2008, ISBN-13: 978-0929306407, ISBN-10: 0929306406
2. Introduction to Algorithms by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, 3rd Edition, Mcgraw Hill, ISBN-13: 978-0262033848, ISBN-10: 9780262033848
3. Data Structures and Algorithms by Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, 1st Edition, Pearson Education, 1983. ISBN-13: 978-0201000238, ISBN-10: 0201000237
4. Programming in C by Stephen G. Kochan, 3rd edition, Pearson Education. ISBN-13: 978-0672326660, ISBN-10: 0672326663

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Shivajinagar, Pune – 5
SYBCA (Science)
(2024 Course under NEP)**

Course Code: 24CsBcaU3102

Course Name: Object oriented Programming using CPP

Teaching Scheme: 2 Lectures/Week

Credits: 02

Examination Scheme: CIA: 20 Marks

End-Sem: 30 Marks

Desirable Prerequisite:

1. Students should be able to program in a standard programming language
2. Students should have logical skills.

Course Objectives:

1. To expose the student to procedural programming using C++ and to increase the depth of students' knowledge about several implementation issues
2. To Understand object oriented programming
3. To Gain knowledge about the capability to store information together in an object
4. To improve your problem solving skills

Course Outcomes:

After successful completion of this course students will able to :

CO No	Course Outcomes (COs)	Blooms Cognitive level
CO 1	Define object oriented features	1
CO 2	Understand the difference between the top-down and bottom up approach	2

CO 3	Apply the concepts of object-oriented programming	3
CO 4	Compare procedure oriented and object oriented programming languages	4
CO 5	Explain virtual and pure virtual function & complex programming situations	5
CO 6	Design real world domain problems using object oriented features	6

Course Contents

Unit No.	Title	Lectures
Unit 1	Object oriented concepts and Introduction to C++	3
	1.1. Object oriented concepts 1.2. Features 1.3. Applications 1.4. Data types, new operators and keywords 1.5. Using namespace concept 1.6. Simple C++ Program 1.7. Introduction to Reference variables	
Unit 2	Classes and Objects	3
	2.1. Classes and Objects 2.2. Access specifiers 2.3. Usage of 'this' pointer 2.4. Defining Data members and Member functions 2.5. Array of objects	
Unit 3	Function in C++	8
	3.1. Call by reference 3.2. Return by reference 3.3. Function overloading and default arguments 3.4. Inline function 3.5. Static class members 3.6. Friend Concept – Function, Class 3.7. Constructor 3.8. Types of constructors 3.9. Dynamic Constructors (new and delete) 3.10. Destructor 3.11. Templates(class and function, Concepts only)	
Unit 4	Operator overloading	5
	4.1. Overloading Unary and Binary operators 4.2. Overloading using member function and friend function	
Unit 5	Inheritance	6
	5.1. Types of inheritance with examples 5.2. Constructors and destructor in derived classes 5.3. Virtual base classes, Virtual functions and Pure virtual function, Abstract base classes (Only concept)	
Unit 6	Working with files and Exception Handling in C++	5
	6.1. C++ stream classes 6.2. Working with files 6.3. File stream class and methods 6.4. File random access 6.5. try, catch and throw primitives 6.6. try with multiple catch 6.7. throws 6.8. rethrowing mechanism	

Reference books:

1. Object Oriented Programming with C++ by E. Balagurusamy, 6th Edition, ISBN: 9332900906, 9789332900905
2. The Complete Reference C++ by Herbert Schildt, 4th Edition, ISBN: 9780070411838, 9780070411838
3. Object Oriented Programming with C++ by Robert Lafore, 4th Edition, ISBN: 9788131722824, 9788131722824

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Shivajinagar, Pune – 5
SYBCA (Science)
(2024 Course under NEP)**

Course Code: 23CsBCAU3103

Course Name: Lab course on Data Structure and CPP

No. of Practicals:15

Examination Scheme: CIA: 20 Marks

Credit: 02

End-Sem: 30 Marks

Sr.No.	Title of the assignment
1	Non-Recursive Sorting Techniques 1.Bubble Sort 2.Insertion Sort 3.Selection Sort
2	Recursive Sorting Techniques 1.Quick Sort 2.Merge Sort
3	Searching Techniques 1.Linear search 2.Binary Search
4	Linked List 1.Singly Linked List 2.Singly Circular Linked List 3.Doubly Linked List 4.Doubly Circular Linked List
5	Stack 1.Static Stack Implementation 2.Dynamic Stack Implementation
6	Queue 1.Static Queue Implementation 2.Dynamic Queue Implementation

