



**SOPHIA COLLEGE FOR WOMEN (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 (AUTONOMOUS)

### DEPARTMENT OF INFORMATION TECHNOLOGY

#### COURSE DETAILS

| SEMESTER 5                               |             |                                                        |          |
|------------------------------------------|-------------|--------------------------------------------------------|----------|
| COURSE TYPE                              | COURSE CODE | COURSE TITLE                                           | CREDITS  |
| MAJOR                                    | T357MJ      | ENTERPRISE JAVA                                        | 3        |
| MAJOR PRACTICAL                          | T357MJP     | ENTERPRISE JAVA PRACTICAL                              | 1        |
| MAJOR                                    | T358MJ      | FULL-STACK WEB DEVELOPMENT WITH .NET                   | 3        |
| MAJOR PRACTICAL                          | T358MJP     | FULL-STACK WEB DEVELOPMENT WITH .NET PRACTICAL         | 1        |
| MAJOR                                    | T359MJ      | SOFTWARE ENGINEERING                                   | 3        |
| MAJOR PRACTICAL                          | T359MJP     | SOFTWARE ENGINEERING PRACTICAL                         | 1        |
| MINOR                                    | T355MN      | SOFTWARE TESTING                                       | 1        |
| MINOR PRACTICAL                          | T355MNP     | SOFTWARE TESTING PRACTICAL                             | 1        |
| DISCIPLINE SPECIFIC ELECTIVE 1           | T351E       | ARTIFICIAL INTELLEGEENCE                               | 3        |
| DISCIPLINE SPECIFIC ELECTIVE 1 PRACTICAL | T351EP      | ARTIFICIAL INTELLEGEENCE PRACTICAL                     | 1        |
| DISCIPLINE SPECIFIC ELECTIVE 2           | T352E       | PRINCIPLES OF GEOGRAPHIC INFORMATION SYSTEMS           | 3        |
| DISCIPLINE SPECIFIC ELECTIVE 2 PRACTICAL | T352EP      | PRINCIPLES OF GEOGRAPHIC INFORMATION SYSTEMS PRACTICAL | 1        |
| VOCATIONAL SKILL COURSE (VSC)            | TVSC501     | INTERNET OF THINGS                                     | (1+1) =2 |



## SOPHIA COLLEGE FOR WOMEN (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

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

### PROGRAMME SPECIFIC OUTCOMES

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



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| <b>Programme: Information Technology</b>                                                                                                                                                                                                                                                                                                                                                                                                                                             |                              | <b>Semester – V</b>        |                 |
| <b>Major</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                              |                            |                 |
| <b>COURSE TITLE: ENTERPRISE JAVA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                              | <b>COURSE CODE: T357MJ</b> |                 |
| <b><u>COURSE OBJECTIVES:</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                              |                            |                 |
| <div>1. To teach students about Java EE and how to create dynamic web applications using Java Servlets, including integrating databases using JDBC.</div> <div>2. To teach students how to manage request dispatching, cookies, sessions, and file handling in Java Servlet applications, and introduce non-blocking I/O to improve the performance of web applications.</div> <div>3. To teach students how to use Java Server Pages (JSP) for building interactive websites.</div> |                              |                            |                 |
| <b><u>COURSE OUTCOMES:</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                              |                            |                 |
| The learner will be able to:                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                              |                            |                 |
| <div>1. Students will acquire the skills to develop dynamic web content with servlets and efficiently integrate databases using JDBC.</div> <div>2. Students will be able to implement request dispatching, manage cookies and sessions, handle file uploads and downloads, and utilize non-blocking I/O techniques in Java web applications.</div> <div>3. Students will be able to build dynamic web pages with JSP and efficiently use JSP tags and action elements.</div>        |                              |                            |                 |
| <b>Lectures per week (1 Lecture is 60 minutes)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   |                              | <b>3</b>                   |                 |
| <b>Total number of Hours in a Semester</b>                                                                                                                                                                                                                                                                                                                                                                                                                                           |                              | <b>45</b>                  |                 |
| <b>Credits</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                              | <b>3</b>                   |                 |
| <b>Evaluation System</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Summative Assessment</b>  | <b>2 Hours</b>             | <b>50 marks</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>Continuous Assessment</b> | <b>--</b>                  | <b>50 marks</b> |

|                                                                           |            |                                                                                                                                                                                                                                |  |
|---------------------------------------------------------------------------|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <b>Unit I:</b><br><br>Java EE:<br>Architecture,<br>Components, and<br>Web | <b>1.1</b> | <b>Introduction to Java EE, Architecture and Components</b>                                                                                                                                                                    |  |
|                                                                           |            | 1.1.1 What is an Enterprise Application?<br>1.1.2 Java EE Technologies and Evolution<br>1.1.3 Understanding Glassfish Server and its role in Java EE development<br>1.1.4 Types of System Architecture<br>1.1.5 Java EE Server |  |



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| Development with Servlets<br>(1 Credit)                                                          |            | 1.1.6 Java EE Containers<br>1.1.7 Setting up development environment                                                                                                                                                                                                 |  |
|                                                                                                  | <b>1.2</b> | <b>Introduction to Java Servlets</b>                                                                                                                                                                                                                                 |  |
|                                                                                                  |            | 1.2.1 The Need for Dynamic Web Content<br>1.2.2 What is Java Servlet Technology?<br>1.2.3 Benefits and Capabilities of Servlets<br>1.2.4 Servlet API and Lifecycle<br>1.2.5 Developing Servlet Programs<br>1.2.6 Using Annotations Instead of Deployment Descriptors |  |
|                                                                                                  | <b>1.3</b> | <b>Advanced Servlet Development and Database Integration</b>                                                                                                                                                                                                         |  |
|                                                                                                  |            | 1.3.1 Introduction to JDBC<br>1.3.2 Advantages of JDBC<br>1.3.3 Types of JDBC Driver<br>1.3.4 JDBC Architecture<br>1.3.5 Accessing Databases with Servlets<br>1.3.6 Building a Servlet-Based Web Application with Database Integration                               |  |
|                                                                                                  | <b>1.4</b> | <b>Request Dispatcher and Application Development</b>                                                                                                                                                                                                                |  |
|                                                                                                  |            | 1.4.1 Introduction to Request Dispatcher<br>1.4.2 Understanding the RequestDispatcher Interface<br>1.4.3 Methods of RequestDispatcher<br>1.4.4 Practical Application of RequestDispatcher                                                                            |  |
| <b>Unit II:</b><br><br>Servlet Technologies, Session Management, and File Handling<br>(1 Credit) | <b>2.1</b> | <b>Cookies and Session Management in Java Servlets</b>                                                                                                                                                                                                               |  |
|                                                                                                  |            | 2.1.1 Types of Cookies<br>2.1.2 Uses of Cookies in Web Applications<br>2.1.3 Creating and Managing Cookies with Servlets<br>2.1.4 Introduction to Sessions<br>2.1.5 Lifecycle of HTTP Sessions<br>2.1.6 Session Tracking with Servlet API                            |  |
|                                                                                                  | <b>2.2</b> | <b>File Handling and Non-Blocking I/O in Web Applications</b>                                                                                                                                                                                                        |  |
|                                                                                                  |            | 2.3.1 Uploading Files<br>2.3.2 Creating Upload File Applications<br>2.3.3 Downloading Files<br>2.3.4 Creating a Download File Application<br>2.3.5 Introduction to Non-Blocking I/O<br>2.3.6 Building a Non-Blocking Read Application with Servlets                  |  |
|                                                                                                  | <b>2.3</b> | <b>Enterprise Beans: Architecture, Types, and Lifecycle in Java EE</b>                                                                                                                                                                                               |  |
|                                                                                                  |            | 2.4.1 Enterprise Bean Architecture<br>2.4.2 Benefits of Enterprise Bean<br>2.4.3 Types of Enterprise Bean                                                                                                                                                            |  |



