Program: B.Sc. – Information Technology (2024 - 25)		Semester: III	
Course: Data Structures And Algorithm		**Course Code:**	
Teaching Scheme		**Evaluation Scheme**	
Lecture (Hours per week)	**Credit**	**Continuous Assessment (CA) (Marks - 40)**	**Semester End Examinations (SEE) (Marks- 60 in Question Paper)**
3	3	20+20	60

Learning Objectives:

1. To understand basics of various data structures and their functions, design and analysis of algorithm, concept of complexity.
2. To apply these concepts to real life problem solving
3. To evaluate and create solutions to real life problem solving

Learning outcomes:

1. Understanding basics of various data structures and their functions, design and analysis of algorithm, concept of complexity.
2. Ability to apply these concepts to real life problem solving
3. Ability to evaluate and create solutions to real life problem solving

Module	Module Content	Module wise Pedagogy Used	Duration of Module

I	**Introduction:** Data Structure, Algorithm, Importance of Algorithm Analysis, Complexity of an Algorithm, Asymptotic Analysis and Notations, Big O Notation, Big Omega Notation, Big Theta Notation, Rate of Growth and Big O Notation. **Array**: Memory Representation of One Dimensional Array, Memory Representation of Two Dimensional Arrays **Linked List:** Linked List, One-way Linked List, Traversal of Linked List, Searching, Memory Allocation and Deallocation, Insertion in Linked List, Deletion from Linked List, Copying a List into Other List, Merging Two Linked Lists, Splitting a List into Two Lists, Reversing One way linked List, Circular Linked List, Applications of Circular Linked List Sparse Arrays, Implementing other Data Structures. Complexity analysis of Link List	Classroom learning	15
II	**Stack**: Introduction, Operations on the Stack Memory Representation of Stack, Array Representation of Stack, Applications of Stack, Evaluation of Arithmetic Expression, Matching Parenthesis, infix and postfix operations, Recursion**.** **Queue:** Introduction, Queue, Operations on the Queue, Memory Representation of Queue, Array representation of queue, Linked List Representation of Queue, Circular Queue, **Tree**: Tree, Binary Tree, Properties of Binary Tree, Memory Representation of Binary Tree, Operations Performed on Binary Tree, Reconstruction of Binary Tree from its Traversals, Binary Search Tree,	Classroom	15

	Operations on Binary Search Tree, Heap Tree, Operation on Heap, Heap Sort, B- Tree		
III	**Graph**: Introduction, Graph, Graph Terminology, Memory Representation of Graph, Adjacency Matrix Representation of Graph, Adjacency List or Linked Representation of Graph, Operations Performed on Graph, Graph Traversal, Applications of the Graph, Reachability, Shortest Path Problems, Spanning Trees. Hash function, Address calculation techniques, Common hashing functions Collision resolution, Linear probing, Quadratic, Double hashing, Buckethashing, Deletion and rehashing. Complexity comparison of different sorting algorithms	Classroom learning.	15

Reference books:

J. Canning, A. Broder, and R. Lafore, *Data Structures & Algorithms in Python*. AddisonWesley Professional, 2022.

M. A. Weiss, *Data Structures and Algorithm Analysis in C+*. 2003.

Details of Continuous Assessment (ICA)- 40 Marks

Continuous Assessment	Details	Marks
Component 1 (ICA-1)	Internal class test (online or offline)	20 marks

	Fill in the blanks /Explain the concepts/Answer in brief/Case study or application-based questions.	
Component 2 (ICA-2)	Presentations/Project Work/ VivaVoce/ Book Review/ Field visit & its presentations/ Documentary filming/ Assignments/ Group Discussions Etc.	20 marks

Details of Semester End Examination (TEE)- 60 Marks

	Particulars	**Marks**
Module 1	Answer in brief (Any 4 out of 6)	20 marks
Module 2	Answer in brief (Any 4 out of 6)	20 marks
Module 3	Answer in brief (Any 4 out of 6)	20 marks

Program: B.Sc. – Information Technology (2024 - 25)		**Semester: III**	
Course: Data structures LAB		**Course Code:**	
Teaching Scheme		**Evaluation Scheme**	
Lecture (Hours per week)	**Credit**	**Continuous Assessment (CA) (Marks -)**	**Machine Test**
2	1	20	30

Learning Objectives:

1. Design simple to complex algorithms.
2. To apply these concepts to real life problem solving
3. To evaluate and create solutions to real life problem solving

Learning outcomes:

4. Using basics of various data structures and their functions, design and analysis of algorithm, concept of complexity.
5. Application of these concepts to real life problem solving
6. Application of these solutions to real life problem solving

Outline of Syllabus: (per session plan)

Modules	Topics	Duration (Lecture)
Module 1	**Use of Basic Tags, Use of CSS, Layout and Media, Tables and Forms, JavaScript**	**10**
	• Implement the following: o Write a program to store the elements in 1-D array and perform the operations like searching, sorting and reversing the elements. [Menu Driven] o Read the two arrays from the user and merge them and display the elements in sorted order. [Menu Driven] o Write a program to perform the Matrix addition, Multiplication and Transpose Operation. [Menu Driven] • Implement the following for Stack: .	
	o Write a program to convert an infix expression to postfix and prefix conversion. Implement the following for Queue: o Write a program to implement the concept of Queue with Insert, Delete, Display and Exit operations. o Write a program to implement the concept of Circular Queue .	