Sr. No.	Assignment Name
1	Introduction to C++(Basic programs using Control structures and Loops)
2	Classes and Objects(Programs using classes, array of Objects, Static Members)
3	Functions in C++(Inline Function, friend function, function with default argument, Constant Function, Function Overloading)
4	Constructor and Destructor(Using default, parameterized and copy constructor)
5	Operator Overloading
6	Inheritance(Program using all types of Inheritance), Virtual functions
7	Exception Handling

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SYBCA (Science)
(2024 Course under NEP)**

Course Code : 24CsBcaU3501

**Course Name : Lab Course Advanced Spreadsheet Concepts
Using R package**

**Teaching Scheme: 4 Hrs /Week
Examination Scheme: CIA : 20 Marks**

**Credits: 02
End-Sem : 30 Marks**

Desirable Prerequisites: Basic knowledge of Excel

Course Objectives:

- To understand the integration of R programming with Excel for data analysis.
- To perform basic and advanced data manipulation using Excel and R.
- To automate simple Excel tasks using R scripts.
- To strengthen foundational Excel knowledge for efficient data handling.

Course Outcomes:

CO No	Course Outcomes (COs)	Blooms Cognitive level
CO 1	Understand and apply basic and advanced Excel functions for data manipulation.	2,3
CO 2	Perform data sorting, filtering, and validation using Excel for efficient analysis.	3,4
CO 3	Set up the R programming environment and implement basic R constructs.	2,3
CO 4	Implement loops, functions, and data manipulation techniques in R.	3,4
CO 5	Perform statistical analysis and data visualization using R (pie charts, bar charts).	4,6

CO 6	Analyze CSV datasets using R and draw insights through advanced data handling.	5,6
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Course Contents:

Sr. No.	Assignment Title
1.	Excel Basics (Data Formats, Formulas, and sorting)
2.	Advance Excel (Data Validation, functions, Filtering and Pivot Table)
3.	R Environment Setup
4.	Learn all the basics of R-Programming (Data types, Variables Operators etc.)
5.	Implement R-Loops with different examples.
6.	Learn the basic of functions in R and implement with examples.
7.	Implement data frames in R. Write a program to join columns and rows in a data frame using c bind() and r bind() in R.
8.	Implement different String Manipulation functions in R.
9.	Write a program to read a csv file and analyze the data in the file in R
10.	Create pie charts and bar charts using R.
11.	Create a data set and do statistical analysis on the data using R.

Progressive Education Society's
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First Year of B.Sc. (Computer Science)
(2023 Course under NEP 2020)

Course Code: 24CsBCAU3901

Course Name: Vedic Mathematics and Computer Fundamentals

Teaching Scheme: TH: 2 Hours/Week

Credit: 02

Examination Scheme: CIA: 20 Marks

End-Sem: 30 Marks

Prerequisite Courses: Arithmetic

Course Objectives:

- To study the ancient Indian methods in arithmetic.
- To study the fundamentals of a computer.

Course Outcomes: On completion of the course

- The students are being introduced to the ancient mathematical methods.
- The students will be able to apply the learned methods in efficient manner where ever necessary.
- The student will be aware of basics of Computers.

Course Contents:

Unit 1	Vedic Mathematics	15 lectures
	• Arithmetical Computations, Multiplication, Division • Factorisation • Simultaneous Simple Equations • Quadratic and Cubic Equations • Divisibility • Elementary Squaring and Cubing • Square roots and Cube roots	
Unit 2	Computer Fundamentals	15 lectures
	• Basics of Computer • The computer system hardware • Computer memory • Input and output devices • Data representation • Algorithms and flow charts	

Reference Books:

1. Vedic Mathematics by Jagadguru Swami Sri B K Tirthaji Maharaja, Motilal Banarsidass Publishers Pvt. Ltd. Delhi, 2009.
2. Computer Fundamentals by Anita Goel, Pearson Publication, First Edition, 2010.
3. The Art of Computer Programming, Volume I & II by Donald Knuth, Third Edition,

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SYBCA (Science)
(2024 Course under NEP)

Course Code: 24CsBcaU3301

Course Name: Project Management-V (Object Oriented Software Engineering)

Teaching Scheme: TH: 4 Hours/Week

Credit: 04

Examination Scheme: CIA: 40 Marks

End-Sem: 60 Marks

Prerequisite Courses:

- Knowledge of Software Engineering practices

Course Objectives:

- To get knowledge and understanding of Object Oriented Software Engineering disciplines, practices and pedagogy.
- To learn Analysis, Design principles for Object Oriented Software Project Development.

