AC: 22/02/2025
Item No. : 1.1.7

SIES (Nerul) College of Arts, Science and Commerce (Autonomous)
Syllabus for Approval
B.Sc (Information Technology)

Sr. No.	Heading	Particulars
1	Title of the Programme	B.Sc Information Technology
2	Year	Second Year
3	Semesters	III
4	Level	UG
5	Pattern	3-4 years & 6-8 semesters Choice Based Grading System
6	Status	New
7	To be implemented from	From Academic year 2025-26 in a progressive manner

* Students who have passed first year in CBCS Non-NEP, need to complete and clear 2 credit course examination per semester as per the equivalence committee guidelines.

Date:22th February, 2025.

Signature:

Dr. Koel Roychoudhury
AC Chairperson

Dr. Meghna Bhatia
Head of the Department

Sri Chandrasekarendra Saraswati Vidyapuram, Plot I-C, Sector V,
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SIES (Nerul) College of Arts, Science and Commerce (Autonomous)

(Affiliated to the University of Mumbai)

RE-ACCREDITED GRADE "A" BY NAAC (3rd CYCLE) BOARD OF STUDIES SYLLABUS FOR

B.Sc. (Information Technology)

(WITH EFFECT FROM THE ACADEMIC YEAR 2025-2026)

OBJECTIVES OF THE PROGRAMME:

- To strengthen the fundamentals and basics of Information Technology and to boost technical development skills.
- To develop the ability to apply the knowledge acquired through analysis of algorithms, mathematical and statistical techniques
- To develop skills to work efficiently in designing solutions to various software and hardware problems by implementing various tools.
- To inculcate professional ethics, and managerial skills to encourage entrepreneurship and promote teamwork to manage diverse projects.
- To enhance employability skills and provide scope for higher education and research in the field of information technology.

B.Sc. Information Technology Programme

(To be implemented from Academic Year- 2025-26)

Semester III			
Course Code	**Course Type**	**Course Title**	**Credit**
U24IT3MJ01	Major	Core Java	3
U24IT3MJP01		Core Java Practical	1
U24IT3MJ02	Major	Advanced Python	3
U24IT3MJP02		Advanced Python Practical	1
U24IT3MJ03	Major	Data Structure	1
U24IT3MJP03		Data Structure Practical	1
U24IT3MI01	Minor	Linear Algebra	2
	OE	To Be Opted from the list	2
U24IT3VSC01	VSC	Transaction Management Systems	1
U24IT3VSCP01		PL/SQL Practicals	1
	AEC	Understanding Basic Forms of English Literature-1(Offered by English Department)	2
U24IT3FP01	FP	Field project	2
U24CC3NSS02	CC	National Service Scheme (NSS) Studies Paper-II	2
U24CC3DLLE02		DLLE - NGO Collaboration	
U24CC3SP02		Sports- Training in Sports	
U24CC3DC01		SIESITDevClub-Learning	
Total			**22**

Open Elective (To be Opted)

Sr. No.	Course Code	Course Name	Credits
1	U24ES3E01	Natural Resource Management(EVS)	2
2	U24MMC3E01	Social Media Marketing (BAMMC)	2
3	U24BE3E01	Introduction to the Indian Economy (Economics)	2
4	U24MS3E01	Personality Development II(BMS)	2
5	U24COM3E01	Advertising and Brand Management -I(BCOM)	2
6	U24IT3E01	Visualization tools for Marketing Research.(IT)	2
7	U24CS3E01	Multimedia and Designing(CS)	2
8	U24ES3E01	Plastics & Environment(EVS)	2
9	U24BI3E01	Basics of Insurance (BBI)	2

Major (Credit 3+1)
Core Java

COURSE CODE: U24IT3MJ01 **COURSE CREDIT: 03**
1 credit - 15 lectures **1 lecture is 60 minutes**

Course Objectives:
The objectives of the Course are:

1. To understand the Object Oriented Principles of Java
2. To provide the knowledge of core programming aspects of Java
3. To understand the new features in Java.
4. To develop solutions using Java.