Module 2	⊓ Implement the following for Linked List: o Write a program to create a single linked list and display the node elements in reverse order. o Write a program to search the elements in the linked list and display the same o Write a program to create double linked list and sort the elements in the linked list. o	**10**
	⊓ Implement the sorting techniques: o Write a program to implement selection sort. o Write a program to implement insertion sort. ⊓ Implement Binary Search	**10**
Total Lectures		**30**

Details of Practical Examination - 50 Marks

Continuous Assessment	Details	Marks
Component 1 (ICA-1)	Machine Test	30 marks
Component 2 (ICA-2)	Presentations/Project Work/ /Mini project, Etc.	20 marks

Program: B.Sc. – Information Technology (2024 - 25)		**Semester: III**	
Course: Database Management System		**Course Code:**	
Teaching Scheme		**Evaluation Scheme**	
Lecture (Hours per week)	**Credit**	**Continuous Assessment (CA) (Marks - 40)**	**Semester End Examinations (SEE) (Marks- 60 in Question Paper)**
3	3	20+20	60

Learning Objectives:

- To understand the basic concepts of Database Systems
- To apply the concepts of Normalization and Database Design in real world scenarios
- To develop ERD models and Relational Databases and SQL queries based on real world problems

Course Outcomes:

After completion of the course, learners would be able to:

CO1: Ability to understand the different concepts of Database Systems

CO2: Ability to apply and implement of normalization and ERD principles on a given dataset

CO3: Develop the ability to implement a given condition using SQL, Relational Algebra, ERD and Relational models

Outline of Syllabus: (per session plan)

Modules	Topics	Duration (Lecture)
Module 1	**Database and Relational Model**	**15**
	Introduction to Databases, What is database system, purpose of database system, view of data, Database Languages, Database Engine, database architecture, Database users and administrators, The evolution of data models, Codd's rules Introduction to the Relational Model Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational algebra	
Module 2	**ERD and Normalisation**	**15**
	Database Design Overview of the Design Process, The Entity- Relationship Model, Complex Attributes, Mapping, Primary Key, Removing Redundant Attributes in Entity Sets, Reducing E-R Diagrams to Relational Schemas, Extended E-R Features, EntityRelationship Design Issues	
	Normalisation Atomic domain and Normalization (1NF, 2NF, 3NF, BCNF). Denormalization	
Module 3	**SQL**	**15**

	Introduction to SQL - SQL Data Definition, Basic Structure of SQL Queries, Set Operations, Null Values, Aggregate Functions, Nested Subqueries, Modification of the Database, Views, comparison between tables and views, SQL Transactions, Integrity Constraints, SQL Data Types and Schemas, Index Definition in SQL, Authorization, Triggers	
Total Lectures		**45**

Reference books:

1. Database System and Concepts , A Silberschatz, H Korth, S Sudarshan, McGraw-Hill Seventh Edition, 2019
2. Database Systems: Design, Implementation, & Management, 14th Edition by Carlos Coronel (Author), Steven Morris 2022

Details of Continuous Assessment (ICA)- 40 Marks

Continuous Assessment	Details	Marks
Component 1 (ICA-1)	Internal class test (online or offline) Fill in the blanks /Explain the concepts/Answer in brief/Case study or application-based questions.	20 marks
Component 2 (ICA-2)	Presentations/Project Work/ VivaVoce/ Book Review/ Field visit	20 marks
	& its presentations/ Documentary filming/ Assignments/ Group Discussions Etc.	

Details of Semester End Examination (TEE)- 60 Marks

	Particulars	Marks
Module 1	Answer in brief (Any 4 out of 6)	20 marks

Module 2	Answer in brief (Any 4 out of 6)	20 marks
Module 3	Answer in brief (Any 4 out of 6)	20 marks

Program: B.Sc. – Information Technology (2024 - 25)		Semester: III	
Course: Database System Management LAB		Course Code:	
Teaching Scheme		Evaluation Scheme	
Lecture (Hours per week)	Credit	Continuous Assessment (CA) (Marks -)	Machine Test
2	1	20	30
Learning Objectives:			
Course Outcomes:			
Outline of Syllabus: (per session plan)			

Modules	Topics	Duration (Lecture)
	For given scenario . Draw E-R diagram and convert entities and relationships to table. Perform the following: · Viewing all databases · Creating a Database · Viewing all Tables in a Database · Creating Tables (With and Without Constraints) · Inserting/Updating/Deleting Records in a Table · Saving (Commit) and Undoing (rollback) Perform the following: · Altering a Table · Dropping/Truncating/Renaming Tables · Backing up / Restoring a Database	**10**