Course Outcomes:

After successful completion of this course students will able to:

CO No	Course Outcomes (COs)	Blooms Cognitive level
CO 1	Understand and apply the fundamental principles of Object-Oriented Programming (OOP) concepts	1
CO 2	Relate the software architectural styles to the suitable applications	2
CO 3	Model software projects using different modelling techniques.	3
CO 4	Examine different behavioral modelling diagrams of UML.	4
CO 5	Assess and evaluate quality of software	5
CO 6	Design optimum solution to meet software requirements of the end users.	6

Course Contents:

Unit 1		12 lectures
	1.1 What is Object Orientation? (Introduction to class, Object, inheritance, polymorphism) 1.2 Model 1.3 Importance of Modeling -Object Oriented Modeling 1.4 Object oriented system development 1.5 Function/data methods – Object oriented analysis, Object oriented construction, Object oriented testing 1.6 Identifying the elements of an object model - Identifying classes and objects, Specifying the attributes, Defining operations 1.7 Finalizing the object definition	
Unit 2	Introduction to UML	08 lectures
	2.1 Overview of UML 2.2 Conceptual Model of UML 2.3 Architecture	
Unit 3	Structural Modeling	15 lectures
	3.1 Classes Relationship, Common mechanism 3.2 Class diagram 3.3 Advanced classes 3.4 Advanced Relationship 3.5 Interface 3.6 Types and Roles 3.7 Packages 3.8 Object Diagram 3.9 Case Study (Minimum Two)	
Unit 4	Behavioral Modeling	15 lectures
	4.1 Interactions 4.2 Use cases 4.3 Use Case Diagram 4.4 Interaction Diagram 4.5 Activity Diagram 4.6 State chart Diagram 4.7 Case Study (Minimum Two)	
Unit 5	Architectural Modeling	10 lectures
	5.1 Components 5.2 Component Diagram 5.3 Deployment Diagram 5.4 Case Study (Minimum Two)	

Reference Books:

- 1) The Unified Modeling Language, User Guide by Grady Booch, James Raumbaugh, Ivar Jacobson, ISBN: 0321267974.
- 2) Object Oriented Software Engineering by Ivar Jacobson, ISBN: 9780201544350
- 3) Software Engineering by Roger S. Pressman, ISBN: 9780078022128
- 4) Applying UML and Patterns by Craig Larman, ISBN-10: 8177589792

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SYBCA (Science)
(2024 Course under NEP)**

Course Code : 24CsCopU3401

Course Name : Cyber Security

Teaching Scheme: 2 Lectures/Week

Credits: 2

Examination Scheme: CIA : 20 Marks

End-Sem: 30 Marks

Course Objectives:

- To gain technical knowledge to protect the computers
- To apply skills to protect computer data
- To plan implement and monitor cyber Security

Course Outcomes:

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

- Characterize privacy, legal and ethical issues of information security
- Identify vulnerabilities critical to the information assets of an organization.
- Diagnose attacks on an organization's computer systems and networks.

Course Contents:

Unit No	Title	lectures
Unit 1	Overview of Networking concepts	7
	1.1 Basics of Communication System 1.2 Transmission Media 1.3 Topology and Types of Networks 1.4 The Internet 1.5 What is world Wide Web 1.6 Protocol 1.7 Introduction to OSI and TCP / IP model	
Unit 2	Types of attack in Cyber Security	8
	2.1 Active and passive attacks 2.2 Distributed Attacks 2.3 Insiders attacks 2.4 Close-in attacks 2.5 spoof attacks 2.6 Password attacks 2.7 Malware and Virus	
Unit 3	Computer Forensics	2
	3.1 Overview 3.2 Computer Forensics 3.3 Importance 3.4 Introduction to Steganography	

Unit 4	Intellectual Property Rights	4
	4.1 What is IPR ? 4.2 Types 4.3 Security laws and standard 4.4 Trademarks 4.5 Copyrights 4.6 Patent	
Unit 5	Access control and Intrusion detection	6
	5.1 Overview of Intrusion detection system 5.2 Scanning attacks 5.3 Denial of service attacks 5.4 Misuse IDS 5.5 Anomaly IDS 5.6 Host based IDS 5.6 Network based IDS	
Unit 6	Firewall	3
	6.1 Firewall concepts 6.2 Firewalls types 6.3 Introduction to DMZ	

Reference Books:

1. The Secret of Cybersecurity, by Scott E. Augenbaum, Forefront Books Publication, ISBN-13 978-1948677080
2. Cyber Security- The Beginners guide, by Dr. Erdal Ozkaya, Packt Publishing Limited, ISBN: 978-1789616194

SEM-IV

Progressive Education Society's
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SYBCA (Science)
(2024 Course under NEP)