Course Outcomes:
After successful completion of this course, students would be able to :

1. To develop applications using Java
2. To implement the OOPs principles of Programming
3. To create error free code using the concepts of exception handling, generics and reflections in the program.
4. To create industry level solutions to problems using collections.

Unit	Topic	Hours
I	**Introduction:** History, Features of Java, Java Development Kit, Java Virtual Machine **Fundamental Programming Structures**: Our First Program, Primitive Types, Variables, Arithmetic Operations, Strings, Input and Output, Control Flow, Arrays and Array Lists, Functional Decomposition **Object-Oriented Programming**: Introduction, Class, Object, Static Keywords, Constructors, this keyword, Inheritance, Inner class, Anonymous Inner class, super keyword, Polymorphism (overloading and overriding), Abstraction, Encapsulation, Abstract Classes, Packages	15
II	**Interfaces And Lambda Expressions:** Interfaces, Static, Default, and Private Methods, Examples of Interfaces, Lambda Expressions, Method and Constructor References, Processing Lambda Expressions, Lambda Expressions and Variable Scope **Exceptions:** Introduction, Pre-Defined Exceptions, try-catch, finally, throws, throw, User-Defined Exceptions **Multithreading:** Thread Creations, Thread Life Cycle, Life Cycle Methods, Synchronization, wait() notify() notify all() methods	15
III	**Generic Programming:** Generic Classes, Generic Methods **Collections:** An Overview of the Collections Framework, Iterators, Sets, Maps, Other Collections **Processing Input and Output:**Input/Output Streams, Readers, and Writers	15

Books and References:

1. Core Java SE 9 for the Impatient, 2nd Edition, Cay Horstmann, Addison-Wesley
2. Java 2: The Complete Reference, Fifth Edition, Herbert Schildt
3. Core Java, Volume I: Fundamentals, Twelfth Edition, Cay S. Horstmann, Addison-Wesley

Core Java Practical

COURSE CODE:U24IT3MJP01 **COURSE CREDIT: 01**
1 credit - 15 lectures **1 lecture is 120 minutes**

Course Outcomes:
After completion of the course, a student should be able to:

1. To understand the implementation of foundational Object Oriented Principles in Java
2. To provide the knowledge of Inheritance for reusability of Code.
3. To understand the new features in Java for reducing errors in code.
4. To develop solutions using Java.

Learning Outcomes:
After successful completion of this course, students would be able to :

1. To develop efficient applications using Java using features like Inheritance and Generics.
2. To implement the OOPs principles of Programming.
3. To reduce errors in code using exception handling and reflections.
4. To create industry level solutions to problems using collections.

Sr. No	List of Practicals
1	a. Write a java program to demonstrate Terminal Input and Output in Java. b. Write a java program to demonstrate String Handling. c. Write a java program to demonstrate working with arrays in Java.
2	a. Write a java program to demonstrate Class, Methods and Objects b. Write a java program to demonstrate Encapsulation in Java.
3	a. Write a java program to implement single level inheritance. b. Write a java program to implement multiple inheritance.
4	a. Write a program to create a class and implement the concepts of Constructor Overloading b. Write a program to implement Method Overloading
5	Write a java program to implement method Overriding.
6	a. Write a program to implement the concepts of Abstract classes and methods b. Write a program to implement the concept of interfaces
7	Create a package, Add the necessary classes and import the package in java class.
8	a. Write a java program to demonstrate lambda expressions with Single Parameter. b. Write a java program to demonstrate lambda expressions with multiple Parameters.
9	a. Write a program to demonstrate try catch block and finally. b. Write a program to define user defined exceptions and raise them as per the requirements
10	a. Write a java program to define and implement an Interface. b. Write a java program to demonstrate working with multiple Interfaces.
11	a. Write a java program to implement thread life cycle. b. Write a java program to implement multithreading.
12	Write a java program to demonstrate Generics. a. Class b. Type

	c. Method d. Interface
13	Write a program to demonstrate the methods of: a. List interface b. Set interface c. Map interface
14	a. Write a java program to open a file and display the contents in the console window. b. Write a java program to copy the contents from one file to other file. c. Write a java program to read the student data from user and store it in the file.
15	Write a program to demonstrate BufferedReader and BufferedWriter Class in Java.

