SOPHIA COLLEGE FOR WOMEN

(EMPOWERED AUTONOMOUS)

Affiliated to the University of Mumbai

Programme: Bachelor of Science

Course: Information Technology

Syllabus for the Academic Year 2025-2026

based on the National Education Policy 2020

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

DEPARTMENT OF INFORMATION TECHNOLOGY

	SEMESTER 4		
COURSE TYPE	**COURSE CODE**	**COURSE TITLE**	**CREDITS**
MAJOR	T245MJ	CORE JAVA	3
MAJOR PRACTICAL	T245MJP	CORE JAVA PRACTICAL	1
MAJOR	T246MJ	WEB DEVELOPMENT WITH JAVASCRIPT FRAMEWORKS	3
MAJOR PRACTICAL	T246MJP	WEB DEVELOPMENT WITH JAVASCRIPT FRAMEWORKS PRACTICAL	1
MINOR	T244MN	COMPUTER FORENSICS	3
MINOR PRACTICAL	T244MNP	COMPUTER FORENSICS PRACTICAL	1
OPEN ELECTIVE (OE) 1	TOE401	ENTREPRENEURSHIP DEVELOPMENT	2
SKILL ENHANCEMENT COURSE (SEC) 1	TSEC401	ADVANCED MOBILE PROGRAMMING	(1+1) =2
ABILITY ENHANCEMENT COURSE (AEC)	TAEC401	TECHNICAL WRITING	2

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

Preamble:

Information Technology (IT) refers to the use, development, and management of computer systems, software, and networks to process, store, retrieve, and exchange information. It encompasses a broad range of technologies and practices aimed at solving problems, improving efficiency, and enabling communication within and between organizations and individuals.

In an era marked by rapid digital transformation and technological advancements, our program is designed to equip students with a comprehensive understanding of the foundational and emerging concepts in Information Technology.

Our BSc IT curriculum integrates theoretical knowledge with practical skills, preparing students to tackle real-world challenges and excel in a diverse range of IT careers. Through a combination of rigorous coursework, industry-relevant projects, and learning experiences, we aim to develop well-rounded professionals who are adept at problem-solving and equipped with the tools to drive technological innovation.

PROGRAMME OBJECTIVES

PO 1	To think analytically and creatively in developing robust, extensible and maintainable technological solutions to simple and complex problems
PO 2	To imbibe quality software development practices
PO 3	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 programmes
PO 4	To communicate effectively with a range of audiences both technical and non-technical
PO 5	To work effectively as a part of a team to achieve a common stated goal

PROGRAMME SPECIFIC OUTCOMES

PSO 1	Demonstrate understanding of fundamental concepts in information technology, including programming, databases, networking, and software engineering principles
PSO 2	Apply technical skills in software development, system analysis, and design using various tools and technologies
PSO 3	Develop proficiency in identifying, formulating, and solving IT-related problems using appropriate techniques, algorithms, and methodologies
PSO 4	Apply concepts of computing, data structures, and software engineering to solve problems using AI and BI technologies.
PSO 5	Develop effective communication skills, both oral and written, essential for articulating technical concepts and collaborating in a team environment

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

MAJOR: Core Java		**Semester – 4**	
Course Title: Core Java		**Course Code: T245MJ**	
Course objectives: 1. To introduce the basic concepts of Java and its data types. 2. To gain knowledge about the control flow statement, iterations and classes in Java. 3. To become familiar with concept of inheritance and packages.			
Course Outcomes: 1. Use the syntax and semantics of java programming language and basic concepts ofOOPs. 2. Implement the use of a variety of basic control structures including selection andrepetition; classes and objects. 3. Develop reusable programs using the concepts of inheritance, interfaces and packages.			
Lectures per week (1 Lecture is 60 minutes)		**3**	
Total number of Hours in a Semester		**45**	
Credits		**3**	
Evaluation System	**Semester End Examination**	**2 Hours**	**50 marks**
	Internal Assessment	**--**	**50 marks**