Course Code : 24CsBcaU4101

Course Name: Operating Systems

Teaching Scheme: 2 Lectures/Week

Credits: 02

Examination Scheme: CIA : 20

Marks End-Sem : 30 Marks

Desirable Prerequisites:

Students should have basic knowledge of Computer Science and Computer Organization

Course Objectives:

- To Study the basic concepts and functions of operating systems.
- To Understand the structure and functions of OS.
- To Learn about Processes, Threads and Scheduling algorithms.
- To Understand the principles of concurrency and Deadlocks.
- To understand the design and implementation issues of Operating System.
- To Learn various memory management schemes.
- To Study I/O management and File systems.
- To Learn the basics of the Linux system and perform administrative tasks on Linux Servers.

Course Outcomes:

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

CO No	Course Outcomes (COs)	Blooms Cognitive level
CO 1	Outline the role of OS in Computer system	1
CO 2	Translate the algorithms into code to implement the various system programs.	2
CO 3	Implement different CPU scheduling and memory management strategies	3
CO 4	Explain system services and its examples, system calls and its types.	4

CO 5	Identify and evaluate the storage management policies with respect to different storage management technologies	5
CO 6	Simulate different operating system calls and build administrative tasks on Linux Servers	6

Course Contents:

Unit No.	Title	Lectures
Unit 1	Introduction to Operating System	5
	1.1. Defining Operating System 1.2. Computer System Architecture 1.3. Operating System Operations 1.4. Operating System Services 1.5. Special Purpose Systems 1.6. Computer Environment – Traditional computing, Client server computing, Peer to peer Computing 1.7. Operating System Structure 1.8. Virtual Machines – Introduction, Benefits System Boot	
Unit 2	System Structure	4
	2.1. User Operating System Interface - Command interpreter, GUI 2.2. System Calls 2.3. Types of System Calls – Process control, File management, Device management, Information maintenance, Communication, Protection 2.4. Linux System calls related to file and directory management	
Unit 3	Process Concept	3
	3.1. Process Concept - Process, Process State, PCB 3.2. Process scheduling 3.3. Operations on processes, Linux System calls related to process 3.4. Inter-process communication	
Unit 4	CPU Scheduling	6
	4.1. Process Scheduling 4.2. Basic Concept - CPU-I/O burst cycle, CPU scheduler, Preemptive scheduling, Dispatcher 4.3. Scheduling Criteria 4.4. Scheduling Algorithms - FCFS, SJF, Priority scheduling, Round-robin scheduling, 4.5. Multiple queue scheduling, Multilevel feedback queue scheduling	
Unit 5	Deadlock Management	6

	5.1. Deadlocks 5.2. System model 5.3. Deadlock Characterization - Necessary conditions, Resource allocation graph 5.4. Deadlock Prevention 5.5. Deadlock Avoidance - Safe state, Resource allocation graph algorithm, Banker's Algorithm 5.6. Deadlock Detection 5.7. Recovery from Deadlock – Process Termination, resources preemption	
Unit 6	Memory Management	6
	6.1 Address binding 6.2 Logical versus physical address space, Dynamic Loading, Dynamic linking and shared libraries' 6.3 Swapping 6.4 Contiguous Memory Allocation – Memory mapping and protection, Memory allocation, Fragmentation 6.5 Paging – Basic Concept 6.6 Segmentation – Basic Concept 6.7 Virtual Memory Management - Demand paging, Page replacement - FIFO, OPT, LRU	

Reference Books:

1. Operating System Concepts by Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, 9th Edition, John Wiley and Sons Inc., 2012. ISBN-10: 1118063333 ISBN-13: 978-1118063330
2. Operating System Concepts by James L. Peterson, Abraham Silberschatz, Addison-Wesley, 3rd Edition, ISBN-13: 978-0201513790 ISBN-10: 020151379X
3. Modern Operating Systems by Andrew S. Tanenbaum, 4th Edition, Addison Wesley, 2001. ISBN-13: 978-0133591620 ISBN-10: 013359162X
4. The Operating Systems: A Concept-Based Approach by D M Dhamdhere, 3rd Edition,
5. Tata Mc Graw-Hill Education, ISBN-10: 1259005585 ISBN-13: 978-1259005589
6. The Operating Systems – Internals and Design Principles by William Stallings, 7th Edition, Prentice Hall, 2011. ISBN-13: 978-0133805918 ISBN-10: 0133805913

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SYBCA (Science)
(2024 Course under NEP)

Course Code: 24CsBcaU4102

Course Name: Python Programming-I

Teaching Scheme: TH: 2 Hours/Week

Examination Scheme: CIA: 20 Marks

Credit: 02

End-Sem: 30 Marks

Prerequisite Courses:

- An understanding of programming in an Imperative Language (e.g., C/CPP)
- Knowledge of basic Discrete Mathematics (e.g., Sets, Relations, Functions)

Course Objectives:

- To introduce Python programming fundamentals and problem-solving skills.
- To cover essential Python concepts such as control structures, functions, and file handling.
- To introduce PostgreSQL database connectivity using Python.
- To implement real-world applications using Python and databases.