Major
Advanced Python (Credit 3+1)

COURSE CODE: U24IT3MJ02
1 credit - 15 lectures

COURSE CREDIT: 03
1 lecture is 60 minutes

Course Objectives:

To learn the basics of object-oriented programming, as well as NumPy and Pandas library usage, data science tools, and data plotting techniques using suitable Python visualization libraries

Course Outcome:

On completing the course, the student will be able to:

1. Understand advanced Python programming concepts and techniques, building on their foundational knowledge.
2. Learn how to use NumPy in Python for data manipulation and numerical computation.
3. Develop the skill of data analysis and manipulation using the panda's library.

UNIT	Topic	HRS
I	**Object Oriented Programming:** Overview of OOP (Object Oriented Programming), Class Definition, Creating Objects, Instances as Arguments, Instances as return values, Built-in Class Attributes, Inheritance, Method Overriding, Data Encapsulation, Data Hiding.	15
II	**Extracting Data:** Connect to Database, creation of Table, insertion of data, Extraction of data.**NumPy**: Introduction to NumPy, NumPy basics, NumPy Attributes and Functions, Creating Arrays from Existing Data, Creating Array from Ranges, Indexing and Slicing in NumPy, Advanced Slicing in NumPy, Append and Resize function, NumPy Matrix Library.	15
III	**Pandas:** Introduction to Pandas, Panda's data structures - Series and Data Frame, Data wrangling using pandas: Loading a dataset into a data frame Selecting Columns from a data frame, Selecting Rows from a data frame, adding new data in a data frame, deleting data from a data frame, data preprocessing using some real time Datasets.**Data Visualization using matplotlib:** Plotting with Matplotlib, Scatter plot, Line plot, Bar plot, Histogram, Box plot.	15

References:

1. Python Made Easy: Step by Step Guide to Programming and Data Analysis using Python for Beginners and Intermediate Level. (2020). (n.p.): Notion Press.
2.Josef, J., Lal, S. P. (2016). Introduction to Computing & Problem Solving With PYTHON.India: Khanna book publishing Company (P) Limited.
3.Jake VanderPlas, "Python Data Science Handbook", 1st Edition, O'Reilly Media Inc., 2016, ISBN: 978-1491912058.

Advanced Python Practicals

COURSE CODE:U24IT3MJP02 **COURSE CREDIT: 01**
1 credit - 15 lectures **1 lecture is 120 minutes**

Sr.No.	List of Practical's
1.	Design a class that stores the information of students and display the same
0.	Implement the concept of inheritance using python
0.	Implement the concept of Method Overriding in Python
0.	Create a class called Numbers, which has a single class attribute called MULTIPLIER, and a constructor which takes the parameters x and y (these should all be numbers). i. Write a method called add which returns the sum of the attributes x and y. ii. Write a class method called multiply, which takes a single number parameter a and returns the product of a and MULTIPLIER.
0.	Design an application on Connection to Database in Python
0.	Design an application on creation of table in Python.
0.	Design a simple database application that stores the records
0.	Design a simple database application that extract the data from database
0.	Implementation of NumPy basics in Python
0.	Implementation of NumPy Arrays
0.	Implementation of Indexing and Slicing in NumPy
0.	Implementation of Pandas Series
0.	Implementation of Pandas Data Frames
0.	Implementation of Programs on Data Preprocessing
0.	Implementation of Data Visualization using matplotlib

Major (Credit 2)
Data Structure

COURSE CODE: U24IT3MJ03 **COURSE CREDIT: 01**
1 credit – 15 lectures **1 lecture is 60 minutes**

Course Objectives :

1. Allow to assess how the choice of data structures and algorithm design methods impacts the performance of programs
2. To choose the appropriate data structure and algorithm design method for a specified application.
3. To solve problems using data structures such as linked lists, stacks, queues.

Course Outcomes: At the end of this course student will:

1. Analyze the concepts of algorithm evaluation and find time and space complexities for searching and sorting algorithms.
2. Implement linear data structure such as stacks, queues, linked lists and their applications.

