

Affiliated to the University of Mumbai

Programme: Bachelor of Science

Course: Information Technology

Syllabus for the Academic Year 2024-2025 based on the National Education Policy 2020



PROGRAMME SPECIFIC OUTCOMES				
1	Identify information technology related problems, analyze them and design the system or provide solution to the problem			
2	Apply the knowledge obtained and emerge as a Developer, Designer, Tester, Security Analyst, Technical Analyst, Networking related modules			
3	To think analytically, creatively and critically in developing robust, extensible and highly maintainable technological solutions to simple and complex problems.			

## DEPARTMENT OF INFORMATION TECHNOLOGY

SEMESTER 3				
COURSE TYPE	COURSE CODE	COURSE TITLE	CREDITS	
MAJOR	T233MJ	PYTHON PROGRAMMING	3	
MAJOR PRACTICAL	T233MJP	PYTHON PROGRAMMING PRACTICAL	1	
MAJOR	T234MJ	DATABASE MANAGEMENT SYSTEM	3	
MAJOR PRACTICAL	T234MJP	DATABASE MANAGEMENT SYSTEM PRACTICAL	1	
MINOR	T233MN	DATA STRUCTURES	3	
MINOR PRACTICAL	T233MNP	DATA STRUCTURES PRACTICAL	1	
OPEN ELECTIVE (OE) 1	TOE301	DIGITAL MARKETING	2	
VOCATIONAL SKILL COURSE (VSC)	TVSC301	COMPUTER NETWORKS	(1+1)=2	
ABILITY ENHANCEMENT COURSE (AEC)	TAEC301	CAMPUS TO CORPORATE	2	



MAJOR: PYTHON PROGRAMMING	Semester – 3
Course Title: PYTHON PROGRAMMING	Course Code: T233MJ

#### **COURSE OBJECTIVES:**

- 1. To learn core python scripting elements such as variables, expressions, condition statements, loop and control statements.
- 2. To learn usage of function and strings in Python.
- 3. To learn the concept of list, tuple, dictionary, exception.
- 4. To get familiar with the topic- classes and objects, inheritance, polymorphism
- 5. To learn the concept of file handling in Python.
- 6. To learn how to handle the exception.

#### **COURSE OUTCOMES:**

The learner will be able to:

- 1. Install, debug and run a Python program, define variables, use if, if-else, for, while loops.
- 2. Explore python function, recursion, a string as a sequence, string slices, and string operations.
- 3. Explore python lists, tuples, dictionary and exception handling.
- 4. Explore python object-oriented concepts, classes, objects, inheritance, and polymorphism.
- 5. Explore file handling mechanism in python.
- 6. Explore the use of try, catch and finally to handle the exception.

Lectures per week (1 Lecture is 60 minutes)			3	
<b>Total number of Hours</b>	in a Semester	45		
Credits			3	
<b>Evaluation System</b>	Semester End	2	50 marks	
	Examination	Hours		
	<b>Internal Assessment</b>		50 marks	

Unit 1	Introduction:	
	History of Python, Features of Python, Installing Python, Running Python	
	program, Comments in Python, Variable, Data type in Python, Type conversion	
	Operators in Python: Arithmetic operator, Assignment operator, Relational operator, Logical operator, Boolean operator, Bitwise operator, Membership operator, Identity operator	15 hours
	Input and Output: Input statement, print() statement	
	<b>Control Statements:</b> if statement, ifelse statement, ifelifelse statement, while loop, for loop, infinite loop, nested loops, break statement,	
	continue statement, pass statement, return statement	