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|                                                                                                     |            | 2.4.4 Lifecycle of Enterprise Beans<br>2.4.5 Lifecycle of a Message Driven Bean<br>2.4.6 Uses of Message Driven Beans                                                                                                                                                                                                                                 |  |
|                                                                                                     | <b>2.4</b> | <b>Java Naming, Directory Services, and Persistence Technologies</b>                                                                                                                                                                                                                                                                                  |  |
|                                                                                                     |            | 2.4.1 What is Naming Service?<br>2.4.2 What is Directory Service?<br>2.4.3 What is Java Naming and Directory interface?<br>2.4.4 What is Persistence?<br>2.4.5 Persistence in Java<br>2.4.6 Current Persistence Standards in Java<br>2.4.7 Why another Persistence Standards?<br>2.4.8 Object/Relational Mapping<br>2.4.9 Java Persistence API        |  |
| <b>Unit III:</b><br><br>Java Server Pages (JSP):<br>Fundamentals, Components, and Advanced Features | <b>3.1</b> | <b>Introduction to Java Server Pages (JSP)</b>                                                                                                                                                                                                                                                                                                        |  |
|                                                                                                     |            | 3.1.1 Overview of JSP technology.<br>3.1.2 Why use Java Server Pages (JSP)?<br>3.1.3 Benefits of using JSP for web development.<br>3.1.4 Advantages and Disadvantages of JSP<br>3.1.5 JSP vs Servlets<br>3.1.6 Life Cycle of a JSP Page<br>3.1.7 How Does a JSP Function?<br>3.1.8 How Does JSP Execute?<br>3.1.9 Role in creating dynamic web pages. |  |
|                                                                                                     | <b>3.2</b> | <b>Getting Started with Java Server Pages</b>                                                                                                                                                                                                                                                                                                         |  |
|                                                                                                     |            | 3.2.1 Comments in JSP<br>3.2.2 Difference between HTML comments and JSP comments.<br>3.2.3 JSP Document<br>3.2.4 Structure of a JSP page<br>3.2.5 JSP Elements<br>3.2.6 JSP Directive Elements<br>3.2.7 JSP Implicit Objects                                                                                                                          |  |
|                                                                                                     | <b>3.3</b> | <b>JSP Action and Declaration Tags</b>                                                                                                                                                                                                                                                                                                                |  |
|                                                                                                     |            | 3.3.1 JSP - Declaration Tag<br>3.3.2 JSP - Action Tags<br>3.3.3 JSP - UseBean action tag<br>3.3.4 JSP - Include Action Tag<br>3.3.5 JSP - Forward action tag<br>3.3.6 JSP- Html Form<br>3.3.7 JSP- Database Access                                                                                                                                    |  |
|                                                                                                     | <b>3.4</b> | <b>Java Server Pages Standard Tag Libraries</b>                                                                                                                                                                                                                                                                                                       |  |



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|  |  | 3.4.1 Features of JSTL:<br>3.4.2 Tag Libraries in JSTL:<br>3.4.3 Core tag library<br>3.4.4 XML tag library<br>3.4.5 Functions tag library<br>3.4.6 SQL tag library |  |
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| <b>Practical: ENTERPRISE JAVA PRACTICAL</b>                                         |                              | <b>Course Code: T357MJP</b> |                 |
| <b><u>COURSE OUTCOMES</u></b>                                                       |                              |                             |                 |
| The learner will be able to                                                         |                              |                             |                 |
| 1. Identify the animals based on their observations of the external characteristics |                              |                             |                 |
| 2. Perform experiments based on temporary mountings                                 |                              |                             |                 |
| 3. Prepare field report based on observations done during field excursions          |                              |                             |                 |
| <b>Lectures per week (1 Lecture is 120 minutes)</b>                                 |                              | <b>1</b>                    |                 |
| <b>Total number of Hours in a Semester</b>                                          |                              | <b>30</b>                   |                 |
| <b>Credits</b>                                                                      |                              | <b>1</b>                    |                 |
| <b>Evaluation System</b>                                                            | <b>Practical Assessment</b>  | <b>2<br/>Hours</b>          | <b>50 marks</b> |
|                                                                                     | <b>Continuous Assessment</b> | <b>--</b>                   |                 |

|  |   |                                                                                                                                                                                                                                                                                              |          |
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|  | 1 | Create a simple calculator application using servlet.                                                                                                                                                                                                                                        | 30 hours |
|  | 2 | Create a servlet for a login page. If the username and password are correct then it says message "Hello" else a message "login failed".                                                                                                                                                      |          |
|  | 3 | Create a registration servlet in Java using JDBC. Accept the details such as Username, Password, Email, and Country from the user using HTML Form and store the registration details in the database.                                                                                        |          |
|  | 4 | Create a Servlet using Request Dispatcher Interface which will validate the password entered by the user, if the user has entered "Servlet" as password, then he will be forwarded to Welcome Servlet else the user will stay on the index.html page and an error message will be displayed. |          |
|  | 5 | Create a servlet that uses Cookies to store the number of times a user has visited servlet.                                                                                                                                                                                                  |          |



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|  | 6  | Create a servlet demonstrating the use of session creation and destruction. Also check whether the user has visited this page first time or has visited earlier also using sessions |  |
|  | 7  | Create a Currency Converter application using EJB.                                                                                                                                  |  |
|  | 8  | Develop simple EJB application to demonstrate Servlet Hit count using Singleton Session Beans.                                                                                      |  |
|  | 9  | Develop a simple JSP application to pass values from one page to another with validations. (Nametxt, age-txt, hobbies-checkbox, email-txt, gender-radio button).                    |  |
|  | 10 | Create a registration and login JSP application to register and authenticate the user based on username and password using JDBC.                                                    |  |

### **ASSESSMENT DETAILS:**

**I. Continuous Assessment (CA): 50 marks**

**II. Summative Assessment (SA): 50 marks**

**III. Practical Examination: 50 marks**

### **REFERENCES**

1. Advanced Java programming., Roy, Uttam K., Oxford University Press, 2015
2. Java EE 7 for beginners, Shah, Sharanam & Shah, Vaishali Shroff Publishers & Distributors, 2013
3. Java EE8 cookbook. Build reliable applications with the most robust and mature technology for enterprise development., Moraes, Elder Packt Publishing 2018



