SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat (Reaccredited with 'A' Grade by NAAC (CGPA 3.11))
Syllabus of Sem-V with effect from the Academic Year 2025-2026

Bachelor of Science (Computer Science)
B.Sc. (CS) Semester V

Course Code	US05MACSC01	Title of the Course	**Object Oriented Programming Using Java**
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	1. To introduce basic programming concepts and necessary constructs of the Java programming language. 2. To understand the fundamental concepts of object-oriented programming using Java. 3. To describe exception handling and Input Output Management. 4. To understand Applet programming using Abstract Window Tollkit (AWT).

Course Content		
Unit	Description	Weightage* (%)
1.	**Introduction** – History of Java, features, the Java environment, the Java Virtual Machine (JVM) – Structure of a Java program, a simple Java program, implementing a Java program – Tokens, comments, constants, variables and data types – Scope of variables, type casting – Operators: arithmetic, relational, logical, assignment, increment/decrement, conditional, ternary operator and special operators – Decision making: if statement, if…else statement, nesting of if…else, the else if ladder, switch statement – Looping: while, do…while, for, loop jumps in loops, labeled loops	25%
2.	**Arrays, Classes, Objects, Interfaces and Inheritance** – Arrays: one, two dimensional arrays – Defining a class, members of a class: variables and methods, creating objects, constructors, accessing class members – Static members v/s instance members – Introduction to inheritance, super keyword – Interfaces: Introduction, definition, extending, implementing & accessing – Final variables, methods and classes, abstract methods and classes – Introduction to method overloading and overriding	25%

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat (Reaccredited with 'A' Grade by NAAC (CGPA 3.11))
Syllabus of Sem-V with effect from the Academic Year 2025-2026

3.	**Exception Handling, I/O Management and Packages** – Managing errors & exceptions: introduction, types of errors, exceptions, syntax of exception handling construct, multiple catch statements, the finally clause, defining and throwing user-defined exceptions, the throw statement – Managing I/O files: introduction, concept of streams, Character stream classes – Introduction to the concept of package, Java API packages – Using java. lang (String, Math)	25%
4.	**Applet Programming** – Applet architecture and skeleton – java.awt package (Button, CheckBox, CheckBoxGroup, Choice, Color, Label, List, TextArea, TextField) – HTML applet tag, display techniques (DrawString, Lines, Rectangle, Ellipses, Circles, Arcs, Polygons, Color) – Introduction to event handling	25%

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Examination	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to develop	
1.	Understanding of the basic programming concepts and necessary constructs of the Java programming language.
2.	Understanding of the fundamental concepts of object-oriented programming using Java.
3.	Ability to describe exception handling and Input Output Management.
4.	Understanding of Applet programming using Abstract Windows Tollkit (AWT)

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat (Reaccredited with 'A' Grade by NAAC (CGPA 3.11))
Syllabus of Sem-V with effect from the Academic Year 2025-2026

Suggested References:	
Sr. No.	References
1.	Programming with Java- A Primer by E. Balaguruswami, 3rd Edition, TMH Publication, 2006.
2.	The Complete Reference – Java 2, 7th Edition Herbert Schildt. TMH Publication, 2017.
3.	Saba Zame , Handbook of Object technology, CRC Press, Washington DC, 1999.
4.	Mary Campion and Kathy Walrath, Java tutorial, Second Edition, Addison Wesley Pun. 1998.
5.	Java 2 Programming Black Book, Steven Holzner, 2005.

On-line resources to be used if available as reference material
On-line Resources
1. https://www.tutorialspoint.com/
2. https://www.w3schools.com/
3. https://www.javatpoint.com/

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SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat (Reaccredited with 'A' Grade by NAAC (CGPA 3.11))
Syllabus of Sem-V with effect from the Academic Year 2025-2026

Bachelor of Science (Computer Science)
B.Sc. (CS) Semester V

Course Code	**US05MACSC02**	Title of the Course	**Relational Database Management System**
Total Credits of the Course	4	Hours per Week	4

Course Objectives:	1. To introduce the students to the relational data model and RDBMS. 2. To teach SQL for accessing an RDBMS.