	Perform the following: · Simple Queries · Simple Queries with Aggregate functions · Queries with Aggregate functions (group by and having clause) Queries involving · Date Functions · String Functions Math Functions	**10**
	Join Queries · Inner Join · Outer Join Views · Creating Views (with and without check option) · Dropping views · Selecting from a view	**10**
Total Lectures		**30**

Details of Practical Examination - 50 Marks

Continuous Assessment	Details	Marks
Component 1 (ICA-1)	Machine Test	30 marks
Component 2 (ICA-2)	Presentations/Project Work/ /Mini project, Etc.	20 marks

Program: B.Sc. – Information Technology (2024 - 25)		**Semester: III**	
Course: Software Engineering		**Course Code:**	
Teaching Scheme		**Evaluation Scheme**	
Lecture (Hours per week)	**Credit**	**Continuous Assessment (CA) (Marks - 40)**	**Semester End Examinations (SEE) (Marks- 60 in Question Paper)**
3	3	20+20	60

Course Learning Objectives:

1. **To understand the concept of Software Engineering.**
2. **To analyse the different software development models.**
3. **To apply the different Software development models**
4. **To analyze and evaluate the various concepts in Software Project Management.**

Course Outcomes:

After completion of the course, learners would be able to:

CO1: Learners will be able to describe the role and concept of Software Engineering.

CO2: Learners will be able to analyse the different Software development models.

CO3: Learners will be able to identify the problem and build the software development models.

CO4: Learners will be able to identify the case , estimate and evaluate the same through various concepts in Software Project Management.

Outline of Syllabus: (per session plan)

Modules	**Topics**	**Duration (Lecture)**
Module 1		**18**
	Introduction: What is software engineering? Software Development Life Cycle, Requirements Analysis, Software Design, Coding, Testing, Maintenance etc. **Software Requirements:** Functional and Non-functional requirements, User Requirements, System Requirements, Interface Specification, Documentation of the software requirements. **Software Processes:** Process and Project, Component Software Processes. **Software Development Process Models.** • Waterfall Model. • Agile Model. **System Models:** Models and its types, Context Models, Behavioural Models, Data Models, Object Models, Structured Methods.	
	Architectural Design: Architectural Design Decisions, System Organization, Modular Decomposition Styles, Control Styles, Reference Architectures. **User Interface Design:** Need of UI design, Design issues, The UI design Process, User analysis, User Interface Prototyping, Interface Evaluation.	
Module 2		**12**

	Software Project Management Introduction to Software Project Management: Introduction, Why is Software Project Management Important? What is a Project? Software Projects versus Other Types of Project, Contract Management and Technical Project Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some Ways of Categorizing Software Projects, The Business Case, Project Success and Failure, What is Management? Management Control, Project Management Life Cycle, Traditional versus Modern Project Management Practices.	
Module 3		**15**
	Software Effort Estimation: Introduction, Where are the Estimates Done? Problems with Over- and UnderEstimates, The Basis for Software Estimating, Software Effort Estimation Techniques, Bottom- up Estimating, The Top-down Approach and Parametric Models, Expert Judgment, Estimating by Analogy, Albrecht Function Point Analysis, Function Points Mark II, COSMIC Full Function Points, COCOMO II: A Parametric Productivity Model, Cost Estimation, Staffing Pattern, Effect of Schedule Compression, Capers Jones Estimating Rules of Thumb	
Total Lectures		**45**

Reference books:

1. Software Engineering: A Practitioner's Approach , 9th Edition, July 2023 by Roger Pressman , Bruce Maxim, McGrawHill Publication.
2. Software Engineering, 10th Edition,May 2017 by Ian Sommerville (Author), Pearson Education.

Details of Continuous Assessment (ICA)- 40 Marks

Continuous Assessment	Details	Marks
Component 1 (ICA-1)	Internal class test (online or offline)	20 marks
	Fill in the blanks /Explain the concepts/Answer in brief/Case study or application-based questions.	

Component 2 (ICA-2)	Presentations/Project Work/ VivaVoce/ Book Review/ Field visit & its presentations/ Documentary filming/ Assignments/ Group Discussions Etc.	20 marks

Details of Semester End Examination (TEE)- 60 Marks

	Particulars	**Marks**
Module 1	Answer in brief (Any 4 out of 6)	20 marks
Module 2	Answer in brief (Any 4 out of 6)	20 marks
Module 3	Answer in brief (Any 4 out of 6)	20 marks

Program: B.Sc. – Information Technology (2024 - 25)		**Semester: III**	
Course: Python Programming Lab		**Course Code:**	
Teaching Scheme		**Evaluation Scheme**	
Lecture (Hours per week)	**Credit**	**Continuous Assessment (CA) (Marks -)**	**Machine Test**
2	1	20	30

Learning Objectives:

- Remembering and Understand the use of Software and Syntax of Python.
- Applying and Analyzing the concepts of functions and strings
- Applying and implementing various concepts and data structures such as list,tuples and dictionaries.