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| <b>Programme: Information Technology</b>                                                                                                                                                                                                                                              |                              | <b>Semester – V</b>        |                 |
| <b>Major</b>                                                                                                                                                                                                                                                                          |                              |                            |                 |
| <b>Course Title: FULL-STACK WEB DEVELOPMENT WITH .NET</b>                                                                                                                                                                                                                             |                              | <b>Course Code: T358MJ</b> |                 |
| <b><u>COURSE OBJECTIVES:</u></b><br><br>1. Master the fundamentals of .NET Framework and ASP.NET.<br>2. Develop proficiency in Web Development and State Management.<br>3. Acquire practical knowledge of ADO.NET and AJAX for dynamic web applications.                              |                              |                            |                 |
| <b><u>COURSE OUTCOMES:</u></b><br><br>The learner will be able to:<br><br>1. Remember and Understand .NET Framework Concepts.<br>2. Apply and Analyse Web Development and State Management Techniques<br>3. Evaluate and Create Data Handling Solutions and Dynamic User Experiences. |                              |                            |                 |
| <b>Lectures per week (1 Lecture is 60 minutes)</b>                                                                                                                                                                                                                                    |                              | <b>3</b>                   |                 |
| <b>Total number of Hours in a Semester</b>                                                                                                                                                                                                                                            |                              | <b>45</b>                  |                 |
| <b>Credits</b>                                                                                                                                                                                                                                                                        |                              | <b>3</b>                   |                 |
| <b>Evaluation System</b>                                                                                                                                                                                                                                                              | <b>Summative Assessment</b>  | <b>2 Hours</b>             | <b>50 marks</b> |
|                                                                                                                                                                                                                                                                                       | <b>Continuous Assessment</b> | <b>--</b>                  | <b>50 marks</b> |

|                      |     |                                                                                                                                                                                                                                                                       |          |
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| UNIT 1<br>(1 Credit) | 1.1 | <b>Introduction to .NET:</b> The .NET Framework, the .NET Languages, The Common Language Runtime, The .NET Class Library, C# Language Basics – Variables, datatypes, Namespaces and Assemblies.                                                                       | 15 hours |
|                      | 1.2 | <b>Web Form Fundamentals:</b> Writing Code, Using the Code-Behind Class, Adding Event Handlers, Understanding the Anatomy of an ASP.NET Application, Introducing Server Controls, Using the Page Class, Using Application Events, Configuring an ASP.NET Application. |          |
|                      |     |                                                                                                                                                                                                                                                                       |          |



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| UNIT 2<br>(1 Credit) | 2.1 | <b>Form Controls:</b> Stepping Up to Web Controls, Web Control Classes, List Controls, Table Controls, Web Control Events and AutoPostBack, Understanding Validation, Using the Validation Controls, Rich Controls, The Calendar, Pages with Multiple Views, User Controls, Website Navigation: Site Maps, The SiteMapPath Control, The TreeView Control, The Menu Control. | 15 hours |
|                      | 2.2 | <b>State Management:</b> Understanding the Problem of State, Using View State, Transferring Information Between Pages, Using Cookies, Managing Session State, Configuring Session State, using query strings, Using Application State, Comparing State Management Options, Styles and Master Pages: Stylesheets, Master Pages, Comparing User controls and Master pages.    |          |
| UNIT 3<br>(1 Credit) | 3.1 | <b>ADO.NET Fundamentals:</b> ADO.Net Architecture, Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access.                                                                                                                                           | 15 hours |
|                      | 3.2 | <b>ADO.Net Connection Objects:</b> ConnectionString object, Command object, Dataset, DataReader, DataAdapter, ExecuteScalar, ExecuteReader, Using statement.                                                                                                                                                                                                                |          |
|                      | 3.3 | <b>ASP.NET AJAX:</b> Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX Control Toolkit.                                                                                                                                                                                                 |          |



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| <b>PRACTICAL</b>                                                                          |                              | <b>Course Code: T358MJP</b> |                 |
| <b>Course Title: FULL-STACK WEB DEVELOPMENT WITH .NET</b>                                 |                              |                             |                 |
| <b><u>COURSE OUTCOMES:</u></b>                                                            |                              |                             |                 |
| The learner will be able to:                                                              |                              |                             |                 |
| 1. Apply and Analyse String Operations, Mathematical Calculations, and Control Structures |                              |                             |                 |
| 2. Evaluate and Create Dynamic Web Forms with Validation, User Controls, and Master Pages |                              |                             |                 |
| 3. Synthesize and Demonstrate Data Access and AJAX Techniques in Web Applications         |                              |                             |                 |
| <b>Lectures per week (1 Lecture is 120 minutes)</b>                                       |                              | <b>1</b>                    |                 |
| <b>Total number of Hours in a Semester</b>                                                |                              | <b>30</b>                   |                 |
| <b>Credits</b>                                                                            |                              | <b>1</b>                    |                 |
| <b>Evaluation System</b>                                                                  | <b>Practical Examination</b> | <b>2 Hours</b>              | <b>50 marks</b> |
|                                                                                           | <b>Continuous Assessment</b> | <b>--</b>                   |                 |

|    |                                                                                                                                                                                                                                                                                                                              |  |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| 1. | Create an application to demonstrate string operations.                                                                                                                                                                                                                                                                      |  |
| 2  | Create an application to demonstrate following operations <ol style="list-style-type: none"> <li>i. Generate Fibonacci series.</li> <li>ii. Test for prime numbers.</li> <li>iii. Test for vowels.</li> <li>iv. Use of foreach loop with arrays.</li> <li>v. Reverse a number and find sum of digits of a number.</li> </ol> |  |
| 3  | Create simple application to perform following operations: <ol style="list-style-type: none"> <li>i. Money Conversion</li> <li>ii. Quadratic Equation</li> </ol>                                                                                                                                                             |  |
| 4  | Demonstrate the use of Calendar control to perform following operations: <ol style="list-style-type: none"> <li>i. Display messages in a calendar control</li> <li>ii. Display vacation in a calendar control</li> </ol>                                                                                                     |  |



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|    | iii. Selected day in a calendar control using style                                                      |  |
| 5  | Create a registration form to demonstrate use of various Validation controls.                            |  |
| 6  | Create a Web Form to demonstrate use User Controls.                                                      |  |
| 7  | Create a web application to demonstrate use of Master Page with applying Styles for page beautification. |  |
| 8  | Develop a web application that displays data using connected data access techniques.                     |  |
| 9  | Develop a web application that displays data using disconnected data access techniques.                  |  |
| 10 | Create a web application to demonstrate use of various Ajax controls.                                    |  |

#### **ASSESSMENT DETAILS:**

- I. Continuous Assessment (CA): 50 marks**
- II. Summative Assessment (SA): 50 marks**
- III. Practical Examination: 50 marks**

#### **REFERENCES:**

1. C# 2015, Anne Bohem and Joel Murach, Murach Publisher, Third Edition, Year 2016.
2. Murach's ASP.NET 4.6 Web Programming in C#2015, Mary Delamater and Anne Bohem, Sixth Edition, Year 2016.



## SOPHIA COLLEGE FOR WOMEN (AUTONOMOUS)

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|-------------------------------------------|----------------------------|
| <b>Programme: BSCIT</b>                   | <b>Semester – 5</b>        |
| <b>MAJOR</b>                              |                            |
| <b>Course Title: SOFTWARE ENGINEERING</b> | <b>Course Code: T359MJ</b> |

### **COURSE OBJECTIVES:**

1. Understand the fundamental concepts of Software Engineering and different Software Development Life Cycle (SDLC) models.
2. Understand modelling software systems using architectural styles and UML diagrams
3. Evaluate software deployment strategies, maintenance processes, and advanced engineering concepts.