Unit 2	Functions: Defining a function, Calling a Function, Format and actual arguments, method overloading, Recursive function, Creating our own module in python  Strings: Creating Strings, Length of string, Indexing in string, Slicing the strings, String method(find(), rfind(), index(), rindex(), lstrip(), rstrip(), count(), replace(), upper(), lower(), swapcase(), title(), split(), join()), String testing methods, Sorting strings, Traversal with a for Loop, String operation  Lists: List, creating list and Accessing Elements, Lists are mutable, updating list, Repetition of lists, Membership in List, Cloning list, Built-in List functions and methods, Nested Lists  Tuple: Tuple, creating tuples, accessing tuple elements, basic operation on tuple, Built-in Tuple Functions, Inserting elements in tuple, Modifying elements in tuple, Deleting elements in tuple	15 hours
Unit 3	Dictionary: Creating a Dictionary, Accessing Values in a dictionary, Updating Dictionary, Built-in Dictionary Method, Sorting elements of Dictionary, Converting list into Dictionary, Converting Strings into Dictionary  OOPs in Python: Features of OOPs, Classes and Objects, self variable, constructor, Inner classes, Inheritance, Constructors in Inheritance, super() method, types of inheritance, method overriding, Polymorphism, operator overloading, Abstract method and abstract class  Exceptions: Errors in Python, Exception, Exception Handling, Types of Exceptions  File Handling in Python:  Python File Open, modes for opening a file, Reading the File, Read Lines, Close Files, write to an Existing File, create a New File, delete a File, check if File exist, Delete Folder	15 hours



MAJOR: PYTHO	ON PROGRAMMING	Semester – 3			
PRACTICAL					
Course Title: PY	THON PROGRAMMING	Course Code	Course Code: T233MJP		
PRACTICAL					
Lectures per week (1	1 Lecture is 60 minutes)		2		
Total number of Ho	urs in a Semester		30		
Credits			1		
<b>Evaluation System</b>	Practical Examination	2 Hours 50 marks			

#### **List of Practical:**

2

a. Calculate the student's grade based on the results of five subjects.

The grade must be calculated as per the following rules:

Average Mark	Grade
91-100	A1
81-90	A2
71-80	B1
61-70	B2
51-60	C1
41-50	C2
33-40	D
21-32	E1
0-20	E2

- b. Write a program to generate the Fibonacci series.
- a. Write a function that reverses the user defined value.
  - b. Write a recursive function to print the factorial for a given number.
- a. Design a Python function to check if a given number is prime or not.



	b. Design a Python function that returns the results of addition, subtraction, multiplication and division.
4	a. Design a python program to display all positions of a sub string in a given main string.
	b. Design a python program to sort a group of strings into alphabetical order.
5	a. Design a python program to create a list with employee data and then retrieve a particular employee details.
	b. Design a Python program to sort a list of tuples.
6	a. Design a python program to create a dictionary from keyboard and display the elements.
	b. Design a python program to convert the elements to two lists into key-value pairs of a dictionary.
7	a. Design a python to create employee class.
	b. Design a Python class called Book with a constructor to initialize attributes like title, author, and year_published.
8	a. Design a python program to implement single inheritance.
	b. Design a python program to implement multiple inheritance.
9	a. Design a Python code to implement exception handling to handle the scenario where the user attempts to divide by zero.
	b. Design a Python code to show the use of finally clause.
10	a. Write a Python program to read an entire text file.
	b. Write a Python program to append text to a file and display the text.

Sr.	Title	Author/s	Publisher	Edition	Year
No.					
1	Core Python Programming	Dr. Nageshwara Rao	Dreamtech Press	2 <sup>nd</sup> Edition	2018
2	Think Python	Allen Downey	O'Reilly	1st	2012
3	An Introduction to	Jason	SPD	1st	2014
	Computer Science using	Montojo, Jennifer			



	Python 3	Campbell, Paul Gries			
4	Python GUI	Burkhard A. Meier	Packt		2015
	Programming Cookbook				
5	Introduction to Problem	E. Balagurusamy	TMH	1st	2016
	Solving with Python				
6	Object-oriented	Michael H.	Pearson	1st	2008
	Programming in Python	Goldwasser, David	Prentice		
		Letscher	Hall		
		Letscher	нап		

MAJOR: DATABASE MANAGEMENT SYSTEM	Semester – 3
Course Title: DATABASE MANAGEMENT SYSTEM	Course Code: T234MJ

#### **COURSE OBJECTIVES:**

- The objective of the course is to present an introduction to database management systems, with an emphasis on how to organize, maintain and retrieve efficiently, and effectively information from a DBMS.
- Analyze database requirements and determine the entities involved in the system and their relationship to one another.
- To study the introduction to PL/SQL.