Course Outcomes:

After successful completion of this course students will able to:

CO No	Course Outcomes (COs)	Blooms Cognitive level
CO 1	Define and demonstrate the use of built-in data structures “lists” and “dictionary”.	1
CO 2	Understand why Python is a useful scripting language for developers.	2
CO 3	Develop the various concepts learnt in Python programming language	3
CO 4	Compare and contrast Python with the other programming languages.	4
CO 5	Explain database connectivity in python programming language.	5
CO 6	Combine all concepts in Python and develop a working application	6

Course Contents:

Unit 1	Introduction to Python	05 lectures
	1.1 History and Features of Python 1.2 Installation and Setup (Python, IDEs) 1.3 Writing and Running Python Scripts 1.4 Variables, Data Types, and Type Casting 1.5 Operators (Arithmetic, Logical, Relational etc.)	
Unit 2	Control Structures	05 lectures
	2.1 Conditional Statements: if, if-else, if-elif-else 2.2 Looping Statements: for, while 2.3 Loop Control Statements: break, continue, pass 2.4 Iterators and Generators 2.5 List Comprehension	
Unit 3	Data Structures	05 lectures
	3.1 Lists: Creation, Slicing, and Methods 3.2 Tuples: Properties and Operations 3.3 Sets: Operations and Applications 3.4 Dictionaries: Key-Value Pairs and Methods 3.5 Nested Data Structures	
Unit 4	Functions and Modules	05 lectures
	4.1 Defining and Calling Functions 4.2 Function Arguments & Return Values 4.3 Scope of Variables (Local & Global) 4.4 Lambda Functions and Recursion 4.5 Importing and Creating Modules	
Unit 5	File Handling and Exception Handling	05 lectures
	5.1 File Handling Basics (Read, Write, Append) 5.2 File Modes 5.3 Exception Handling: try-except-finally 5.4 Debugging and Error Handling	
Unit 6	Database Connectivity	05 lectures
	6.1 Introduction to Databases 6.2 Setting Up a Database	

	6.3 Connecting Python with database 6.4 Executing SQL Queries	
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Reference Books:

1. Python Programming using problem solving approach by Reema Thareja, Oxford University Press.2017,ISBN-10 : 0199480176; ISBN-13 : 978-0199480173
2. Introduction to Computation and Programming Using Python with application to understanding data by Guttag John V.PHI, ISBN-10 : 0262519631; ISBN-13 : 978-0262519632
3. Introduction to Computer Science using Python by Charles Dierbach, Wiley, ISBN: 9788126556014, 9788126556014

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SYBCA (Science)
(2024 Course under NEP)

Course Code: 24CsBcaU4103

Course Name: Lab Course on 24CsBcaU4101 & 24CsBcaU4102

Teaching Scheme: 4 Hrs/Week

Credits: 2

Examination Scheme: CIA: 20

Marks End-Sem: 30 Marks

Operating Systems Assignments

Course Contents:

Sr. No.	Assignment Title
1.	CPU Scheduling (FCFS, Shortest Job First, Round Robbin, Priority scheduling)
2.	Deadlock Avoidance (Banker algorithm, Resource request algorithm)
3.	Page Replacement Algorithms (FIFO, MFU, LRU)

Python Assignments

Course Contents:

Sr.No	List of practical
1	Basic Python Programming A. Writing and Executing Simple Python Programs B. Implementing Operators and Type Casting C. Working with input() and print() Functions D. Simple Arithmetic Operations and Expression Evaluation E. Debugging Simple Python Programs
2	Control Statements A. Implementing if-else and Nested Conditions

	B. Using Loops (for and while) for Pattern Printing C. Writing Programs Using Loop Control Statements D. Generating Fibonacci Series, Factorial, and Prime Numbers E. Implementing List Comprehension
3	Functions and Modules A. Writing and Calling User-Defined Functions B. Implementing Different Types of Function Arguments C. Using Built-in Functions (len(), sum(), max(), min()) D. Recursion Programs (Factorial, Fibonacci) E. Importing and Using Built-in Modules (math, random)
4	Data Structures A. Working with Lists: Adding, Removing, Updating Elements B. Performing Operations on Tuples and Sets C. Using Dictionary Methods (get(), keys(), values(), items()) D. Implementing Nested Lists and Dictionaries E. Sorting and Searching Data in Python Collections
5	File Handling and Exception Handling A. Writing and Reading Text Files (.txt, .csv) B. Implementing File Operations (Open, Read, Write, Append) C. Working with Exception Handling (try-except) D. Handling Multiple Exceptions and Using finally E. Debugging Errors and Implementing assert Statements
6	Database Connectivity A. Creating a Database