Sr.No.	Syllabus	No. of lectures
Unit I	**Introduction:**Introduction and Definition of Data Structure, Classification of Data Structures, Primitive Data Types, Abstract Data Types, Data structure vs. File Organization, Operations on Data Structure, Importance of Algorithm Analysis, Complexity of an Algorithm, Asymptotic Analysis and Notations. **Stacks and Queue :-** 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,Introduction to Queue, Definition, Queue Implementation, Operations on the Queue, Circular Queue, De-queue and Priority Queue. **Linked List:** Introduction, Representation and Operations of Linked Lists, Singly Linked List, Doubly Linked List, Circular Linked List, And Circular Doubly Linked List.	15

References:

1. Trembley, J. P. and Soresan, P.G. (1983), An introduction to data structures with applications, Mc-Graw Hill International Editions, ISBN-13: 978-0070651579,ISBN10: 0070651574
2. Horowitz, E., and Sahani, S. (1973), Data Structures :Galgotia publication
3. Aho, Hopcroft, Ulman J.V. (1983), Data Structures and Algorithms, ISBN-13: 9780201000238 ,ISBN-10: 0201000237
4. Nikaulus, W. (1976) Algorithms- Data Structures Programs, ISBN-13: 978130224187, ISBN-10: 0130224189
5. Tannenbaum, A. M. (1995), Data Structures using C and C++; PHI., ISBN-13: 9780130369970,ISBN-10: 0130369977

Data Structures Practicals

COURSE CODE : U24IT3MJP03 **COURSE CREDIT: 01**
1 credit - 15 lectures **1 lecture is 120 minutes**

Course objectives:

- To learn how to program linear data structures.
- To practice basic techniques of algorithm analysis ,recursion techniques To develop ability to write a computer program to solve specified problems.

Course outcome:

Students will be able to-

- Apply and implement learned algorithms, data structures to solve problems.
- Meet the desired programming needs.

(Note : Implement all practical using "C" Language)

Sr.No.	List of Practical
1.	**Implement the following:**
a.	Write a program to store the elements in 1-D array and perform the operations like searching, sorting and reversing the elements. [Menu Driven]
b.	Read the two arrays from the user and merge them and display the elements in sorted order.[Menu Driven]
c.	Write a program to perform the Matrix addition, Multiplication and Transpose Operation. [Menu Driven]
2.	**Implement the following for Stack:**
a.	Write a program to implement the concept of Stack with Push, Pop, Display and Exit operations.
b.	Write a program to convert an infix expression to postfix and prefix conversion.
c.	Write a program to implement Tower of Hanoi problem.
3.	**Implement the following for Queue:**
a.	Write a program to implement the concept of Queue with Insert, Delete, Display and Exit operations.
b.	Write a program to implement the concept of Circular Queue
c.	Write a program to implement the concept of Deque.
4.	**Implement the following for Linked List:**
a.	Write a program to create a single linked list and display the node elements in reverse order.
b.	Write a program to search the elements in the linked list and display the same
c.	Write a program to create double linked list and sort the elements in the linked list.
5.	**Implement the following sorting techniques:**
a.	Write a program to implement bubble sort.
b.	Write a program to implement selection sort.
6.	**Implement the following sorting techniques:**

a.	Write a program to implement insertion sort.
b.	Write a program to implement merge sort.
7.	**Implement the following data structure techniques:**
a.	Write a program to search the element using sequential search.
b.	Write a program to search the element using binary search.
8.	**Implement the following data structure techniques:**
a.	Write a program to create the tree and display the elements.
b.	Write a program to construct the binary tree.
c.	Write a program for inorder, postorder and preorder traversal of tree
9.	**Implement the following data structure techniques:**
a.	Write a program to insert the element into maximum heap.
b.	Write a program to insert the element into minimum heap.
10.	Write a program to implement the collision technique.
11.	Write a program to implement the concept of linear probing.
12.	Write a program to generate the adjacency matrix.
13.	Write a program for the shortest path diagram.
14.	Write a program to implement Breadth First Search.
15.	Write a program to implement Depth First Search.