#### **COURSE OUTCOMES:**

#### The learner will be able to:

- Describe the fundamental elements of relational database management systems
- Explain the basic concepts of relational data model, entity-relationship model, relational database design, relational algebra and SQL.
- Design ER-models to represent simple database application scenarios
- Convert the ER-model to relational tables, populate relational database and formulate SQL queries on data.
- Improve the database design by normalization.

Lectures per week (1 Lecture is 60 minutes)			3	
Total number of Hours in a Semester			45	
Credits			3	
<b>Evaluation System</b>	Semester End	2 50 marks		
-	Examination	Hours		
	<b>Internal Assessment</b>		50 marks	

UNIT 1	Introduction to Databases and Transactions
	What is database system, purpose of database system, view of data, relational
	databases, database architecture, transaction management



	Data Models	15 hours
	The importance of data models, Basic building blocks, Business rules, The evolution of data models, Degrees of data abstraction.  Database Design, ER Diagram and Unified Modeling Language	
	Database design and ER Model: overview, ER Model, Constraints, ER Diagrams, ERD Issues, weak entity sets, Codd's rules, Relational Schemas, Introduction to UML	
UNIT 2	Relational database model:	
	Logical view of data, keys, integrity rules, Relational Database design: features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF).	15 hours
	Constraints, Views and SQL	
	Constraints, types of constrains, Integrity constraints, Views: Introduction to views, data independence, security, updates on views, comparison between tables and views SQL: data definition, aggregate function, Null Values, nested sub queries, Joined relations. Triggers.	
	Transaction management and Concurrency	
	Control Transaction management: ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods	
UNIT 3	<b>PL-SQL</b> : Beginning with PL / SQL, Identifiers and Keywords, Operators, Expressions, Sequences, Control Structures, Cursors and Transaction, Collections and composite data types, Procedures and	
	Functions, Exceptions Handling, Packages, With Clause and	15 hours
	Hierarchical Retrieval, Triggers.	



MAJOR: DATABASE MANAGEMENT SYSTEM	TEM Semester – 3		
Course Title: DATABASE MANAGEMENT SYSTEM Course Code: T234MJP			
Lectures per week (1 Lecture is 60 minutes) 2			
Total number of Hours in a Semester	30		
Credits 1			
Evaluation System	2 Hours 50 marks		

### **List of Practical:**

1	SQL Statements – 1
	Writing Basic SQL SELECT Statements Restricting and Sorting Data
2	SQL Statements – 2 Single-Row Functions Displaying Data from Multiple Tables
3	SQL Statements – 3
	Aggregating Data Using Group Functions
4	SQL Statements – 4 Subqueries
5	Manipulating Data Using INSERT statement Using DELETE statement Using UPDATE statement
6	Creating and Managing Tables Creating and Managing Tables
7	Creating and Managing other database objects Including Constraints Creating Views



	Other Database Objects
8	Using SET operators, Date/Time Functions, GROUP BY clause (advanced features) and advanced subqueries Using SET Operators Datetime Functions Enhancements to the GROUP BY Clause Advanced Subqueries
9	Introduction to print hello world in pl/sql
10	Write a program for Control Structures in PL/SQL

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Database System and Concepts	A Silberschatz, H Korth, S Sudarshan	McGraw- Hill	Fifth Edition	
2	Database Systems	Rob Coronel	Cengage Learning	Twelft h Edition	
3	Programming with PL/SQL for Beginners	H. Dand, R. Patil and T. Sambare	X –Team	First	2011
4	Introduction to Database System	C.J.Date	Pearson	First	2003



MINOR: DATA STRUCTURES	Semester – 3
Course Title: DATA STRUCTURES	Course Code: T233MN

#### **COURSE OBJECTIVES:**

- 1. To provide the knowledge of basic data structures and their implementations.
- 2. To understand the importance of data structures in context of writing efficient programs.
- 3. To develop skills to apply appropriate data structures in problem solving.
- 4. To understand and apply various searching and sorting algorithms.