### **COURSE OUTCOMES:**

**The learner will be able to :**

1. Apply appropriate requirement elicitation techniques and create a Software Requirements Specification (SRS) document.
2. Design software systems using UML diagrams and implement code following object-oriented principles.
3. Analyse different cloud deployment models (IaaS, PaaS, SaaS) and their use cases.

|                                             |                       |         |          |
|---------------------------------------------|-----------------------|---------|----------|
| Lectures per week (1 Lecture is 60 minutes) |                       | 3       |          |
| Total number of Hours in a Semester         |                       | 45      |          |
| Credits                                     |                       | 3       |          |
| Evaluation System                           | Summative Assessment  | 2 Hours | 50 marks |
|                                             | Continuous Assessment | --      | 50 marks |

|                                                        |            |                                                                                                                                 |                 |
|--------------------------------------------------------|------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <b>UNIT 1</b>                                          | <b>1.1</b> | <b>Introduction to Software Engineering &amp; SDLC:</b>                                                                         | <b>15 hours</b> |
| <b>Software Analysis &amp; Requirement Engineering</b> |            | 1.1.1: Definition, Scope, and Importance of Software Engineering, Software Development Life Cycle (SDLC) Overview               |                 |
| <b>(1 Credit)</b>                                      |            | 1.1.2: Software Process Models: Waterfall, Spiral, Incremental, V model, Agile- Scrum, Kanban, Extreme Programming (XP), DevOps |                 |



## SOPHIA COLLEGE FOR WOMEN (AUTONOMOUS)

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|-----------------------------------------------------------------------------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
|                                                                             | 1.2 | <b>Software Requirement Engineering:</b><br>1.2.1: Requirement Elicitation Techniques: Stakeholder Interviews, Surveys, Use Cases,<br><b>Feasibility Study: Technical,</b> Economic, Operational, Social and Legal Feasibility.<br>1.2.2: Types of Requirements: Functional vs. Non-functional, Business vs. Technical, Software Requirements Specification (SRS) |          |
| <b>UNIT 2</b><br><b>Software Design &amp; Development</b><br>(1 Credit)     | 2.1 | <b>Software Design Principles &amp; Architecture:</b> 2.1.1: Software Architectural Styles: Monolithic vs. Microservices, MVC, Layered Architecture, Event-Driven Architecture and SOA. Design Concepts- Modularity, Cohesion, Coupling, Abstraction.                                                                                                             | 15 hours |
|                                                                             | 2.2 | <b>UML Modelling &amp; Object-Oriented Design: Introduction to UML &amp; Its Importance in Software Development</b><br><b>2.2.1: Structural Diagrams:</b> Class Diagram, Object Diagram, Component Diagram<br><b>2.2.2: Behavioural Diagrams:</b> Use Case Diagram, Sequence Diagram, Activity and State transition Diagram.                                      |          |
|                                                                             | 2.3 | <b>Software Development &amp; Implementation:</b> 2.3.1: Programming Paradigms: Object-Oriented, Functional, Procedural and event driven programming.<br>2.3.2: Code Documentation & Version Control (GitHub).                                                                                                                                                    |          |
| <b>UNIT 3</b><br><b>Software Deployment &amp; Maintenance</b><br>(1 Credit) | 3.1 | <b>Software Deployment Strategies:</b><br>3.1.1: Overview of Cloud Deployment Models: IaaS, PaaS, SaaS, Cloud Deployment Platforms: AWS, Azure, Google Cloud – Features and Use Cases, Comparative Analysis of Cloud Deployment Models and Strategies                                                                                                             | 15 hours |
|                                                                             | 3.2 | <b>Software Maintenance &amp; Evolution:</b><br><b>3.2.1:</b> Types of Software Maintenance: Corrective, Adaptive, Perfective, Preventive<br>Software Reengineering & Refactoring- Code Optimization, Legacy System Migration, Real-World Case Study on Software Refactoring, Software Project management Life cycle                                              |          |



## SOPHIA COLLEGE FOR WOMEN (AUTONOMOUS)

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|  |     |                                                                                                                                                                   |  |
|  | 3.3 | <b>Advanced Software Engineering Topics: 3.3.1:</b> Component-Based Software Engineering (CBSE), Distributed Software Engineering, Embedded and Real-Time Systems |  |

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| <b>PRACTICAL</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                              | <b>Course Code: T357MJP</b> |                 |
| <b>Course Title: SOFTWARE ENGINEERING</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                              |                             |                 |
| <b><u>COURSE OUTCOMES:</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                              |                             |                 |
| The learner will be able to :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                              |                             |                 |
| <div><div>1.</div><div>Apply software requirement engineering techniques to define a project scope, identify functional and non-functional requirements, and create an SRS document. <i>(Related to Practicals 1 &amp; 2)</i></div></div> <div><div>2.</div><div>Develop and interpret various UML diagrams (E-R Diagram, Use Case, Class, Activity, State Transition, and Sequence Diagrams) to model system design effectively. <i>(Related to Practicals 3–8)</i></div></div> <div><div>3.</div><div>Utilize version control systems like GitHub to manage project documentation, track changes, and collaborate efficiently. <i>(Related to Practicals 9 &amp; 10)</i></div></div> |                              |                             |                 |
| <b>Lectures per week (1 Lecture is 60 minutes)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                              | <b>2</b>                    |                 |
| <b>Total number of Hours in a Semester</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                              | <b>30</b>                   |                 |
| <b>Credits</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                              | <b>1</b>                    |                 |
| <b>Evaluation System</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Practical Assessment</b>  | <b>2<br/>Hours</b>          | <b>50 marks</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <b>Continuous Assessment</b> | <b>--</b>                   |                 |

|  |   |                                                                                                                                                                              |          |
|--|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
|  | 1 | Identify a real-world software problem for project development. Define the problem statement, objectives, and project scope. Prepare and submit a one-page project proposal. | 30 hours |
|  | 2 | Identify functional and non-functional requirements. Conduct requirement elicitation using interviews, surveys, or case studies.                                             |          |



### **SOPHIA COLLEGE FOR WOMEN (AUTONOMOUS)**

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|  | 3  | Draw E-R Diagram for the selected problem statement                                                 |  |
|  | 4  | Draw Use Case Diagram for the selected problem statement                                            |  |
|  | 5  | Draw Class Diagram for the selected problem statement                                               |  |
|  | 6  | Draw Activity Diagram for the selected problem statement                                            |  |
|  | 7  | Draw State transition Diagram for the selected problem statement                                    |  |
|  | 8  | Draw Sequence Diagram for the selected problem statement                                            |  |
|  | 9  | Set up a GitHub repository for the project. Upload SRS document and UML diagrams to the repository. |  |
|  | 10 | Use Git commands for version control, committing, and managing changes.                             |  |