Course Outcomes:
After completion of the course, learners would be able to:
CO1: Understand the use of software for developing programs in Python
CO2: Apply and Analyzing the concept of functions and strings in Python
CO3: Applying and implementing various concepts and data structures such as list,tuples and dictionaries.

Outline of Syllabus: (per session plan)

Modules	Topics	Duration (Lecture)
Module 1	**Introduction and Use of Software and Basic Programs to implement conditional statements,looping and control statements**	**10**
Module 2	**Programs to implement the concept of functions and strings**	**10**
Module 3	**Programs to implement the concept of Lists,Tuples and Dictionaries**	**10**
Total Lectures		**30**

Reference books:

1. Think Python: How to Think Like a Computer Scientist , 3rd Edition, September 2024 by Allen B. Downey, O'Reilly Media publications.
2. Problem Solving and Python Programming, 1st Edition, September 2017, by Balagurusamy, Publisher McGraw Hill Education
3. Python: The Complete Reference, 4th Edition, March 2018, by Martin C. Brown, McGraw Hill Education publication.

4. **Details of Practical Examination - 50 Marks**

Continuous Assessment	Details	Marks
Component 1 (ICA-1)	Machine Test	30 marks
Component 2 (ICA-2)	Presentations/Project Work/ /Mini project, Etc.	20 marks

Programme: B. Sc. IT (Information Technology)					**Semester : III**		
Course: Mathematics for Information Technology I					**Code :**		
Suggested Lectures per week				**02**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credits**	**Theory**		**Practical**	
				Internal	**External**	**Component 1**	**Component 2**
30	0	**Nil**	**2**	**20 Marks**	**30 Marks**	--	--
Internal Component (Theory Break up)							
Class Test Duration 20 Mins				**Assignments**			
10 Marks				**10 Marks**			
Examination (Duration 1 Hrs)				**Mini Project/Case study/ Field Visit (report to be submitted and certified prior to practical examination)**			
External Component 30 Marks				Total 20 + 30 = 50 Marks			

Learning Objectives:

1. Use axioms of vector spaces (over the real or complex or rational fields) to discuss examples, vector spaces such as subspaces of the space of all polynomials, matrices, function.

2. Able to use the concept of eigenvalues and eigenvectors to solve systems of linear equations, diagonalizing matrices.

3. Understand how inner products are used in orthogonal projections. This involves finding the projection of one vector onto another.

Learning Outcomes:

1. Understand what vectors represent, how they are visualized with arrows, and how basic operations like addition and scalar multiplication are performed.

2. Use of eigenvalues and eigenvectors to solve systems of linear equations by transforming matrices into diagonal form.

3. Understand how inner products are used to find the orthogonal projection of one vector onto another.

Pedagogy: Classroom learning, Presentation.

Module	Module Content	Module wise Pedagogy Used	Duration of Module
I	**Vector Spaces**: Vector spaces and subspaces, Null spaces, column spaces. Linearly dependent and independent sets, Bases and dimension, Coordinate systems, Row echelon form, Rank of matrix.	Classroom learning	10 lectures
II	**Eigen values and Eigen vectors**: Eigen values and Eigen vectors, The characteristic equation, Properties of Eigen values and Eigen vectors, Diagonalization, Similar Matrices.	Classroom learning	10 lectures
III	**Inner product space**: Inner product, length and orthogonality, Orthogonal and Orthonormal sets, Orthogonal Projections, Gram Schmidt Process, Orthonormal bases.	Classroom learning	10 lectures

1. Linear Algebra and its Applications (5th Edition) David C Lay, Steven R. Lay, Judi J. MacDonald Pearson Publication, Fifth Edition, 2016.
2. Elementary Linear Algebra with supplemental Applications, by Howard Anton and others, Wiley Student Edition, Fourth edition.
3. Matrix and Linear Algebra (aided with MATLAB), by Kanti Bhushan Datta, Eastern Economic Edition, Fourth edition.

Details of Continuous Assessment (ICA)- 20 Marks

Continuous Assessment	Details	Marks
Component 1 (ICA-1)	Internal class test (online or offline) Fill in the blanks /Explain the concepts/Answer in brief/Case study or application-based questions.	10 marks
Component 2 (ICA-2)	Presentations/Project Work/ VivaVoce/ Book Review/ Field visit & its presentations/ Documentary filming/ Assignments/ Group Discussions Etc.	10 marks

Details of Semester End Examination (TEE)- 30 Marks

	Particulars	Marks
Module 1	Answer in brief (Any 2 out of 3)	10 marks
Module 2	Answer in brief (Any 2 out of 3)	10 marks
Module 3	Answer in brief (Any 2 out of 3)	10 marks

Teaching Scheme		**Evaluation Scheme**	
Lecture (Hours per week)	**Credit**	**Continuous Assessment (CA) (Marks - 40)**	**Semester End Examinations (SEE) (Marks- 60 in Question Paper)**
3	3	20+20	60

Learning Objectives

1. To analyze IPV4 addressing and subnetworking.
2. To analyze essential networking utilities and packet information of common protocols.
3. To configure IP routing using static routes, RIP, and OSPF.
4. To implement DHCP, DNS, and virtualization in a network.