### **COURSE OUTCOMES:**

Upon Completing the Course, Students will able to:

- 1. Learn the basic types for data structure, implementation and application.
- 2. Know the strength and weakness of different data structures.
- 3. Use the appropriate data structure in context of solution of given problem.
- 4. Apply Algorithm for solving problems like sorting, searching, insertion and deletion of data.

Lectures per week (1 Lecture is 60 minutes)		3	
Total number of Hours in a Semester		45	
Credits		3	
<b>Evaluation System</b>	Semester End Examination	on 2 Hours 50 marks	
Internal Assessment			50 marks

	internal Assessment		50 mari	<b>S</b>
UNIT 1 Concepts	Arrays: Introduction, One Dimensional Array, Memory Representation of One-Dimensional Array, Traversing, Insertion, Deletion, Searching, Sorting, Merging of Arrays, Memory Representation of Two-Dimensional Arrays, Advantages and Limitations of Arrays.		15 hours	
	Sorting Techniques: Bubble Sort and Selection Sort  Searching Techniques: Sequential Search and Binary Search.			
	Linked List:			
UNIT 2 Theories	Linked List.  Linked List, One-way Linked List, Travel Memory Allocation and De-allocation, Ins from Linked List, copying a List into Other I splitting a List into Two Lists, Reversing O	ertion in Link List, Merging	ed List, Deletion Γwo Linked Lists,	15 hours
	Stack: Introduction, Operations on the Stack, Me Array Representation of Stack, Linked Matching Parenthesis, Recursion.	• •		



UNIT 3 Application		
	<b>Trees:</b> Tree, Binary Tree, Properties of Binary Tree, Memory Representation of Binary Tree, Operations Performed on Binary Tree: Preorder, Inorder and Postorder; Reconstruction of Binary Tree from its Traversals, Binary Search Tree, Operations on Binary Search Tree: Traversal, Search, Insertion and Deletion operations.	

MINOR: DATA STRUCTURES PRACTICAL Semester – 3			Semester – 3		
Course Title: DATA STRUCTURES PRACTICAL Course Code: T233MNP		se Code: T233MNP			
Lectures per week (1 Lecture is 60 minutes) 2		2			
Total number of Hours in a Semester			30		
Credits			1		
<b>Evaluation System</b>	Practical Examination	2 Hou	2 Hours 50 marks		

List OF F	PRACTICAL
1.	Write a program to store the elements in 1-D array and perform the operations like searching,
	sorting and reversing the elements.
2.	Write a program to create a singly linked list and display the node elements in reverse order.
3.	Write a program to implement the concept of Stack with Push, Pop, Display and Exit
	operations.
4.	Write a program to implement Tower of Hanoi problem.
5.	Write a program to implement bubble sort.
6.	Write a program to implement selection sort.
7.	Write a program to search the element using sequential search.
8.	Write a program to search the element using binary search.
	Write a program to implement the concept of Queue with Insert, Delete, Display and Exit operations.
9.	
10.	Write a program to implement the concept of Deque.

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	A Simplified Approach to Data	Lalit Goyal, Vishal	SPD	1st	2014
	Structures	Goyal,Pawan			
		Kumar			



2.	An Introduction to Data	Jean – Paul	Tata	2nd	2007
	Structure with Applications	Tremblay and Paul	MacGraw		
		Sorenson	Hill		
3.	Data Structure and Algorithm	Maria Rukadikar	SPD	1st	2017
4.	Schaum's Outlines Data	Seymour Lipschutz	Tata	2nd	2005
	structure		McGraw		
			Hill		
5.	Data structure – A	AM Tanenbaum, Y	Prentice	2nd	2006
	Pseudocode Approach	Langsam and MJ	Hall India		
	with C	Augustein			
6.	Data structure and	Weiss, Mark Allen	Addison	1st	2006
	Algorithm Analysis in C		Wesley		

OE : DIGITAL MARKETING	Semester – 3
Course Title: DIGITAL MARKETING	Course Code: TOE301

#### **COURSE OBJECTIVES:**

- 1. To learn to evaluate the historical evolution discerning between traditional and digital approaches while appraising their respective advantages and drawbacks.
- 2. Understand to analyze sophisticated SEO strategies
- 3. Learn SEM skills through comprehensive keyword research, strategic PPC campaign management utilizing Google AdWords.
- 4. Critically evaluate social media marketing strategies.