Course Content		
Unit	Description	Weightage* (%)
1.	**Relational Database Theory and Data Modeling** − The three-schema architecture for a Database Management System (DBMS) − Introduction to data models (hierarchical, network, relational) − Examples of current RDBMS products − The relational data model: concepts and terminology, operations on data (DDL, DML), relationships and relationship types − Integrity constraints − Codd rules − Entity-relationship modeling (different types of entities, attributes, relationships and their representation in the E-R diagram) − Case studies of data modeling using E-R modeling	25%
2.	**Introduction to SQL** − SQL - introduction, advantages and disadvantages − Data types – built-in (number, char, varchar2, date, raw, long raw) − Types of SQL Statements: DDL (Data Definition Language), DML (Data Manipulation Language), DCL (Data Control Language), TCL (Transaction Control Language) − Working with SQL*Plus – overview and basic commands like ed, start, get, save, exit, connect, set linesize, set pagesize and host − Creating table and inserting data - CREATE TABLE, INSERT, retrieving data using query – SELECT, manipulating data – DELETE and UPDATE, modifying and removing table – ALTER TABLE and DROP TABLE.	25%

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat (Reaccredited with 'A' Grade by NAAC (CGPA 3.11))
Syllabus of Sem-V with effect from the Academic Year 2025-2026

3.	**Data Constraints and Functions**	25%
	– Pseudo columns – ROWID, ROWNUM, USER, UID, SYSDATE	
	– Null values, TAB table, DUAL table	
	– Operators – arithmetic, relational, logical, range searching, pattern matching and set	
	– Data constraints – Introduction, advantages and disadvantages	
	– Type of data constraints – NOT NULL, UNIQUE, PRIMARY KEY, FOREIGN KEY and CHECK	
	– Modifying constraints, working with data dictionary and use of USER_CONSTRAINTS	
	– Functions – introduction, merits and demerits, types of functions (scalar and aggregate)	
	– Scalar: Numeric functions (ABS, FLOOR, MOD, POWER, ROUND, SIGN, SQRT and TRUNC), Character functions (CHR, ASCII, CONCAT, INITCAP, LOWER, SUBSTR, TRIM, UPPER), Date functions (ADD_MONTHS, LAST_DAY, NEXT_DAY, MONTHS_BETWEEN), Conversion functions (TO_NUMBER, TO_CHAR and TO_DATE)	
	– Aggregate fun: AVG, COUNT, MAX, MIN, SUM	
	– Miscellaneous functions – NVL, DECODE, COALESCE	
4.	**Query, Subquery, Joins, Transaction Management and Reporting through SQL*Plus**	25%
	– Query and subquery, types of subquery	
	– Creation and manipulation of database objects – indexes, views, sequences and synonym	
	– Joining tables, types of joins (cross join, natural join, inner join, equijoin, outer joins, self-join).	
	– Data control language statements – GRANT and REVOKE	
	– Transaction control language statements – COMMIT, ROLLBACK and SAVEPOINT	
	– PL-SQL Block, CURSOR	
	– FUNCTION AND PROCEDURE	

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat (Reaccredited with 'A' Grade by NAAC (CGPA 3.11))
Syllabus of Sem-V with effect from the Academic Year 2025-2026

Teaching-Learning Methodology	Multiple teaching approaches: lectures and discussion, exploration and inquiry, cooperative group work, demonstrations, and presentations.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Examination	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Apply the basic knowledge of the relational data model and RDBMS
2.	Use SQL for accessing an RDBMS

Suggested References:	
Sr. No.	References
1.	An introduction to Database Systems : Bipin C. Desai, Galgotia Poblications Pvt. Ltd, 1981.
2.	Ivan Bayross: SQL,PL/SQL The programming language of Oracle, 3rd revised edition, BPB Publications, 2010.
3	SQL/PLSQL for Oracle9i, P. S. Deshpande, dreamtech press, reprint edition 2009.
4	Understanding Database Management Systems: S. Parthsarthy and B.W.Khalkar, Master Academy, First edition – 2007.

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SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat (Reaccredited with 'A' Grade by NAAC (CGPA 3.11))
Syllabus of Sem-V with effect from the Academic Year 2025-2026

Bachelor of Science (Computer Science)
B.Sc. (CS) Semester-V

Course Code	**US05MACSC03**	Title of the Course	**Practical**
Total Credits of the Course	4	Hours per Week	08

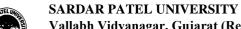| Course Objectives:	1. To study the concepts of object-oriented programming concepts using Java. 2. To learn query processing techniques.