### **ASSESSMENT DETAILS:**

**I. Continuous Assessment (CA): 50 marks**

**II. Summative Assessment (SA): 50 marks**

**III. Practical Examination: 50 marks**

### **REFERENCES:**

1. Software Engineering, Ian Sommerville, Pearson Ninth edition ,2017
2. An Integrated Approach to Software engineering, Pankaj Jalote, 3rd edition
3. Software Engineering: A Practitioners Approach , pressmen ,McGarw hill



## SOPHIA COLLEGE FOR WOMEN (AUTONOMOUS)

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| <b>Programme: BSc IT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                              | <b>Semester – 5</b>        |                 |
| <b>MINOR</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                              |                            |                 |
| <b>Course Title: SOFTWARE TESTING</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                              | <b>Course Code: T355MN</b> |                 |
| <b><u>COURSE OBJECTIVES:</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                              |                            |                 |
| <div><div></div><div><div>1. Understand the fundamental concepts, principles, and life cycle of software testing.</div><div>2. Apply various software testing techniques, strategies, and methodologies to evaluate software quality.</div><div>3. Utilize test planning, test case design, and automation tools to enhance testing efficiency.</div></div></div>                                                                                                                                                                                              |                              |                            |                 |
| <b><u>COURSE OUTCOMES:</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                              |                            |                 |
| <div>The learner will be able to:</div> <div><div></div><div><div>1. Explain the importance of testing, differentiate between verification &amp; validation, and describe the Software Testing Life Cycle (STLC)</div><div>2. Implement functional and non-functional testing methods, including unit testing, integration testing, system testing, security testing, and performance testing.</div><div>3. Design effective test cases, create test plans, and demonstrate automation testing using tools like Selenium, TestNG, or Pytest.</div></div></div> |                              |                            |                 |
| <b>Lectures per week (1 Lecture is 60 minutes)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                              | <b>1</b>                   |                 |
| <b>Total number of Hours in a Semester</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                              | <b>15</b>                  |                 |
| <b>Credits</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                              | <b>1</b>                   |                 |
| <b>Evaluation System</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Summative Assessment</b>  | <b>---</b>                 | <b>25 marks</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Continuous Assessment</b> | <b>--</b>                  | <b>--</b>       |

|                      |     |                                                                                                                              |          |
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| UNIT 1<br>(1 Credit) | 1.1 | 1.1.1 Introduction to Software Testing:<br>Importance of Testing in Software<br>Development, Difference Between Verification | 15 hours |
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## SOPHIA COLLEGE FOR WOMEN (AUTONOMOUS)

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|  |  | <p>&amp; Validation, Principles of Testing, Software Testing Life Cycle (STLC)</p> <p>1.1.2: Types of Software Testing: Manual vs. Automated Testing, Functional Testing (Unit Testing, Integration Testing, System Testing, UAT), Non-Functional Testing (Load Testing, Stress Testing, Scalability Testing, Security Testing), OWASP Top 10 Vulnerabilities.</p> <p>1.1.3: Testing Strategies &amp; Approaches: White Box Testing (Statement Coverage, Branch Coverage, Decision Testing), Black Box Testing (Equivalence Partitioning, Boundary Value Analysis, Decision Table Testing), Grey Box Testing.</p> <p>1.1.4: Bug Life Cycle, Examples of Defects, Error, Mistake, Need for Automation Testing, Overview of Tools: Selenium, TestNG, Pytest</p> |  |
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| <b>Programme: BSCIT</b>                                                                                                                                                                                                                                                                                                                | <b>Semester – 5</b>         |
| <b>Minor</b>                                                                                                                                                                                                                                                                                                                           |                             |
| <b>PRACTICAL COURSE</b>                                                                                                                                                                                                                                                                                                                | <b>Course Code: T355MNP</b> |
| <b>SOFTWARE TESTING</b>                                                                                                                                                                                                                                                                                                                |                             |
| <p><b><u>COURSE OUTCOMES:</u></b></p> <p>The learner will be able to:</p> <ol style="list-style-type: none"> <li>1. Design test cases using Blackbox Testing Methodology.</li> <li>2. Design test cases using Whitebox Testing Methodology.</li> <li>3. Utilize automation tools for functional and non-functional testing.</li> </ol> |                             |
| <b>Lectures per week (1 Lecture is 60 minutes)</b>                                                                                                                                                                                                                                                                                     | <b>2</b>                    |
| <b>Total number of Hours in a Semester</b>                                                                                                                                                                                                                                                                                             | <b>30</b>                   |



## SOPHIA COLLEGE FOR WOMEN (AUTONOMOUS)

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| <b>Credits</b>           |                             | <b>1</b>  |                 |
| <b>Evaluation System</b> | <b>Practical Assessment</b> | <b>--</b> | <b>25 Marks</b> |

|  |   |                                                                           |          |
|--|---|---------------------------------------------------------------------------|----------|
|  | 1 | Unit and Integration testing using Pytest                                 | 30 hours |
|  | 2 | Black box testing: Equivalence Partitioning                               |          |
|  | 3 | Black box testing: Boundary Value Analysis                                |          |
|  | 4 | Black box testing: Cause Effect graphs and Decision Table Testing         |          |
|  | 5 | White Box testing: Statement- Branch and Decision testing                 |          |
|  | 6 | Control flow graph and cyclomatic complexity                              |          |
|  | 7 | Non-functional testing: Load and Performance Testing using automated tool |          |
|  | 8 | Automated testing for websites using Selenium                             |          |

### ASSESSMENT DETAILS:

**I. Summative Assessment (SA): 25 marks**

**II. Practical Examination: 25 marks**

### REFERENCES:

1. Foundations of software testing, Rex Black, Eric Venendal, Graham, Cengage Publications, third Edition, 2015
2. Software testing Foundation, Dorothy Graham, ISTQB, 2nd Edition, Cengage
3. software testing: Principles, Testing and Tools, Limaye, McGraw Hill Education, 2017