Learning Outcomes

After completion of the course, learners would be able to:

CLO1: Calculate IPV4 addresses based on subnetting and supernetting

CLO2: Apply different networking commands, routing protocol

CLO3: Configure different networking servers and virtualization.

Outline of Syllabus: (per session plan)

Sr No	**List of Practical**
1	IPv4 Addressing and Subnetting a) Given an IP address and network mask, determine other information about the IP address such as: • Network address • Network broadcast address • Total number of host bits • Number of hosts b) Given an IP address and network mask, determine other information about the IP address such as: • The subnet address of this subnet • The broadcast address of this subnet • The range of host addresses for this subnet • The maximum number of subnets for this subnet mask • The number of hosts for each subnet • The number of subnet bits • The number of this subnet
2	Use of ping and tracert / traceroute, ipconfig / ifconfig, route and arp utilities.
3	Configure IP static routing.
4	Configure IP routing using RIP.

5	Configuring Simple OSPF.
6	Configuring DHCP server and client.
7	Create virtual PC based network using virtualization software and virtual NIC.
8	Configuring DNS Server and client.
9	Configuring OSPF with multiple areas.
10	10. Use of Wireshark to scan and check the packet information of following protocols • HTTP • ICMP • TCP • SMTP • POP3

Reference books:

Behrouz Forouzan A., Data Communication and Networking, 6th Edition, Standard Edition, Tata McGraw Hill, 2022.

Andrew S. Tanenbaum, Nick Feamster, David J. Wetherall, 6th Edition, Standard Edition, Pearson Education, 2022.

Details of Practical Examination - 50 Marks

Continuous Assessment	Details	Marks
Component 1 (ICA-1)	Machine Test	30 marks
Component 2 (ICA-2)	Presentations/Project Work/ /Mini project, Etc.	20 marks

Program: B.Sc. – Information Technology (2024 - 25)		**Semester: IV**	
Course: Networking Technology		**Course Code: NHNET251**	
Teaching Scheme		**Evaluation Scheme**	
Lecture (Hours per week)	**Credit**	**Continuous Assessment (CA) (Marks - 40)**	**Semester End Examinations (SEE) (Marks- 60 in Question Paper)**
3	3	20+20	60

Learning Objectives

1. To understand basic concepts in data communication and networking
2. To equip learners with the fundamental knowledge of network models and transmission media
3. To integrate different OSI model layers and its applications in networking.

Learning Outcomes
After completion of the course, learners would be able to:
CLO1: Understand the concepts of data communication and networking

CLO2: Describe core concepts of network models and different transmission media

CLO3: Explore various OSI model layers and its integration

Outline of Syllabus: (per session plan)

Modules	Topics	Duration (Lecture)
Module 1	**Introduction:** Data communications, networks, network types, Protocols and Standards. **Network Models:** Protocol layering, The OSI model, TCP/IP protocol suite **Introduction to Physical layer:** Transmission media, Signal transmission and encoding, Network performance and transmission impairments, Switching techniques and multiplexing.	**15**
Module 2	**Link layer:** Framing, Error Detection and Correction, Data Link control Medium Access Control and Local Area Networks: Channel allocation, Multiple access protocols, LAN standards, Link layer switches & bridges **Network Layer:** Logical addressing, Basic internetworking (IP, CIDR, ARP, RARP, DHCP, ICMP), Routing, forwarding and delivery, Static and dynamic routing, Routing algorithms and protocols, Congestion control algorithms, IPv6.	**15**
Total Lectures		**45**
Module 3	**Transport Layer:** Process-to-process delivery, Transport layer protocols (UDP and TCP), SCTP, Congestion control **Application Layer:** Domain Name System, World Wide Web and Hyper Text Transfer Protocol, Electronic mail, File Transfer Protocol, Remote login, Network management, Data compression	**15**

Reference books:

Behrouz Forouzan A., Data Communication and Networking, 6th Edition, Standard Edition, Tata McGraw Hill, 2022.

Andrew S. Tanenbaum, Nick Feamster, David J. Wetherall, 6th Edition, Standard Edition, Pearson Education, 2022.

Details of Continuous Assessment (ICA)- 40 Marks

Continuous Assessment	Details	Marks

Component 1 (ICA-1)	Internal class test (online or offline) Fill in the blanks /Explain the concepts/Answer in brief/Case study or application-based questions.	20 marks
Component 2 (ICA-2)	Presentations/Project Work/ VivaVoce/ Book Review/ Field visit & its presentations/ Documentary filming/ Assignments/ Group Discussions Etc.	20 marks

Details of Semester End Examination (TEE)- 60 Marks

	Particulars	**Marks**
Module 1	Answer in brief (Any 4 out of 6)	20 marks
Module 2	Answer in brief (Any 4 out of 6)	20 marks
Module 3	Answer in brief (Any 4 out of 6)	20 marks