Course Content		
Part	Description	Weightage (%)
I	Practical based on US05MACSC01	50%
II	Practical based on US05MACSC02	50%

Teaching-Learning Methodology	Hands on training through required ICT tools.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Examination	50%
2.	University Examination	50%

Course Outcomes: After completing this course, the learner will be able to	
1.	gain knowledge of object-oriented programming concepts using Java.
2.	gain the knowledge of RDBMS.

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SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat (Reaccredited with 'A' Grade by NAAC (CGPA 3.11))
Syllabus of Sem-V with effect from the Academic Year 2025-2026

Bachelor of Science (Computer Science)
B.Sc. (CS) Semester V

Course Code	**US05MICSC01**	Title of the Course	**Object Oriented Programming Using C++**
Total Credits of the Course	2	Hours per Week	2

Course Objectives:	1. To study the fundamental concepts and constructs of the C++ programming language
	2. To learn the basic concepts of object-oriented programming using C++.

Course Content		
Unit	Description	Weightage* (%)
1.	**Object Oriented Programming (OOP) Concepts and C++** − Basic OOP concepts: objects, classes, encapsulation, data hiding, inheritance, polymorphism − Introduction to C++: structure of a C++ program, data types, variables, constants, expressions, statements and operators − Usage of header files − Control flow statements: if else, for loop, while loop, do while loop, switch, break and continue	50%
2.	**Input/Output, Arrays, and Working with Classes** − Basic I/O in C++ − Arrays in C++: introduction, declaration, initialization of one, two and multi-dimensional arrays, operations on arrays − Working with strings: introduction, declaration, string manipulation and arrays of strings. − Classes and objects in C++ − Constructors: default, parameterized, copy, constructor overloading and destructor − Access specifiers, implementing and accessing class members	50%

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat (Reaccredited with 'A' Grade by NAAC (CGPA 3.11))
Syllabus of Sem-V with effect from the Academic Year 2025-2026

Teaching-Learning Methodology	Multiple teaching approaches: lectures and discussion, exploration and inquiry, cooperative group work, demonstrations, and presentations.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Examination	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to	
1.	Apply the knowledge of fundamental concepts and constructs of the C++ programming language.
2.	Carray out object-oriented programming using C++.

Suggested References:	
Sr. No.	References
1.	E Balagurusamy: Object Oriented Programming in C++, Tata McGraw-Hill Publishing Co. Ltd., 2008.
2.	Robert Lafore: Object Oriented Programming in Turbo C++, Guide, Galgotia Pub. (P) Ltd., 1991.
3.	Barkakati N.: Object Oriented Programming in C++, PHI. OOP's using C++ for Dummies, 1991.

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SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat (Reaccredited with 'A' Grade by NAAC (CGPA 3.11))
Syllabus of Sem-V with effect from the Academic Year 2025-2026

Bachelor of Science (Computer Science)
B.Sc. (CS) Semester-V

Course Code	**US05MICSC02**	Title of the Course	**Pratical**
Total Credits of the Course	2	Hours per Week	04

Course Objectives:	1. To study the concepts of object-oriented programming concepts using C++

Course Content		
Part	Description	Weightage (%)
I	Practical based on US05MICSC01	100%

Teaching-Learning Methodology	Hands on training through required ICT tools.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Examination	50%
2.	University Examination	50%

Course Outcomes: After completing this course, the learner will be able to	
1.	gain knowledge of object-oriented programming concepts using C++.
2.	gain the knowledge of C + + .

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat (Reaccredited with 'A' Grade by NAAC (CGPA 3.11))
Syllabus of Sem-V with effect from the Academic Year 2025-2026

Bachelor of Science (Computer Science)
B.Sc. (CS) Semester V

Course Code	**US05MICSC03**	Title of the Course	**Computer Networks**
Total Credits of the Course	2	Hours per Week	2

Course Objectives:	1. To understand the basic concepts of Computer networks and data communication. 2. To acquire knowledge of basic concepts related to network protocols and standards.