## SOPHIA COLLEGE FOR WOMEN (AUTONOMOUS)

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| <b>Programme: BSc IT</b>                                                                                                                                                                                                                                                                                                                                         |                              | <b>Semester – 5</b>                                                                                                                  |                 |
| <b>ELECTIVE 1</b>                                                                                                                                                                                                                                                                                                                                                |                              |                                                                                                                                      |                 |
| <b>Course Title: ARTIFICIAL INTELLIGENCE</b>                                                                                                                                                                                                                                                                                                                     |                              | <b>Course Code: T351E</b>                                                                                                            |                 |
| <b><u>COURSE OBJECTIVES:</u></b><br><br>1. To introduce the fundamental concepts of AI, its history, applications, and the role of intelligent agents.<br>2. To teach AI search techniques for problem-solving and decision-making in competitive environments.<br>3. To explain how AI uses logic for knowledge representation and intelligent decision-making. |                              |                                                                                                                                      |                 |
| <b><u>COURSE OUTCOMES:</u></b><br><br>The learner will be able to:<br><br>1.Understand AI fundamentals and how intelligent agents interact with their environment.<br>2.Apply search strategies and game-playing algorithms for AI-based problem-solving.<br>3.Implement logical reasoning and apply inference techniques in AI systems.                         |                              |                                                                                                                                      |                 |
| <b>Lectures per week (1 Lecture is 60 minutes)</b>                                                                                                                                                                                                                                                                                                               |                              | <b>3</b>                                                                                                                             |                 |
| <b>Total number of Hours in a Semester</b>                                                                                                                                                                                                                                                                                                                       |                              | <b>45</b>                                                                                                                            |                 |
| <b>Credits</b>                                                                                                                                                                                                                                                                                                                                                   |                              | <b>3</b>                                                                                                                             |                 |
| <b>Evaluation System</b>                                                                                                                                                                                                                                                                                                                                         | <b>Summative Assessment</b>  | <b>2 Hours</b>                                                                                                                       | <b>50 marks</b> |
|                                                                                                                                                                                                                                                                                                                                                                  | <b>Continuous Assessment</b> | <b>--</b>                                                                                                                            | <b>50 marks</b> |
| UNIT 1<br><br>(1 Credit)                                                                                                                                                                                                                                                                                                                                         |                              |                                                                                                                                      | 15 hours        |
|                                                                                                                                                                                                                                                                                                                                                                  | 1.1                          | <b>Introduction:</b> What is Artificial Intelligence? Foundations of AI, history, the state of art AI today, Risk and Benefits of AI |                 |
|                                                                                                                                                                                                                                                                                                                                                                  | 1.2                          | <b>Intelligent Agents:</b> agents and environment, good behavior, nature of environment, the structure of agents.                    |                 |
|                                                                                                                                                                                                                                                                                                                                                                  | 1.3                          | Domains of AI and Introduction to Generative AI                                                                                      |                 |
|                                                                                                                                                                                                                                                                                                                                                                  | 2.1                          | <b>Solving Problems by Searching:</b> Problem solving agents, examples problems, search                                              |                 |



## SOPHIA COLLEGE FOR WOMEN (AUTONOMOUS)

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| UNIT 2<br>(1 Credit) |     | algorithms, uninformed search strategies, informed search strategies, heuristic functions.                                                                                                  | 15 hours |
|                      | 2.2 | <b>Search in Complex Environments:</b> local search and Optimization Problems, search with non-deterministic action.                                                                        |          |
|                      | 2.3 | <b>Adversarial Search and Games:</b> Game Theory, Optimal decisions in games, Monte Carlo Tree Search, stochastic games, partially observable games, Limitations of Game Search Algorithms. |          |
| UNIT 3<br>(1 Credit) | 3.1 | <b>Logical Agents:</b> Knowledge-based agents, The Wumpus world, logic, propositional logic, propositional theorem proving, effective propositional model checking.                         | 15 hours |
|                      | 3.2 | <b>First-Order Logic:</b> Representation Revisited, Syntax and semantics, using First-Order Logic, Knowledge engineering in First-Order Logic.                                              |          |
|                      | 3.3 | <b>Inference in First-Order Logic:</b> propositional vs. First-Order Inference, unification and First-order Inference, forward and backward chaining, resolution.                           |          |

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| <b>PRACTICAL</b>                                                                                                                                                                                                                                                                                                                                                                                                                                       | <b>Course Code: T351EP</b> |
| <b>Course Title: ARTIFICIAL INTELLIGENCE</b>                                                                                                                                                                                                                                                                                                                                                                                                           |                            |
| <b><u>COURSE OUTCOMES:</u></b><br>The learner will be able to : <ol style="list-style-type: none"> <li>1. Implement basic AI algorithms like Depth First Search and Breadth First Search.</li> <li>2. Solve common AI problems like the Tower of Hanoi, Water Jug, and Missionaries and Cannibals using search techniques</li> <li>3. Develop simple AI applications, such as shuffling cards and solving Constraint Satisfaction Problems.</li> </ol> |                            |
| <b>Lectures per week (1 Lecture is 120 minutes)</b>                                                                                                                                                                                                                                                                                                                                                                                                    | <b>1</b>                   |



## SOPHIA COLLEGE FOR WOMEN (AUTONOMOUS)

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| <b>Total number of Hours in a Semester</b> |                              | <b>30</b>          |                 |
| <b>Credits</b>                             |                              | <b>1</b>           |                 |
| <b>Evaluation System</b>                   | <b>Practical Assessment</b>  | <b>2<br/>Hours</b> | <b>50 marks</b> |
|                                            | <b>Continuous Assessment</b> | <b>--</b>          |                 |

|  |           |                                                                                                                          |                 |
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|  | <b>1</b>  | Write a program to implement depth first search algorithm.                                                               | <b>30 hours</b> |
|  | <b>2</b>  | Write a program to implement breadth first search algorithm.                                                             |                 |
|  | <b>3</b>  | Write a program to solve tower of Hanoi problem.                                                                         |                 |
|  | <b>4</b>  | Write a program to implement alpha beta search.                                                                          |                 |
|  | <b>5</b>  | Write a program to implement A* algorithm.                                                                               |                 |
|  | <b>6</b>  | Write a program to solve water jug problem.                                                                              |                 |
|  | <b>7</b>  | Write a program to solve Missionaries and Cannibals problem.                                                             |                 |
|  | <b>8</b>  | Write a program to shuffle Deck of cards.                                                                                |                 |
|  | <b>9</b>  | Solve constraint satisfaction problem                                                                                    |                 |
|  | <b>10</b> | Write a program to derive the predicate.<br>(for e.g.: Sachin is batsman, batsman is cricketer) - > Sachin is Cricketer. |                 |

### ASSESSMENT DETAILS:

**III. Continuous Assessment (CA): 50 marks**

**IV. Summative Assessment (SA): 50 marks**

**V. Practical Examination: 50 marks**



## SOPHIA COLLEGE FOR WOMEN (AUTONOMOUS)

### REFERENCES:

1. Artificial Intelligence: A Modern Approach, Stuart Russel and Peter Norvig, Pearson 4<sup>th</sup> Edition, 2022
2. A First Course in Artificial Intelligence Deepak Khemani TMH First 2017
3. Artificial Intelligence: A Rational Approach, Rahul Deva, Shroff Publishers, 2<sup>nd</sup> Reprint, 2022

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                              |                           |                 |
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| <b>Programme: BSc IT</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                              | <b>Semester – 5</b>       |                 |
| <b>ELECTIVE 2</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                              |                           |                 |
| <b>Course Title: PRINCIPLES OF GEOGRAPHIC INFORMATION SYSTEMS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                              | <b>Course Code: T352E</b> |                 |
| <b><u>COURSE OBJECTIVES:</u></b><br><br>1. To introduce students to the fundamental concepts of GIS, spatial data, and real-world representations used in geoinformatics.<br>2. To equip learners with knowledge of spatial databases, referencing systems, GIS software architecture, and data management techniques<br>3. To develop the ability to perform spatial analysis, data entry, preparation, quality checks, and apply GIS operations for decision-making and problem-solving                                                                                               |                              |                           |                 |
| <b><u>COURSE OUTCOMES:</u></b><br><br>The learner will be able to:<br><br>1. Explain the core concepts of GIS, including types of geographic phenomena, spatial data models, and computer-based representations of the real world.<br>2. Demonstrate the ability to manage spatial data using GIS architecture, spatial referencing methods, and relational databases for accurate geospatial analysis.<br>3. Apply GIS tools and techniques for data input, error checking, spatial queries, overlay analysis, terrain modelling, and network analysis to address geographic problems. |                              |                           |                 |
| <b>Lectures per week (1 Lecture is 60 minutes)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                              | <b>3</b>                  |                 |
| <b>Total number of Hours in a Semester</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                              | <b>45</b>                 |                 |
| <b>Credits</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                              | <b>3</b>                  |                 |
| <b>Evaluation System</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Summative Assessment</b>  | <b>2 Hours</b>            | <b>50 marks</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Continuous Assessment</b> | <b>--</b>                 | <b>50 marks</b> |