	B. Connecting Python to database
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Progressive Education Society's
Modern College of Arts, Science and Commerce, (Autonomous)
Shivajinagar, Pune – 5
SYBCA (Science)
(2024 Course under NEP)

Course Code: 24CsBcaU4501

Course Name Lab Course on Web Technologies-I

Teaching Scheme: 4 Hrs/Week

Credits: 2

Examination Scheme: CIA: 20

Marks End-Sem: 30 Marks

Desirable Prerequisite: One must have knowledge of HTML and CSS.

Course Objectives:

- Understanding working of server-side language.
- Learn the syntax and semantics of Programming Language.
- Understand functions to facilitate code reuse and manipulate strings.
- Understand and analyze and apply concepts of array.
- Understand PHP scripts and determine their behavior
- Understand the need for working on web scraping.

Course Outcomes:

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

CO No	Course Outcomes (COs)	Blooms Cognitive level
CO 1	Explain the fundamental concepts of PHP, including syntax, data types, and basic program structure.	2
CO 2	Apply control structures (decision-making and loops) to develop dynamic and interactive PHP applications.	3
CO 3	Design and implement string manipulation and functions to build modular and efficient PHP programs.	6
CO 4	Analyze and implement arrays (indexed, associative, and multidimensional) to manage and process data efficiently.	4
CO 5	Develop database-driven web applications by connecting PHP to a Postgres database.	6
CO 6	Demonstrate the ability to extract and manipulate external web content using web scraping techniques in PHP.	3

Sr. No.	Assignment Title
1.	Introduction to php (Basic programs using Control structures and Loops)
2.	String
3.	Functions in php
4.	Array (Indexed, associative, and multidimensional)
5.	Postgres Database connectivity with php

**Progressive Education Society's
Modern College of Arts, Science and Commerce,
Shivajinagar, Pune - 5
SYBCA (Science)
(2024 Course under NEP)**

Course Code: 24CsBcaU4301

**Course Name: Project Management VI
(Software Project Management)**

Teaching Scheme: TH: 4 Hours/Week

Credit: 04

Examination Scheme: CIA: 40 Marks

End-Sem: 60 Marks

Prerequisite Courses:

- 1. Software Engineering**

Course Objectives:

1. To learn process of software project management
2. To understand details of cost estimation
3. To Learn use of project Management tools
4. To understand configuration management
5. To learn user roles and software teams
6. To be familiar with the different methods and techniques used for project management.

Course Outcomes:

1. Describe the principal tasks of software project managers, and basic concepts in software projects
2. Identify and describe the key phases of project management
3. Plan software projects, including risk and quality management
4. Explain basic concepts and principles of components of software

CO.No	Course Outcome	Blooms cognitive Level
CO 1	Describe the principal tasks of software project managers, and basic concepts in software projects	1,4
CO 2	Identify and describe the key phases of project management	2,4
CO 3	Plan software projects, including risk and quality management	5,6,3
CO 4	Explain basic concepts and principles of components of software	1,2
CO 5	Be an active team member on an IT project.	3,6
CO 6	Apply project management concepts and	3,2

	techniques to an IT project.	
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Course Contents

Unit No.	Title	Lectures
Unit 1	Introduction To Software Project Management	6
	1.1. Project Definition 1.2. Contract Management 1.3. Activities covered by Software Project Management 1.4. Overview of Project Planning 1.5. Stepwise Project Planning.	
Unit 2	Project Evaluation	9
	2.1. Work Break Down for Project Estimation & setting 2.2. Milestones 2.3. Different methods of estimation 2.3.1. COCOMO model 2.3.2. Delphi cost estimation 2.3.3. Function point analysis. 2.4. Project Management through Microsoft Project (MS-Project) 2.5. Introduction 2.5.1. Gantt Chart 2.5.2. PERT Chart 2.6. Usage of Microsoft Project for Estimation and Management 2.7. Software Project Metrics (Size Oriented, Software Measurement, Function Oriented, Object Oriented Metrics) 2.8. Project Scheduling, tracking & Progress reporting	
Unit 3	Activity Planning	9
	3.1. Objectives 3.2. Project Schedule 3.3. Sequencing and Scheduling Activities 3.4. Network Planning Models 3.4.1. Forward Pass 3.4.2. Backward Pass 3.5. Activity Float 3.6. Shortening Project Duration 3.7. Activity on Arrow Networks	
Unit 4	Risk Management	8
	4.1. Nature Of Risk 4.2. Types of Risk 4.3. Managing Risk	