Unit 1	**Introduction:** History, Features of Java, Java Virtual Machine,Java API, Java Development Kit (JDK), Installation of JDK, Java Compiler And Interpreter **Basic Language Elements:** Identifiers, keywords, comments, Variables, Variable name, Data Types, Literals, Operators **Input and Output in Java:** Reading data from keyboard, Java Console Class, Displaying Output with System.out.printf(), Displaying formatted output with String.format() **Control Flow Statements:** The If…Else If…Else Statement, The Switch…Case Statement **Iterations:** The While Loop, The Do … While Loop, The For Loop, The Foreach Loop, Labeled Statements, The Break And Continue Statements, The Return Statement	15 hours
Unit 2	**Classes and Objects:** Object Creation, access specifier, Constructors, Types of constructor **Methods in Java :** Understanding Methods, Static Method, Static Block, this keyword, Instance Method, Passing Primitive Data Types to Methods, Passing objects to Methods, Methods with Variable Arguments, Method Overloading, Recursion	15 hours

	Arrays: Single Dimensional Arrays, Two Dimensional Arrays, Multi-Dimensional Arrays, Jagged Array **Strings:** Creating strings, String class methods, String comparison, Immutability of Strings	
Unit 3	**Inheritance:** Inheritance, super keyword, Protected Specifier, Type of Inheritance, Abstract Classes, Abstract Methods, Interfaces, Multiple Inheritance **Packages:** Package, Types of Packages, Creating sub package in a package, Importing Packages **Threads:** Thread, single and multi-tasking, Uses of thread, Creating a thread, thread life cycle. **Exceptions:** Errors in a Java Program, Exception, Exception Handling, Handling Multiple Exception, throws Clause, throw clause, Finally block, types of Exceptions	15 hours

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

MAJOR: Core Java PRACTICAL		**Semester – 4**	
Course Title: Core Java PRACTICAL		**Course Code: T245MJP**	
Lectures per week (1 Lecture is 60 minutes)		**2**	
Total number of Hours in a Semester		**30**	
Credits		**1**	
Evaluation System	**Practical Examination**	**2 Hours**	**50 marks**

List of Practical:

1	a) Write a Java program to print the area and perimeter of a circle.
	b) Write a java program to Check if a year is a leap year or not.
2	a) Write a java program to reverse a number.
	b) Write a Java program to accept a number and check whether the number is Armstrong number or not.
3	a) Write a java program to generate the Fibonacci series up to a specified limit.
	b) Write a Java program to print the following pyramid: * * * * * * * * * * * * * * *
4	a) Write a java program to Check if a character is a vowel or consonant using switch case.
	b) Write a Java program to reverse a string.
5	a) Write a program to initialize the instance variables of Person class, using parameterized constructor.
	b) Write a java class using constructor to add two complex numbers.
6	a) Write a Java program to explain Method Overloading
	b) Write java program to calculate factorial of a number using recursion.
7	a) Write a java class to sort an array in ascending and descending order.
	b) Write a java program to split a string into pieces wherever a space is found.
8	a) Write a java program to implement single level inheritance.

	b) Write a java program to implement multiple inheritance.
9	a) Write a java program in which abstract class Car contains an instance variable, one concrete method and two abstract methods.
	b) Write a java program which implements the use of try, catch and finally block.
10	a) Write a Java program to import the package in java class.
	b) Write a java program showing execution of multiple tasks with a single thread.

REFERENCES:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Core Java 8 for Beginners	Vaishali Shah, Sharnam Shah	SPD	1st	2015
2	Java: The Complete Reference	Herbert Schildt	McGraw Hill	9th	2014
3	Murach's beginning Java with Net Beans	Joel Murach , Michael Urban	SPD	1st	2016

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

MAJOR: WEB DEVELOPMENT WITH JAVASCRIPT FRAMEWORKS	**Semester – 4**
COURSE TITLE: WEB DEVELOPMENT WITH JAVASCRIPT FRAMEWORKS	**Course Code: T246MJ**

COURSE OBJECTIVES:

1. Learn History, Features and Application of JavaScript
2. Learn to develop single page Angular applications.
3. To explore React basic and advanced in-depth concepts.