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| UNIT 1<br>(1 Credit) |     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 15 hours |
|                      | 1.1 | <b>A Gentle Introduction to GIS</b><br><b>The nature of GIS:</b> Some fundamental observations, Defining GIS, GISystems, GIScience and GIApplications, Spatial data and Geoinformation.                                                                                                                                                                                                                                                                                                                                             |          |
|                      | 1.2 | <b>The real world and representations of it:</b> Models and modelling, Maps, Databases, Spatial databases and spatial analysis                                                                                                                                                                                                                                                                                                                                                                                                      |          |
|                      | 1.3 | <b>Geographic Information and Spatial Database</b><br><b>Models and Representations of the real world</b><br><b>Geographic Phenomena:</b> Defining geographic phenomena, types of geographic phenomena, Geographic fields, Geographic objects, Boundaries<br><b>Computer Representations of Geographic Information:</b> Regular tessellations, irregular tessellations, Vector representations, Topology and Spatial relationships, Scale and Resolution, Representation of Geographic fields, Representation of Geographic objects |          |
| UNIT 2<br>(1 Credit) | 2.1 | <b>Data Management and Processing Systems</b><br><b>Hardware and Software Trends</b><br><b>Geographic Information Systems:</b> GIS Software, GIS Architecture and functionality, Spatial Data Infrastructure (SDI)                                                                                                                                                                                                                                                                                                                  | 15 hours |
|                      | 2.2 | <b>Stages of Spatial Data handling:</b> Spatial data handling and preparation, Spatial Data Storage and maintenance, Spatial Query and Analysis, Spatial Data Presentation                                                                                                                                                                                                                                                                                                                                                          |          |
|                      | 2.3 | <b>Database management Systems:</b> Reasons for using a DBMS, Alternatives for data management, The relational data model, Querying the relational database                                                                                                                                                                                                                                                                                                                                                                         |          |



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|                          | 2.4 | <b>GIS and Spatial Databases:</b> Linking GIS and DBMS, Spatial database functionality                                                                                                                                                                                                                                                                                                                                                                                                                          |          |
| UNIT 3<br><br>(1 Credit) | 3.1 | <b>Spatial Referencing and Positioning</b><br><b>Spatial Referencing:</b> Reference surfaces for mapping, Coordinate Systems, Map Projections, Coordinate Transformations<br><br><b>Satellite-based Positioning:</b> Absolute positioning, Errors in absolute positioning, Relative positioning, Network positioning, code versus phase measurements, Positioning technology                                                                                                                                    | 15 hours |
|                          | 3.2 | <b>Data Entry and Preparation</b><br><b>Spatial Data Input:</b> Direct spatial data capture, Indirect spatial data capture, Obtaining spatial data elsewhere<br><b>Data Quality:</b> Accuracy and Positioning, Positional accuracy, Attribute accuracy, temporal accuracy, Lineage, Completeness, Logical consistency<br><b>Data Preparation:</b> Data checks and repairs, Combining data from multiple sources<br><b>Point Data Transformation:</b> Interpolating discrete data, Interpolating continuous data |          |
|                          | 3.3 | <b>Retrieval, classification and measurement:</b> Measurement, Spatial selection queries, Classification<br><b>Overlay functions:</b> Vector overlay operators, Raster overlay operators<br><b>Neighbourhood functions:</b> Proximity computations, Computation of diffusion, Flow computation, Raster based surface analysis<br><b>Analysis:</b> Network analysis, interpolation, terrain modeling                                                                                                             |          |



## SOPHIA COLLEGE FOR WOMEN (AUTONOMOUS)

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| <b>PRACTICAL</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                              | <b>Course Code: T352EP</b> |                 |
| <b>Course Title PRINCIPLES OF GEOGRAPHIC INFORMATION SYSTEMS</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                              |                            |                 |
| <b><u>COURSE OUTCOMES:</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                              |                            |                 |
| The learner will be able to :                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                              |                            |                 |
| <div>1. Apply techniques to create, manage, and analyze vector and raster data using GIS tools, including data formatting, styling, and geospatial calculations.</div> <div>2. Demonstrate proficiency in data integration, georeferencing, digitization, and working with projections and WMS data for map creation and spatial analysis.</div> <div>3. Perform advanced spatial analysis using attribute management, spatial joins, raster sampling, and interpolation techniques to solve real-world geographic problems.</div> |                              |                            |                 |
| <b>Lectures per week (1 Lecture is 120 minutes)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                              | <b>1</b>                   |                 |
| <b>Total number of Hours in a Semester</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                              | <b>30</b>                  |                 |
| <b>Credits</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                              | <b>1</b>                   |                 |
| <b>Evaluation System</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>Practical Assessment</b>  | <b>2<br/>Hours</b>         | <b>50 marks</b> |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Continuous Assessment</b> | <b>--</b>                  |                 |

|  |          |                                                                                                                                           |                 |
|--|----------|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
|  | <b>1</b> | Creating and Managing Vector Data: Adding vector layers, setting properties, formatting, calculating line lengths and statistics          | <b>30 hours</b> |
|  | <b>2</b> | Exploring and Managing Raster data: Adding raster layers, raster styling and analysis, raster mosaicking and clipping                     |                 |
|  | <b>3</b> | Making a Map, Working with Attributes, Importing Spreadsheets or CSV files<br>Using Plugins, Searching and Downloading OpenStreetMap Data |                 |
|  | <b>4</b> | Working with attributes, terrain Data                                                                                                     |                 |
|  | <b>5</b> | Working with Projections and WMS Data                                                                                                     |                 |



### **SOPHIA COLLEGE FOR WOMEN (AUTONOMOUS)**

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|--|----------|----------------------------------------------------------------------------------------------------------------------------------------|--|
|  | <b>6</b> | Georeferencing Topo Sheets and Scanned Maps<br>Georeferencing Aerial Imagery<br>Digitizing Map Data                                    |  |
|  | <b>7</b> | Managing Data Tables and Spatial data Sets:<br>Table joins, spatial joins, points<br>in polygon analysis, performing spatial queries   |  |
|  | <b>8</b> | Advanced GIS Operations 1: Nearest Neighbor<br>Analysis, Sampling Raster<br>Data using Points or Polygons, Interpolating<br>Point Data |  |

### **ASSESSMENT DETAILS:**

**VI. Continuous Assessment (CA): 50 marks**

**VII. Summative Assessment (SA): 50 marks**

**VIII. Practical Examination: 50 marks**

### **REFERENCES:**

1. Principles of Geographic Information Systems- An Introductory Text Book, Editors: Otto Huisman and Rolf, The International Institute of Geoinformation Science and Earth Observation, Fourth edition, 2009
2. Principles of Geographic Information Systems, P. A Burrough and R.A.McDonnell, Oxford university Press, Third edition, 1999.
3. Introduction to Geographic Information Systems Chang Kang-tsung (Karl), McGrawHill Any Above 3<sup>rd</sup> Edition 2013 7<sup>th</sup> Edition