Program: B.Sc. – Information Technology (2024 - 25)		**Semester: IV**	
Course: Core Java		**Course Code:**	
Teaching Scheme		**Evaluation Scheme**	
Lecture (Hours per week)	**Credit**	**Continuous Assessment (CA) (Marks - 40)**	**Semester End Examinations (SEE) (Marks- 60 in Question Paper)**
3	3	20+20	60

Learning Objectives:

- Remembering and Understand evolution,features and approach of Java
- Applying and implementing various concepts of Object Oriented Programming in Java.
- Analyzing the Relationships between classes through inheritance and Polymorphism
- Creating different user interfaces with the help of AWT and Graphics

Course Outcomes:
After completion of the course, learners would be able to:
CO1: Remembering and Understand the History and Features of Java.
CO2: Apply and implement the various concepts of OOP in Java
CO3: Analyze and implement the relationships of classes through inheritance and polymorphism
CO4: Will write programs to implement AWT and Graphics programming in Java

Outline of Syllabus: (per session plan)

Modules	Topics	Duration (Lecture)
Module 1		**15**
	Evolution of Java: Java History, Java Features,Comparison of Java with C and C++,Java Support Systems, Java Environment. **Overview of Java : Introduction**, Java Statements, Java Virtual Machine, main(), public, static, void, string[] args, statements, Command Line Arguments in Java**.** **Arrays,Strings and Vectors :** One and two dimensional arrays,Strings,Vectors,Wrapper Classes. **Classes, Objects and Methods in Java :** Defining a Class ,Fields Declaration,Creating Objects,Accessing Class Members,Constructors, Method Overloading, Static Members and Methods	
Module 2		**15**
	Inheritance : Extending a class,Overriding methods,Final variables and methods, Final classes, Finalizer Methods, Abstract Methods and Classes,Visibility Control. Interfaces : Defining Interfaces,Extending Interfaces, Implementing Interfaces,Accessing Interface Variables. Packages : Java API Packages,Using System Packages, Naming Conventions,Creating Pakages,Accessing a Package. Multithreading in Java : Introduction, Creating Thread,Extending the thread class,Life Cycle of a Thread,using Thread methods,Thread Exceptions, Thread Priority,Thread Synchronization,Implementing the Runnable interface.	
Module 3		**15**

	Managing Errors and Exception : Types of Errors,Exceptions,Syntax of Exception Handling cod,Multiple Catch Statements,Using Finally Statement. Applet Programming : Introduction,Applet Life Cycle,creating an excutable applet. Graphics Programming : The Graphics Class,Drawing different Shapes and Charts. Event Handling: Delegation Event Model, Events, Event classes, Event listener interfaces, adapter classes and inner classes. Abstract Window Toolkit: Window Fundamentals, Component, Container, Panel, Window, Frame, Canvas. Components – Labels, Buttons, Check Boxes, Radio Buttons, Choice Menus, Text Fields, Text, Scrolling List, Scrollbars, Panels, Frames Layouts: Flow Layout, Grid Layout, Border Layout, Card Layout.	
Total Lectures		**45**

Reference books:

1. Programming with Java , 7th Edition, November 2023, McGrawHill Publications.
2. Java: The Complete Reference, 13th Edition –February 2024

Details of Continuous Assessment (ICA)- 40 Marks

Continuous Assessment	Details	Marks
Component 1 (ICA-1)	Internal class test (online or offline) Fill in the blanks /Explain the concepts/Answer in brief/Case study or application-based questions.	20 marks

Component 2 (ICA-2)	Presentations/Project Work/ VivaVoce/ Book Review/ Field visit & its presentations/ Documentary filming/ Assignments/ Group Discussions Etc.	20 marks

Details of Semester End Examination (TEE)- 60 Marks

	Particulars	**Marks**
Module 1	Answer in brief (Any 4 out of 6)	20 marks
Module 2	Answer in brief (Any 4 out of 6)	20 marks
Module 3	Answer in brief (Any 4 out of 6)	20 marks

Program: B.Sc. – Information Technology (2024 - 25)		**Semester: IV**	
Course: Core Java Programming Lab		**Course Code:**	
Teaching Scheme		**Evaluation Scheme**	
Lecture (Hours per week)	**Credit**	**Continuous Assessment (CA) (Marks -)**	**Machine Test**
2	1	20	30

Learning Objectives:

- Remembering and Understand the software and syntax of Java ⌜ Applying and implementing various concepts of Object Oriented Programming in Java.
- Analyzing the Relationships between classes through inheritance and Polymorphism \
- Creating different user interfaces with the help of AWT and Graphics

Course Outcomes:

After completion of the course, learners would be able to:

CO1: The learner will be able to install the software and write basic programs

CO2: Apply and implement the various concepts of OOP in Java

CO3: Analyze and implement the relationships of classes through inheritance and polymorphism

CO4: Will write programs to implement AWT and Graphics programming in Java

Outline of Syllabus: (per session plan)		
Modules	**Topics**	**Duration (Lecture)**
Module 1	Introduction and Use of Software and Basic Programs to implement conditional statements,looping and control statements Programs to implement creation of Classes and Objects Programs to implement Arrays,Strings and Vectors	**10**
Module 2	Programs to implement different type of inheritance with visibility scope specifiers. Programs to implement the concept of interfaces and multithreading. Programs to create and use an user defined package.	**10**
Module 3	Programs to implement Graphics Programming Programs to implement AWT components and layouts	**10**
Total Lectures		**30**