#### **COURSE OUTCOMES:**

- 1. Discriminate between traditional and digital marketing methodologies, discerning their respective advantages and limitations.
- 2. Evaluate and adapt SEO strategies based on evolving algorithms and industry best practices to ensure sustained search engine visibility and traffic.
- 3. Develop and refine PPC advertising campaigns using Google AdWords, employing advanced ad copywriting and optimization techniques
- 4. Evaluate the effectiveness of social media marketing strategies in achieving business objectives, utilizing analytical tools to measure engagement and audience reach.

$\mathcal{E}$	
<b>Lectures per week (1 Lecture is 60 minutes)</b>	2
<b>Total number of Hours in a Semester</b>	30
Credits	2



	Introduction to Digital Marketing Overview of digital marketing, History of digital marketing, Digital	
UNIT 1	marketing vs traditional marketing, Advantages and disadvantages of digital	15 hours
	marketing	
	Search Engine Optimization (SEO)	
	Introduction to SEO, how search engines work, On-page optimization	
	techniques, Off-page optimization techniques, SERP ,Technical SEO,404	
	Error, Canonical Tag, What Is AMP & Importance? What Is Sitemap &	
	Importance? What Are Robots.Txt & Importance? What Is SSL &	
	Importance? What Is Schema & Importance? Page load Optimization.	
	Search Engine Marketing (SEM)	
	Introduction to SEM, Keyword research and analysis, Pay-per-click (PPC)	
	advertising ,Google Ad Words ,Ad copywriting and optimization , Landing	
	page optimization, SEO algorithms	
	Social Media Marketing (SMM)	
UNIT 2	Introduction to SMM, Social media platforms and their	
	differences(Facebook ,Twitter , instagram ,LinkedIn) , Developing a social	15 hours
	media strategy, Measuring social media success, Newsfeed and	
	Recommendation Algorithms.	
	Website Hosting using Word Press	
	Website Planning & Development- Website, Types of Websites, Phases of	
	website development, Keywords: Selection process, An introduction to how	
	a web server works with Word Press, Creating basic things like posts, pages,	
	and users, and changing settings.	

Books and References:							
Sr. No.	Title	Author/s	Publisher	Edition	Year		
1.	Digital Marketing, V. Ahuja, Oxford University Press 4,	Digital Marketing, S.Gupta	McGraw-Hill	4			
2.	The Art of SEO Marketing: Mastering SEO Engine Optimization Media	Eric Enge and Stephan Spencer	O'reilly	3			
3	SOCIAL MEDIA MARKETING WORKBOOK 2022 by	Jason McDonald	Oxford University Press	Illustrated	2015		



VSC: COMPUTER NETWORKS	Semester – 3
COURSE TITLE: COMPUTER NETWORKS	Course Code: TVSC301

#### **COURSE OBJECTIVES:**

- 1. Students will grasp the foundational concepts of computer networking, including network models, topologies.
- 2. Students will gain comprehensive knowledge of how data is transmitted, organized, and processed across networks.
- 3. They will understand the functions and protocols associated with each layer in OSI and TCP/IP.
- 4. Students will be equipped with practical skills in configuring, managing, and troubleshooting computer networks.

### **COURSE OUTCOMES:**

- 1. Students will demonstrate competency in using basic networking commands for configuration and troubleshooting purposes.
- 2. Students will develop the ability to analyze and determine key information from given IP addresses and network masks.
- 3. Students will gain practical experience in configuring network topologies using simulation tools like GNS.
- 4. Students will acquire the skills to use Wireshark for packet analysis, aiding in network troubleshooting and optimization

Lectures per week (1 Lecture is 60 minutes)	1
<b>Total number of Hours in a Semester</b>	15
Credits	1

	Basics of networking Model: introduction to Network, Topologies, OSI and	
UNIT 1	TCP/IP model.	15 hours
	Physical Layer: Bit rate, modulation, transmission modes. Data Link Layer	
	Functions: Framing, addressing, error detection. Network Layer Functions:	
	Routing, logical addressing, sub-netting. IP addresses, routers, routing	
	protocols. Transport Layer Functions: Segmentation, flow	
	control, error recovery. TCP, UDP, ports, sockets. Session Layer Functions:	
	Dialog control, session establishment, termination. Concepts: Sessions, dialog,	
	synchronization. <b>Presentation Layer:</b> Translation, encryption, compression.	
	<b>Application Layer:</b> Interface with user applications, network services.	
	Concepts: Protocols (HTTP, FTP, SMTP), APIs.	