COURSE OUTCOMES:

The learner will be able to:

1. Understand how to interact with the Document Object Model (DOM) and Browser Object Model
2. Comprehend the architecture and key components of AngularJS, including modules, controllers, directives, and services.
3. Understand how to work with forms in React, handle form submissions, and manage form state.

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

Unit 1	**Introduction to JavaScript :** Introduction, Features of JavaScript, History of JavaScript, Application of JavaScript **JavaScript Basics:** Comment, Variable, Data Types, Operator, If statement, Switch, Loop, Function **JavaScript Objects:** Object, Array, String, Date, Math, Boolean, Number **JavaScript Browser Object Model (BOM):** Browser Objects, Window Object, Navigator Object **JavaScript Document Object Model (DOM):** Document Object, getElementById, GetElementsByClassName()	15 hours
Unit 2	**Introduction to Angular JS :** What is Angular JS, Advantage of Angular JS, Angular JS MVC, Setting up Visual Studio Code for Angular development, installing the Angular CLI, Create a workspace and initial application, Run the application, creating a simple Angular project using Angular CLI **Components and Templates:**	15 hours

	Understanding Angular components, Creating and using components in Angular, Templates in Angular: interpolation, property binding, and event binding Styling Angular components **Directives and Pipes:** Introduction to directives in Angular, Using built-in structural and attribute directives Creating custom directives, Working with pipes for data transformation and formatting **Forms and Validation:** Event-driven forms in Angular, Form validation and error handling	
Unit 3	**Introduction to React.js** Overview of React.js and its advantages, Setting up the development environment (Node.js, npm, create-react-app), Creating a simple React component **Components and Props:** Understanding React components, Creating functional and class components Props and prop types, Component lifecycle methods **State and Events:** Managing component state, Handling events in React, Conditional rendering, Using forms in React **Introduction to React Hooks:** useState, useEffect, and other built-in hooks	15 hours

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

MAJOR: Web Development with JavaScript Frameworks **PRACTICAL**		**Semester – 4**	
Course Title: Web Development with JavaScript Frameworks **PRACTICAL**		**Course Code: T246MJP**	
Lectures per week (1 Lecture is 60 minutes)		**2**	
Total number of Hours in a Semester		**30**	
Credits		**1**	
Evaluation System	**Practical Examination**	**2 Hours**	**50 marks**

List of Practical:

1	Create a JavaScript program to accept marks in three subject, compute total and avg. Then, this average is used to determine the corresponding grade. The grades are computed as follows: Range: <60 → Grade: F <70 → D <80 → C <90 → B <100 → A
2	Create event driven JavaScript program to convert temperature to and from Celsius, Fahrenheit. Formula: c/5= (f-32)/9
3	Create a simple JavaScript program that print the user's browser details on the browser.
4	Create a simple JavaScript program that print the document object model details on the browser.
5	Create a JavaScript program to validate a registration form.
6	Implement a scenario using the **ng-if** directive in AngularJS to conditionally display content based on a variable.

7	Illustrate the usage of array expressions in AngularJS.
8	Develop a simple AngularJS application with a form that includes various types of input fields
9	Create a React application that includes a button and a counter. Implement a functionality where clicking the button increments the counter, and display the current counter value on the screen.
10	Develop a React application that maintains and displays student records. Create a functional component (**StudentList**) that receives an array of student objects as props. Each student object should have properties such as **id**, **name**, **grade**, and **subject**.