Course Content		
Unit	Description	Weightage* (%)
1.	**Introduction** – Computer networks: definition and advantages – Classification of computer networks – Introduction and differences among Local Area Networks (LANs), Metropolitan Area Networks (MANs), Wide Area Networks (WANs) – Uses of Computer Networks – Meaning of the basic terms: topology, data rate, modulation rate, spectrum, bandwidth, server, host	50%
2.	**Transmission Media, Local Area Network Technology and Networking Devices** – Guided Transmission Media: Magnetic media, Twisted pair, Coaxial Cables, Fiber optics – Types and characteristics of Local Area Networks – LAN Topologies: Bus, Star, Ring, Tree, Complete (Mesh) – Functions of various networking components: modems, amplifiers, repeaters, hubs, switches, bridges, routers, gateway	50%

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat (Reaccredited with 'A' Grade by NAAC (CGPA 3.11))
Syllabus of Sem-V with effect from the Academic Year 2025-2026

Teaching-Learning Methodology	Blended learning approach incorporating traditional classroom teaching and online /ICT- based teaching practices.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Examination	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to develop	
1.	Ability to describe the significance and functioning of computer networks.
2.	Knowledge of various network protocols and standards.

Suggested References:	
Sr. No.	References
1.	Behrouz Forouzan, introduction to data communications and networking, 4th edition, Tata McGraw-hill publishing co. Ltd., New Delhi, 1998.
2.	Tanenbaum A. S., computer networks, 3rd edition prentice-hall of India Pvt. Ltd., New Delhi, 1997.

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SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat (Reaccredited with 'A' Grade by NAAC (CGPA 3.11))
Syllabus of Sem-V with effect from the Academic Year 2025-2026

Bachelor of Science (Computer Science)
B.Sc. (CS) Semester-V

Course Code	**US05MICSC04**	Title of the Course	**Practical**
Total Credits of the Course	2	Hours per Week	04

Course Objectives:	1. To study various network topologies.

Course Content		
Part	Description	Weightage (%)
I	Practical based on US05MICSC03	100%

Teaching-Learning Methodology	Hands on training through required ICT tools.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Examination	50%
2.	University Examination	50%

Course Outcomes: After completing this course, the learner will be able to
1.	Gain the knowledge of Network Topology along with layout diagrams.

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat (Reaccredited with 'A' Grade by NAAC (CGPA 3.11))
Syllabus of Sem-V with effect from the Academic Year 2025-2026

Bachelor of Science (Computer Science)
B.Sc. (CS) Semester V

Course Code	US05SECSC01	Title of the Course	**Software Engineering**
Total Credits of the Course	2	Hours per Week	2

Course Objectives:	1. To acquire the knowledge about Server Side Web Development Technology. 2. To understand how to design customized Web Applications using ASP.NET

Course Content		
Unit	Description	Weightage* (%)
1.	**Introduction of SE, Software Requirement Specifications and Software Project Planning** − Introduction: Software and Software Engineering − Phases in Software development − Process Models: Waterfall, Prototype, Iterative enhancement, spiral − Introduction: Software Requirement Specification (SRS) and Needs − Software Requirement Specifications (SRS), Characteristics and Components of SRS − Project Monitoring Plan: Time sheets, Reviews, Cost- schedule milestone and Earned value method − Software Quality Assurance Plans (SQAP) − Overview of Risk Management	50%
2.	**System Design, Coding and Testing** − Introduction: System Design − Design Objectives and Design Principles − Design Concepts - Top down and Bottom up approach, Problem Partition, Abstraction, Modularity, Module Level Concept, Coupling, Cohesion − Introduction: Coding, Top Down and Bottom Up approach for coding − Introduction: Testing, Error, Fault, Failure − Levels of Testing − Functional Testing v/s. Structural testing	50%

Teaching-Learning Methodology	Blended learning approach incorporating both traditional classroom teaching as well as usage of ICT tools.

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat (Reaccredited with 'A' Grade by NAAC (CGPA 3.11))
Syllabus of Sem-V with effect from the Academic Year 2025-2026

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Examination	50%
2.	University Examination	50%

Course Outcomes: Having completed this course, the learner will be able to develop	
1.	understanding of the fundamental concepts related to software engineering, different phases of software development and various process models.
2.	understanding of the basic concepts related to requirement specification and software project planning.
3.	basic knowledge about the concepts related to system design, coding and testing.

Suggested References:	
Sr. No.	References
1.	An Integrated Approach to Software Engineering by PankajJalote ,Narosa Publishing House, Second Edition,1997.
2.	Software Engineering a practitioner's approach by Roger S. Pressman, Tata McGraw-Hill, Fifth Edition, 2001.
3.	Software Engineering Fundamentals by Richard Fairley, Tata McGraw- Hill, 2017.

On-line resources to be used if available as reference material
On-line Resources
1. https://www.tutorialspoint.com/   2. https://www.w3schools.com/

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