VSC 1: COMPUTER NETWORKS	Semester – 3
Course Title: COMPUTER NETWORKS	Course Code:
	TSEC201
Lectures per week (1 Lecture is 60 minutes)	2
Total number of Hours in a Semester	30



Credits					1	
Evaluati	on System	<b>Practical Examination</b>		2 Hours		
List of Pra		1 CNI ( 1' 1 '	170 1 1			
1	Stuc	ly of Networking devices a	nd Topologies.			
2	Basi	c networking commands.				
_	2432	e neem standg e standards.				
		1. Ipconfigtracert	6. route	е		
		2. Nslookup	7. getm	nac		
		3. Hostname	8. ping			
		4. Systeminfo	9. path	ping		
		5. netstat	10. arp			
	~			11 1100		
3		figuring basic topology on etwork.	GNS and Unders	standing different cl	lasses	
	OI II	etwork.				
4	Given a	n IP address and network r	nask, determine o	other information at	oout	
	the IP a	ddress such as:				
	- I	Network address				
	<b>-</b> ]	Network broadcast address				
		Γotal number of host bits				
		Number of hosts				
5	Con	figure network topology ar	nd implement stat	ic routing.		
6	Con	figure a network using Dis	tance vector Rout	ting Model		
O	Con	inguie a network asing Dis	tunee vector from	ting Woden		
7	Con	Configure network using Link State Vector Routing Protocol				
8	Use	of Wire-shark to scan and	check the packet	information of		
		owing protocols	1			
		HTTP				
		ICMP				
		rcp Emter				
	• ,	SMTP				



#### **REFERENCES:**

Books and References:					
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Data Communications	Behrouz-A.Forouzan	Mc Graw Hill	5	2022
	and Networking with				
	TCPIP Protocol Suit				

AEC:	Semester – 3
Course Title: CAMPUS TO CORPORATE	Course Code: TAEC301

#### **COURSE OBJECTIVES:**

- 1. Gain knowledge about different types of interviews and improve interview performance.
- **2.** Understand intrapersonal and interpersonal communication dynamics and conflict management in the workplace.
- 3. Develop skills and understand the importance of international communication.
- **4.** Learn effective strategies for delivering group communication, teamwork and leadership.

### **COURSE OUTCOMES:**

- 1. Utilize interview techniques to enhance job interview performance and have a impactful media interviews and press conferences.
- 2. Apply interpersonal communication skills to build effective relationships and manage conflicts in professional settings.
- 3. Demonstrate improved speaking skills with clarity, confidence, and fluency.
- 4. Effective deliver group communication, teamwork and exhibit impactful leadership.

Lectures per week (1 Lecture is 60 minutes)	2
Total number of Hours in a Semester	30
Credits	2

UNIT 1 Concepts	Interviews: Objectives of Interviews, Types of Interviews, Job Interviews, Media Interviews, Press Conferences.  Intrapersonal and Interpersonal Business Communication: Intrapersonal Communication, Self-Concept and Dimensions of Self, Interpersonal Needs, Social Penetration Theory, Rituals of	15 hours
	Conversation and Interviews, Conflict in the Work Environment.	
	International Communication: The Global Marketplace, Styles of	
UNIT 2	Management, The International Assignment.	
Theories	Group Communication, Teamwork, and Leadership: Group Life	15 hours
	Cycles and Member Roles, Group Problem Solving, Business and	
	Professional Meetings, Teamwork and Leadership.	



Books and References:						
Sr. No.	Title	Author/s	Publisher	Edition	Year	
1.	Business Communication for Success	University of Minnesota	University of Minnesota		2015	
2.	Technical Communication: Principles and Practice	Meenakshi Raman	Oxford University Press	3rd Edition	2015	