REFERENCES:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	JavaScript: The Definitive Guide	David Flanagan	O'Reilly Media	7th Edition	2020
2	Head First JavaScript Programming	Eric Freeman, Elisabeth Robson	O'Reilly Media	1st Edition	2014
3	Professional JavaScript for Web Developers	Nicholas C. Zakas	Wrox	4th Edition	2020
4	Pro AngularJS	Adam Freeman	Apress	4th Edition	2020
5	AngularJS: Up and Running: Enhanced Productivity with Structured Web Apps	Brad Green, Shyam Seshadri	O'Reilly Media	2nd Edition	2014
6	Learning AngularJS: A Guide to AngularJS Development	Ken Williamson	Addison-Wesley	1st Edition	2015
7	Pro React	Cassio de Sousa Antonio	Apress	1st Edition	2015
8	React: Up & Running: Building Web Applications	Kirupa Chinnathambi	O'Reilly Media	1st Edition	2016

SOPHIA COLLEGE FOR WOMEN (EMPOWERED AUTONOMOUS)

MINOR: COMPUTER FORENSICS	**Semester – 4**
Course Title: COMPUTER FORENSICS	**Course Code: T244MN**

COURSE OBJECTIVES:

1. To understand different type of cyber-crimes and basic understanding of the computer forensic fundamentals.
2. To understand the procedures for identification, preservation, and extraction of electronic evidence and data seizure.
3. To understand and develop skills for duplication of digital evidence and learn the legal aspects of collecting and preserving digital evidence.

COURSE OUTCOMES:

Upon successful completion of the course the students will be able to

1. Conduct digital investigations that conform to accepted professional standards and are based on the investigative process: identification, preservation, examination, analysis, and reporting.
2. Apply a solid foundational grounding in computer networks, operating systems, file systems, hardware, and mobile devices to digital investigations and to the protection of computer network resources from unauthorized activity;

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

UNIT 1 Concepts	**Introduction to Cyber Crimes:** Internet, hacking, ethical hacking, need of ethical hacking, Black Hat vs. Gray Hat vs. White Hat, how is Ethical hacking different from security auditing and digital forensics? Virus, Obscenity, software piracy, Data encryption, decryption, compression. **Computer Forensics Fundamentals:** What is Computer Forensic? Use of Computer Forensics in Law Enforcement, Computer Forensic Services, Computer evidence service options, Other Miscellaneous Services, Benefits of professional forensic technology, Steps taken by computer forensics specialists.	**15 hours**
UNIT 2 Theories	**Evidence Collection and Data Seizure:** Why collects evidence? Collection options, types of evidence, the rules of evidence, volatile evidence, general procedures, collection and archiving, methods of collection, artifacts, collection steps, controlling contamination: The chain of custody, Evidence search and seizure. **Duplication and preservation of digital evidence:** Preserving the digital crime scene, computer evidence processing steps,	**15 hours**

	Legal aspects of collecting and preserving computer forensic evidence	
UNIT 3 Application	**Email Investigation:** Exploring the role of email investigations, exploring the roles of the client and server in email, investigating email crimes and violations, understanding email servers, using specialised email forensic tools. **Cell Phone and Mobile Device Forensics:** Understanding mobile device forensics, understanding acquisitions procedures for cell phones and mobile devices, I – Phone forensics.	**15 hours**

MINOR: COMPUTER FORENSICS PRACTICAL		**Semester – 2**	
Course Title: COMPUTER FORENSICS PRACTICAL		**Course Code: T244MNP**	
Lectures per week (1 Lecture is 60 minutes)		**2**	
Total number of Hours in a Semester		**30**	
Credits		**1**	
Evaluation System	**Practical Examination**	**2 Hours**	**50 marks**

List OF PRACTICAL	
1.	Using Steganography tools.
2.	Capturing and analyzing network packets using Wireshark.
3.	Using Traffic Capturing and Analysis tools.
4.	Using Email Forensic tools.
5.	Using Password cracking tools.
6.	Using Forensic Toolkit (FTK).
7.	Using Data Acquisition tools.
8.	Preparing a case Report.
9.	Using Mobile Forensic tools.
10.	Forensic investigation using EnCase.