## SOPHIA COLLEGE FOR WOMEN (AUTONOMOUS)

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|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| <b>Programme: BSc IT</b>                                                                                                                                                                                                                                                                                                                                                              |     | <b>Semester – 5</b>                                                                                                                                                                                                                                                                                                                                                                                                                         |                           |
| <b>VSC</b>                                                                                                                                                                                                                                                                                                                                                                            |     |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                           |
| <b>Course Title: INTERNET OF THINGS</b>                                                                                                                                                                                                                                                                                                                                               |     | <b>Course Code: TVSC501</b>                                                                                                                                                                                                                                                                                                                                                                                                                 |                           |
| <b><u>COURSE OBJECTIVES:</u></b><br><br>1. Understand the fundamental concepts, technologies,<br>2. Analyse design principles and communication protocols for connected IoT devices.<br>3. Implement IoT interfacing with sensors, actuators, and API integration.                                                                                                                    |     |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                           |
| <b><u>COURSE OUTCOMES:</u></b><br><br>The learner will be able to:<br><br>1. Explain the essence of IoT, its underlying technologies<br>2. Apply design principles such as privacy, web thinking, and graceful degradation while understanding IoT communication protocols.<br>3. Demonstrate Arduino-based sensor and actuator interfacing and perform API integration using Python. |     |                                                                                                                                                                                                                                                                                                                                                                                                                                             |                           |
| <b>Lectures per week (1 Lecture is 60 minutes)</b>                                                                                                                                                                                                                                                                                                                                    |     | <b>1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    |                           |
| <b>Total number of Hours in a Semester</b>                                                                                                                                                                                                                                                                                                                                            |     | <b>15</b>                                                                                                                                                                                                                                                                                                                                                                                                                                   |                           |
| <b>Credits</b>                                                                                                                                                                                                                                                                                                                                                                        |     | <b>1</b>                                                                                                                                                                                                                                                                                                                                                                                                                                    |                           |
| <b>Evaluation System</b>                                                                                                                                                                                                                                                                                                                                                              |     | <b>Summative Assessment</b>                                                                                                                                                                                                                                                                                                                                                                                                                 | ---                       |
|                                                                                                                                                                                                                                                                                                                                                                                       |     | <b>Continuous Assessment</b>                                                                                                                                                                                                                                                                                                                                                                                                                | --<br><br><b>20 marks</b> |
| UNIT 1<br><br>(1 Credit)                                                                                                                                                                                                                                                                                                                                                              | 1.1 | 1.1.1: The Internet of Things: An Overview:<br>The Flavour of the Internet of Things, The “Internet” of “Things”, The Technology of the Internet of Things, Enchanted Objects, Who is Making the Internet of Things?<br><br>1.1.2: Design Principles for Connected Devices:<br>Calm and Ambient Technology, Magic as Metaphor, Privacy, Keeping Secrets, Whose Data Is It Anyway? Web Thinking for Connected Devices, Small Pieces, Loosely | 15 hours                  |



## SOPHIA COLLEGE FOR WOMEN (AUTONOMOUS)

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|  |  | <p>Joined, First-Class Citizens On The Internet, Graceful Degradation, Affordances.</p> <p><b>1.1.3: Internet Principles: Internet Communications: An Overview, IP, TCP, The IP Protocol Suite (TCP/IP), UDP, IP Addresses, DNS, IPv4, IPv6, MAC Addresses, 802.15.4 PHY, 802.15.4 PHY, 6LoPAN, DTLS, COAP, MQTT, XMPP, IOT protocol versus TCP/IP protocol.</b></p> <p><b>1.1.4: IoT interfacing and API integration: Introduction to Arduino, Raspberry Pi, Comparing Microcontroller, Microprocessor and Embedded system, Arduino interfacing with Sensors (light sensor, ultrasonic distance sensor, gas sensor), Actuators (LEDs, buzzers, 7-segment displays, LCD display), Introduction to API Integration, Mashing APIs using Python</b></p> |  |
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## SOPHIA COLLEGE FOR WOMEN (AUTONOMOUS)

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| <b>Programme: Sciences</b>                                                                                                                                                                                                                                                                                                                    |                              | <b>Semester – 5</b>         |                 |
| <b>Information Technology Minor</b>                                                                                                                                                                                                                                                                                                           |                              |                             |                 |
| <b>PRACTICAL COURSE- INTERNET OF THINGS</b>                                                                                                                                                                                                                                                                                                   |                              | <b>Course Code: TVSC501</b> |                 |
| <b><u>COURSE OUTCOMES:</u></b>                                                                                                                                                                                                                                                                                                                |                              |                             |                 |
| The learner will be able to:                                                                                                                                                                                                                                                                                                                  |                              |                             |                 |
| <div><div>1.</div><div>Design and simulate basic electronic circuits using Tinkercad and Arduino.</div></div> <div><div>2.</div><div>Interface and control sensors (light, ultrasonic, gas) and actuators (LEDs, buzzers, displays) with Arduino.</div></div> <div><div>3.</div><div>Integrate and utilize API mashing techniques</div></div> |                              |                             |                 |
| <b>Lectures per week (1 Lecture is 60 minutes)</b>                                                                                                                                                                                                                                                                                            |                              | <b>2</b>                    |                 |
| <b>Total number of Hours in a Semester</b>                                                                                                                                                                                                                                                                                                    |                              | <b>30</b>                   |                 |
| <b>Credits</b>                                                                                                                                                                                                                                                                                                                                |                              | <b>1</b>                    |                 |
| <b>Evaluation System</b>                                                                                                                                                                                                                                                                                                                      | <b>Continuous Assessment</b> | <b>Practical Assessment</b> | <b>20 marks</b> |

|  |   |                                                                                                  |          |
|--|---|--------------------------------------------------------------------------------------------------|----------|
|  | 1 | Introduction to circuit Designing in Tinkercad.                                                  | 30 hours |
|  | 2 | Interfacing Led: Different colour Led blinking on even/odd numbers by taking input from the user |          |
|  | 3 | Interfacing 7-digit segment and buzzer with Arduino                                              |          |
|  | 4 | Interfacing button and buzzer with Arduino                                                       |          |
|  | 5 | Interfacing LCD with Arduino                                                                     |          |
|  | 6 | Interfacing Light Sensor with Arduino                                                            |          |
|  | 7 | Interfacing Ultrasonic distance sensor with Arduino                                              |          |
|  | 8 | Simulating Gas leakage detection using Arduino                                                   |          |



## **SOPHIA COLLEGE FOR WOMEN (AUTONOMOUS)**

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|--|---|------------------------------|--|
|  | 9 | Mashing Up APIs using python |  |
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### **ASSESSMENT DETAILS:**

**I. Continuous Assessment (CA): 20 marks**

**II. Practical Examination: 20 marks**

### **REFERENCES:**

1. Internet of things Architecture and Design principle, Raj kamal,2017
2. Data communication networks, Fourouzan, 6th edition,2022
3. Designing the Internet of Things, Adrián McEwen, Hakim Cassimally, WILEY,2016