	4.4. Hazard Identification 4.5. Hazard Analysis 4.6. Risk Planning and Control	
Unit 5	Software Quality Management & Control	7
	5.1. Quality Assurance & Standards 5.2. The SEI Capability Maturity Model CMM 5.3. Concept of Software Quality 5.3.1. Software Quality Attributes, 5.3.2. Software Quality Metrics and Indicators, 5.4. Quality assurance & Validation plan (SQA Activities, reviews, walkthroughs, inspection, testing) Automation to improve Quality in testing 5.5. Defect Management	
Unit 6	Configuration Management (CM)	7
	6.1. Configuration management & Maintenance plan 6.2. Change Management 6.3. Version and Release Management 6.4. Configuration Management Tools	
Unit 7	Managing People and Organizing Teams	10
	7.1. Introduction 7.2. Understanding Behaviour 7.3. Organizational Behaviour (Selecting The Right Person) 7.4. The Oldham Hackman Job Characteristics Model 7.5. Working In Groups 7.6. Becoming A Team 7.6.1. Decision Making 7.6.2. Leadership 7.6.3. Organizational Structures 7.7. Stress, Health and Safety 7.8. Case Studies	
Unit 8	Project Management Tools	3
	8.1. Project management tool like MS Project 8.2. Assignment based on the tool	
Unit 9	EXPERIENTIAL LEARNING	1
	Case study	

Reference books:

1. Software Project Management 5th Edition, McGraw. Hill. ISBN-10 : 0077122798, ISBN-13 : 978-0077122799
2. Effective Software Project Management 1st Edition Robert K. Wysocki ISBN-10 : 0764596365 , ISBN-13 : 978-0764596360

3. Information Technology Project Management by Kathy Schwalbe Thomson Publication.
ISBN-101285847091
4. Software project management in practice, Pearson, 1st Edition, Pankaj Jalote ISBN-13: 9780201737219
5. Software testing and quality assurance, Theory and practice, Wiley, 1st edition, Kshirsagar Naik ISBN-10 : 0471789119 ISBN-13 : 978-0471789116
6. Software project management, A Concise Study, S. A. Kelkar. ISBN-10 : 8120347021 ISBN-13 : 978-8120347021
7. Software Engineering-A Practitioner's Approach 7th or 8th edition, Roger Pressman, McGraw Hill Publication ISBN-10 : 0071184589 ISBN-13 : 978-0071184588
8. Reference website <http://www.pmi.org>

OPEN ELECTIVE

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Shivajinagar, Pune - 5

SYBCA (Science) (2024 Course under NEP)

Course Code: 24CsCopU4401
Teaching Scheme: 2 Lectures/Week
Examination Scheme: CIA : 20 Marks

Course Name: Web Designing
Credits: 2
End-Sem : 30 Marks

Desirable Prerequisites:

- Knowledge of basic Computer hardware & software is necessary.

Course Objectives:

- Understand Internet Concept, Network protocols, web server types and basics of web designing
- Understanding and implementing different HTML tags
- Explain and demonstrate Cascading Style Sheet (CSS)
- Design and develop web pages using HTML tags, form elements and CSS

Course Outcomes:

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

- Implement interactive web page(s) using HTML, CSS
- Design a responsive web site using HTML and CSS

Unit No.	Title	Lectures
Unit 1	Introduction to Web Technologies	5
	1.1 Introduction to Web Technologies 1.2 How the Website Works? 1.3 Clients- Servers and Communication 1.4 Client and Server Scripting Languages 1.5 Internet-Basic, Internet Protocols (HTTP, FTP, IP) 1.6 World Wide Web (WWW) 1.7 HTTP request message, HTTP response message 1.8 Types of Websites (Static and Dynamic Websites)	
Unit 2	Introduction to HTML	8
	2.1 Basic HTML Document 2.2 HTML Tags 2.3 HTML Document Structure 2.4 HTML Basic Tags 2.5 HTML – FORMATTING Tags 2.6 HTML – IMAGES	