REFERENCE BOOKS:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1	Computer Forensics, Computer Crime Investigation	John R,Vacca	Firewall Media New Delhi.		
2	Computer Forensics and Investigations	Nelson, Phillips Enfinger, Steuart	CENGAGE Learning		
3	Real Digital Forensics	Keith j.Jones, Richard Bejitlich,Curtis W.Rose ,Addison	Wesley Pearson Education		
4	Forensic Compiling,A Tractitioneris Guide	Tony Sammes and Brain Jenkinson	Springer International edition		
5	Computer Evidence Collection &Presentation	Chrostopher L.T. Brown	Firewall Media.		

OE : ENTREPRENEURSHIP DEVELOPMENT	**Semester – 4**
COURSE TITLE: ENTREPRENEURSHIP DEVELOPMENT	**Course Code: TOE401**

COURSE OBJECTIVES

1. Understand the concept of entrepreneurship, including its meaning, types, traits, and factors promoting or hindering entrepreneurial ventures.
2. Recognize the stages in the entrepreneurial process, comprehend the importance of an entrepreneurial culture.
3. Learn to apply various methods for developing successful business ideas.

COURSE OUTCOMES:

1. Students will demonstrate the ability to generate a diverse range of creative and innovative ideas for addressing real-world problems and identifying potential business opportunities.
2. Students will be able to critically analyze complex problems, reframe them from different perspectives, and identify underlying needs and opportunities for innovation, thereby enhancing their problem-solving skills.
3. Students will be equipped with techniques for validating the viability and feasibility of proposed solutions or business ideas through market research and user feedback.

Lectures per week (1 Lecture is 60 minutes)	**2**	
Total number of Hours in a Semester	**30**	
Credits	**2**	
UNIT 1	**UNIT I:** **Chapter 1: An overview of ENTREPRENEURSHIP** Introduction, Definition of Entrepreneurship, Evolution of Entrepreneurship in India, Determinants of Entrepreneurship, Entrepreneurship and Economic Development, Models of Entrepreneurship, Entrepreneurial ecosystem, Entrepreneurial competencies, Dimensions of entrepreneurship - Introduction, Rural, Social, Ecopreneurship, Techno Entrepreneurship, Women Entrepreneurship. **Chapter 2: Business Opportunity Identification and Selection** Business Opportunity Identification, Trends, A Good Business Idea, Sources of Business Ideas- Internal Sources- External Sources, Techniques of Idea Generation, Scanning and Screening of Business Ideas, Selection of Workable Business Ideas, New Product Development Process, **Business Canvas Model**, **Legal/Ethical issues- Patents and IPR.**	15 hours
UNIT 2	**UNIT II:** **Chapter 3: Business incubators and Accelerators**: Meaning, Importance of Business Incubation Stages of Business Incubation-Physical Facility Support, Networking Facilities, Support Services. **Types of Business Incubator**-Corporate Incubators, Private Investors' Incubators, Academic Incubators, Local Economic Development Incubators, Incubators vs. Accelerators **Chapter 4: Funding Sources of Finance-** Introduction, Importance of funding for startups, Different stages of funding (seed, angel, venture capital, etc.), Bootstrapping- Definition and advantages,Crowd funding: Types of crowdfunding (reward-based, equity-based, donation-based), Angel Investors: Role of angel investors in startup ecosystem, Venture Capital:Understanding venture capital funding, Criteria for venture capital investment, Corporate Funding and Strategic Partnerships - Benefits, How to approach corporate investors, Overview of government grants and incentives for startups	15 hours

REFERENCES:

Books and References:					
Sr. No.	**Title**	**Author/s**	**Publisher**	**Edition**	**Year**

1.	Entrepreneurship, A South Asian Perspective Sangeeta Sharma,	Kuratko and Rao	Cengage Learning	First Edition	2012
2.	Entrepreneurship Development	Khanka S.S.,	PHI Learning Pvt Ltd		2017
3	Entrepreneurial Development	S.Chand	& Co. Ltd., New Delhi		2001.

SEC : ADVANCED MOBILE PROGRAMMING	**Semester – 4**
COURSE TITLE: ADVANCED MOBILE PROGRAMMING	**Course Code: TSEC401**

COURSE OBJECTIVES:

1. Understand the Android activity lifecycle and its significance in managing application state and user interactions.
2. Explore various layout types in Android and learn to design intuitive user interfaces.
3. Understand the role of activities and fragments in Android applications.
4. Explore database integration using Firebase and SQLite in Android.