Reference books:

1. Programming with Java , 7th Edition, November 2023, McGrawHill Publications.
2. Java: The Complete Reference, 13th Edition –February 2024

Details of Practical Examination - 50 Marks

Continuous Assessment	Details	Marks
Component 1 (ICA-1)	Machine Test	30 marks
Component 2 (ICA-2)	Presentations/Project Work/ /Mini project, Etc.	20 marks

Programme: B. Sc. IT (Information Technology)					**Semester: IV**		
Course: Mathematics for Information Technology II					**Code:**		
Suggested Lectures per week				**02**			
Teaching Scheme				**Evaluation Scheme**			
Lecture	**Practical**	**Tutorial**	**Credits**	**Theory**		**Practical**	
				Internal	**External**	**Component 1**	**Component 2**
30	0	**Nil**	**2**	**20 Marks**	**30 Marks**	NA	NA
Internal Component (Theory Break up)							
Class Test Duration 20 Mins				**Assignments**			
10 Marks				**10 Marks**			

Examination (Duration 1 Hrs)	**Mini Project/Case study/ Field Visit (report to be submitted and certified prior to practical examination)**
External Component 30 Marks	Total 20 + 30 = 50 Marks

Learning Objectives:

1. Learn about iterative methods like bisection method, Newton-Raphson method, and their variations to find approximate solutions for various equations.
2. Apply Euler's method, Taylor's series and Runge-Kutta method to approximate the solution of a first-order differential equation.
3. Understand that numerical integration techniques like the trapezoidal rule and Simpson's rule provide approximate solutions for definite integrals.
4. Able to learn how to use Gaussian elimination, Gauss-Jordan Method, LU Decomposition to solve a system of linear equations represented by a matrix equation Ax = b.

Learning Outcomes:

1.Understand the concept of finding the roots (or zeros) of a function f(x) - the points where the function intersects the x-axis and f(x) = 0.

2. Understand the Euler, Taylor's series, Runge-Kutta method as a numerical approach to approximate solutions of ODEs.

3. Apply Gauss Elimination, Gauss-Jordan Method, LU Decomposition is to solve systems of linear equations represented by Ax = b.

Pedagogy: Classroom learning, Presentation.

Module	Module Content	Module wise Pedagogy Used	Duration of Module
Module I	**Solution of Algebraic and Transcendental Equations**: The Bisection Method, The Method Of False Position, NewtonRaphson Method, The Secant Method **Interpolation**: Forward, Backward & Central Differences, Shift operator, Symbolic Relations and Separation of Symbols, Newton's Formulae For Interpolation, Lagrange's Interpolation Formula, Divided Differences	Classroom learning	10

Module II	**Numerical Differentiation and Integral**: Numerical solution of 1st and 2nd order differential equations: Taylor series, Euler's Method, Modified Euler's Method, Runge-Kutta Method for 3rd and 4nd Order Differential Equations. **Numerical Integration**: Trapezoidal rule, Simpson's 1/3rd, 3/8th rule.	Classroom learning	10
Module III	**Matrices and Linear Systems of Equation:** Matrix Operations, Rank of a Matrix, Consistency of a Linear System of Equations, Gauss Elimination, GaussJordan Method, LU Decomposition.	Classroom learning	10

References:

[1] Introductory method of numerical analysis by S.S Sastry, PHI Leaning Pvt. Ltd. 5th Ed. Year 2012

Details of Continuous Assessment (ICA)- 20 Marks

Continuous Assessment	Details	Marks
Component 1 (ICA-1)	Internal class test (online or offline) Fill in the blanks /Explain the concepts/Answer in brief/Case study or application-based questions.	10 marks
Component 2 (ICA-2)	Presentations/Project Work/ VivaVoce/ Book Review/ Field visit & its presentations/ Documentary filming/ Assignments/ Group Discussions Etc.	10 marks

Details of Semester End Examination (TEE)- 30 Marks

	Particulars	Marks
Module 1	Answer in brief (Any 2 out of 3)	10 marks
Module 2	Answer in brief (Any 2 out of 3)	10 marks
Module 3	Answer in brief (Any 2 out of 3)	10 marks

Program: B.Sc. – Information Technology (2024 - 25)		**Semester: IV**	
Course: Embedded System		**Course Code:**	
Teaching Scheme		**Evaluation Scheme**	
Lecture (Hours per week)	**Credit**	**Continuous Assessment (CA) (Marks - 40)**	**Semester End Examinations (SEE) (Marks- 60 in Question Paper)**
3	3	20+20	60

Learning Objectives:

- To understand concept of embedded systems and their applications in real world
- To understand the core concepts of Embedded Systems
- To understand structure of 8051 microcontroller and Design and development of ES

Course Outcomes:

After completion of the course, learners would be able to:

CO1: Ability to operate, design and program embedded system

CO2: Ability to design mini applications and projects using embedded system.