	2.7 HTML – LISTS	
Unit 3	HTML – TABLES	6
	2.1 Table Heading 2.2 Cellpadding and Cells pacing Attributes 2.3 Colspan and Rowspan Attributes 2.4 Tables Backgrounds 2.5 Table Height and Width 2.6 Table Caption 2.7 Nested Tables	
Unit 4	Advanced HTML tags	6
	4.1 HTML - Introduction to Forms 4.2 Tags and Attributes 4.3 Input Text Fields 4.4 Select Menus 4.5 Check Boxes and Radio Buttons 4.6 Text Areas and Buttons	
Unit 4	Introduction to Cascading Style Sheets	5
	5.1 Concept of CSS 5.2 Types of CSS 5.3 Creating Style Sheet 5.4 CSS Properties	

Reference Books:

- Complete HTML- Thomas Powell, fifth edition, McGrawHill publication, ISBN:9780070701946
- HTML and JavaScript–Ivan Bayross, forth edition, BPB publication, ISBN:978818330084

Websites:

1. www.php.net.in
2. www.W3schools.com
3. <https://api.drupal.org>

Progressive Education Society's
Modern College of Arts, Science and Commerce (Autonomous),
Shivajinagar, Pune – 5

SYBCA (Science)
(2024 Course under NEP)

Course Code: 24CsBcaU4601

Course Name: Introduction to Data Science

Teaching Scheme: TH: 2 Hours/Week

Examination Scheme: CIA: 20 Marks

Credit: 02

End-Sem: 30 Marks

Prerequisite Courses:

- Basic knowledge of mathematics, statistics, and programming (preferably Python or R)

Course Objectives:

- Introduce students to the fundamental concepts and techniques used in data science.
- Develop an understanding of data preprocessing, analysis, and visualization techniques.
- Introduce students to the basics of machine learning and data modeling.
- Equip students with the ability to handle real-world data and derive insights from it.

Course Outcomes:

After successful completion of this course students will able to:

CO No	Course Outcomes (COs)	Blooms Cognitive level
CO 1	Understand the fundamental concepts of Data Science.	1
CO 2	Analyze and describe data types, data collection methods, and data cleaning techniques.	2
CO 3	Apply data preprocessing techniques such as normalization, scaling, and outlier detection.	3
CO 4	Analyze and visualize data using statistical and graphical techniques.	4
CO 5	Evaluate and interpret results from machine learning models, including classification and regression.	5
CO 6	Create data science solutions and communicate findings through reports and presentations.	6

Course Contents:

Unit 1	Introduction	04 lectures
	1.1 Definition and importance of Data Science 1.2 Role of a Data Scientist 1.3 Key areas of Data Science: Data Collection, Cleaning, Analysis, and Visualization 1.4 Overview of tools and technologies (Python, R, etc.)	
Unit 2	Data Collection and Data Types	04 lectures
	2.1 Data Collection Methods: Structured and Unstructured Data 2.2 Data Sources: APIs, Web Scraping, Databases, CSV, JSON 2.3 Types of Data: Quantitative vs. Qualitative 2.4 Data Formats and Storage	
Unit 3	Data Cleaning and Preprocessing	04 lectures
	3.1 Handling Missing Data 3.2 Data Transformation: Normalization, Scaling, Encoding 3.3 Outlier Detection and Treatment 3.4 Data Quality and Integrity	
Unit 4	Data Visualization	06 lectures
	4.1 Importance of Data Visualization in Data Science 4.2 Tools and Libraries: Matplotlib, Seaborn, Plotly (for Python) 4.3 Basic Visualizations: Histograms, Bar Charts, Line Graphs, Pie Charts 4.4 Advanced Visualizations: Heatmaps, Scatter Plots, Box Plots	
Unit 5	Exploratory Data Analysis (EDA)	06 lectures
	5.1 Statistical Summaries: Mean, Median, Mode, Variance, Standard Deviation 5.2 Distributions: Normal Distribution, Binomial Distribution 5.3 Hypothesis Testing and p-values	
Unit 6	Introduction to Machine Learning	06 lectures
	6.1 Supervised vs. Unsupervised Learning 6.2 Overview of Machine Learning Algorithms 6.3 Applications of Machine Learning	

	5.4 Basic Terminology: Training, Testing, Overfitting, Underfitting 5.5 Linear Regression and Logistic Regression	
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Reference Books:

1. **"Data Science for Business"** by Foster Provost and Tom Fawcett **ISBN:** 9781449361327
2. **"Python for Data Analysis"** by Wes McKinney **ISBN-13:** 978-1491957660
3. **"Introduction to Machine Learning with Python"** by Andreas C. Müller and Sarah Guido **ISBN:** 9789352134571
4. **"Practical Statistics for Data Scientists"** by Peter Bruce and Andrew Bruce **ISBN:** 9781491952962
5. **Online Resources:** DataCamp, Coursera, and edX for hands-on tutorials and courses