COURSE OUTCOMES:

1. Student will be to set up the Android development environment and create basic applications.
2. Capability to design user-friendly interfaces using various layout types and widgets in Android.
3. Implementing activity and fragment functionality to create dynamic and interactive user interfaces.
4. Competence in performing CRUD operations to manage application data seamlessly and efficiently.

Lectures per week (1 Lecture is 60 minutes)	**1**
Total number of Hours in a Semester	**15**
Credits	**1**

UNIT 1	**Understanding Android Activity Lifecycle**: Explanation of the Android activity lifecycle and its various states. Significance of lifecycle methods in managing application state and user interactions. **Creating Simple Android Applications:** Basics of setting up Android development environment (IDE, SDK, etc.). Step-by-step guide to creating a simple "Hello World"	15 hours

	application. **Layout Design in Android:** Introduction to Android layout types: Linear, Relative, Constraint, etc. **Utilizing Widgets in Android:** Overview of commonly used Android widgets such as buttons, text views, checkboxes, radio buttons, and calendars. **Activity and Fragment Implementation:** Understanding the role and functionality of activities and fragments in Android applications. **Database Integration in Android:** Introduction to Firebase and SQLite databases for Android application development. Performing CRUD (Create, Read, Update, and Delete) operations using Firebase Real-time Database or SQLite.	

SEC 1: ADVANCED MOBILE PROGRAMMING.		**Semester – 4**	
Course Title: ADVANCED MOBILE PROGRAMMING.		**Course Code: TSEC401**	
Lectures per week (1 Lecture is 60 minutes)		**2**	
Total number of Hours in a Semester		**30**	
Credits		**1**	
Evaluation System	**Practical Examination**	**2 Hours**	

List of Practical:

1	Write a program to demonstrate the android activity lifecycle	
2	Creating a simple application to display Hello World	
3	Write a program to demonstrate the use of layouts.	
4	Write a program to demonstrate the use of widget (button, Text view, Checkbox, Radio button, calendar etc.)	
5	Write a program to implement activity and fragments. .	
6	Write a program to perform CRUD operations using FIREBASE/SQL lite.	

REFERENCES:

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Android App Development for Dummies	Michael Burton	Wiley	3rd	2015

2.	Java for Android Development	Jeff Friesen	Apress	2nd	2013

AEC : TECHNICAL WRITING	**Semester – 4**
Course Title: TECHNICAL WITING	**Course Code: TAEC401**

COURSE OBJECTIVES:

1. Understand the ethical and professional constraints of audience, style, and content for writing situation.
2. To inculcate research integrity
3. Understanding of publication ethics

COURSE OUTCOMES:

1. The student will be able to practice audience analysis and develop effective communication strategies for a variety of audiences
2. The students will be able to practice open access publications and research metrics
3. The students will be able to know basics of research integrity and publication ethics in general

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

UNIT 1	**INTRODUCTION TO TECHNICAL WRITING:** Five steps to successful writing, writing for the web, Content Management, Context, Ethics in Writing, Global communication, Collaborative writing, Conflict, outlining.	15 hours
UNIT 2	Research and Documentation, Copyright, Literature Reviews, Plagiarism Questionnaires, Research **Managing intellectual property**: Intellectual property, Trade secrets, An introduction to patents, Trademarks, Brand names, Copyright	15 hours

REFERENCES:

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year

1.	Handbook of Technical writing	Gerald J. Aldred, Charles T brusaw, Walter E	Bedford/St. Martin's	9th edition	2008
2	Technical Communication	Mike Markel	Bedford/St. Martin's	11	2014
3	Innovation Management and New Product Development	Paul Trott	Pearson	6	2017
4	Technical Writing 101: A Real-World Guide to Planning and Writing Technical Content	Alan S. Pringle and Sarah S. O'Keefe	scriptorium	3	2009