CO3: Capacity in use, design and developing using 8051

Outline of Syllabus: (per session plan)

Modules	**Topics**	**Duration (Lecture)**
Module 1	**Embedded System – Characteristics, Attributes, Examples**	**15**

	Introduction: Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems **Characteristics and quality attributes of embedded systems:** Characteristics, operational and non-operational quality attributes. **Embedded Systems Application and Domain Specific:** Application specific – washing machine, domain specific - automotive. **Real Time Operating System (RTOS):** Operating system basics, types of operating systems	
Module 2	**Core of embedded systems**	**15**
	microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little-endian processors, Application specific ICs, Programmable logic devices, COTS, Memory organization, sensors and actuators, communication interface, embedded firmware, other system components	
Module 3	**8051 and design and development of ES**	**15**
	8051 Microcontroller Microcontrollers and Embedded processors, Overview of 8051 family. 8051 Microcontroller hardware, Input/output pins, Ports, and Circuits, External Memory. **Design and Development:** Embedded system development Environment – IDE, types of file generated on cross compilation, disassembler/ de-compiler, simulator, emulator and debugging Embedded product development life-cycle, Trends in embedded industry	
Total Lectures		**45**

Reference books:

1. Introduction to embedded systems. Shibu K V, 2017, Second Edition, Tata Mcgraw Hill
2. The 8051 Microcontroller and Embedded Systems, 2007, Second Edition Muhammad Ali Mazidi Pearson –Reprint 2020
3. Embedded Artificial Intelligence: Devices, embedded Systems, and Industrial Applications, Ovidiu Vermesan, Mario Diaz Nava, Bjorn Debabillie, River Publisher, 1st Edition, 2023
4. Embedded System Design: Embedded Systems Foundation of Cyber-Physical Systems, and Internet of Things, Peter Marwedel, 4th Edition, 2021, Springer

Details of Continuous Assessment (ICA)- 40 Marks

Continuous Assessment	Details	Marks

Component 1 (ICA-1)	Internal class test (online or offline) Fill in the blanks /Explain the concepts/Answer in brief/Case study or application-based questions.	20 marks
Component 2 (ICA-2)	Presentations/Project Work/ VivaVoce/ Book Review/ Field visit & its presentations/ Documentary filming/ Assignments/ Group Discussions Etc.	20 marks

Details of Semester End Examination (TEE)- 60 Marks

	Particulars	**Marks**
Module 1	Answer in brief (Any 4 out of 6)	20 marks
Module 2	Answer in brief (Any 4 out of 6)	20 marks
Module 3	Answer in brief (Any 4 out of 6)	20 marks

Program: B.Sc. – Information Technology (2024 - 25)		**Semester: IV**	
Course: Embedded Systems LAB		**Course Code:**	
Teaching Scheme		**Evaluation Scheme**	
Lecture (Hours per week)	**Credit**	**Continuous Assessment (CA) (Marks -)**	**Machine Test**
2	1	20	30

Learning Objectives:

1. To understand the programming of 8051 microcontrollers in C
2. To understand the interfacing of LED using 8051 microcontroller
3. To understand the interfacing of different devices like LCD, 7 segment LED using 8051

Course Outcomes:

1. Ability to develop programs in C using 8051

2. Develop different programs based on interfacing LED

3. Develop programs based on interfacing of different devices like LCD, 7 segment LED using 8051

Outline of Syllabus: (per session plan)

Modules	**Topics**	**Duration (Lecture)**
	Design and develop a reprogrammable embedded computer using 8051 microcontrollers and to show the following aspects. a. Programming b. Execution c. Debugging Configure timer control registers of 8051 and develop a program to generate given time delay. To demonstrate use of general purpose port i.e. Input/ output port of two controllers for data transfer between them.	**10**
	Port I / O: Use one of the four ports of 8051 for O/P interfaced to eight LED's. Simulate binary counter (8 bit) on LED's	**10**

	To interface 8 LEDs at Input-output port and create different patterns. To demonstrate timer working in timer mode and blink LED without using any loop delay routine. Serial I / O: Configure 8051 serial port for asynchronous serial communication with serial port of PC exchange text messages to PC and display on PC screen. Signify end of message by carriage return. To demonstrate interfacing of seven-segment LED display and generate counting from 0 to 99 with fixed time delay. Interface 8051 with D/A converter and generate square wave of given frequency on oscilloscope.	
	Interface 8051 with D/A converter and generate triangular wave of given frequency on oscilloscope. Using D/A converter generate sine wave on oscilloscope with the help of lookup table stored in data area of 8051. Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clock wise direction. Generate traffic signal. Implement Temperature controller. Implement LCD interfacing	**10**
Total Lectures		**30**

Details of Practical Examination - 50 Marks

Continuous Assessment	Details	Marks
Component 1 (ICA-1)	Machine Test	30 marks
Component 2 (ICA-2)	Presentations/Project Work/ /Mini project, Etc.	20 marks