Minor(Credit 2)
Linear Algebra

COURSE CODE: U24IT3MI01
1 credit - 15 lectures

COURSE CREDIT: 02
1 lecture is 60 minutes

Course Objectives:
Hu

Course Outcome:
The learner will be able to;

1. Appreciate the relevance and applications of Linear Algebra in the field of Information Technology.
2. Express clear understanding of the concept of a solution to a system of equations.
3. Find eigenvalues and corresponding eigenvectors for a square matrix.
4. Understand the concept of linear transformation.

UNIT	Topic	HRS
I	**Vectors in Rn and Cn** Introduction to vectors, Vector addition, Scalar-vector multiplication, Combining vector addition and scalar multiplication, Dictionary-based representations of vectors, Dot-product, Vectors in Rn, Introduction to Complex numbers, Vectors in **Cn.** **Matrices** Matrices, Algebra of matrices, Elementary Transformation, Rank of Matrix, Echelon or Normal Matrix, Singularity of matrix, Inverse of matrix, Linear dependence and linear independence of vectors, System of Linear equation, Gaussian Elimination method.	**15**
II	**Eigenvalues and Eigenvectors** Characteristic Polynomials of degree 2 and 3, Eigenvalues and eigenvectors, Properties of eigenvalues and eigenvectors, Cayley–Hamilton Theorem, Minimal Polynomial. Coordinate representation in terms of eigenvectors, Google PageRank algorithm. **Linear Transformation** Introduction to Linear Transformation, Null space and Range of a Linear Transformation, Matrix Representation of a Linear Transformation.	**15**

References:

1. Coding the Matrix Linear Algebra through Applications to Computer Science, First Edition, Philip N. Klein, Newtonian Press 2013.
2. 2. Schaum's Outline of Linear Algebra, Sixth Edition by Seymour Lipschutz, Marc Lipson, McGraw Hill 2017.
3. Linear Algebra and Its Applications, David C Lay, Pearson Education India; 3rd Edition, 2002.

VSC (Credit 2)
Transaction Management Systems

Course Code: U24IT3VSC01
1 credit - 15 lectures

Course Credit: 1
1 lecture is 60 minutes

Course Objectives:

1. To understand database design by normalization.
2. To explore relational database design and dependencies.
3. To make students aware about importance of protecting data from unauthorized users

Course Outcome:

1. Learners will be able to do database design using all normalization techniques.
2. Learners can implement various dependencies in the database.
3. Learners can explore database recovery management.

UNIT	Topic	HRS
I	**Database Design theory and normalization:** Basics of functional dependencies and normalization ((1NF, 2NF, 3NF, BCNF) for relational databases. Relational database design and further dependencies. **Transaction management and Concurrency:** Control Transaction management: ACID properties, serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management.	15

Text Books

1. "Fundamentals of Database System", Elmasri Ramez, Navathe Shamkant, Pearson Education, Seventh edition, 2017
2. Database Management Systems", Raghu Ramakrishnan and Johannes Gehrke, 3rd Edition, 2014
3. Database Systems: Design implementation and management by Carlos Coronel, Steven Morris, Peter Rob

PL/SQL- Practicals

COURSE CODE: U24IT3VSCP01 **COURSE CREDIT: 01**
1 credit - 30 lectures **1 lecture is 120 minutes**

Sr. No.	List of Practical
1	**PL/SQL Basics** a. Write a PL/SQL program to implement the Use of variables. b. Write executable statement.
2	a.Write a PL/SQL program to Interact with Oracle Server b.Write a PL/SQL program to Create anonymous PL/SQL block
3	**Control Structure in PL/SQL .** **a.**Write a PL/SQL program Using while loop **b.** Write a PL/SQL program to implement Do loop
4	a.Write a PL/SQL program to implement For loop b.Write a PL/SQL program to implement GOTO statement
5	**a. Create conditional statement using PL/SQL** Using if statement **b. Create conditional statement using PL/SQL** Using if else statement
6	**a.** Write a PL/SQL program Using elsif ladder **b.** Write a PL/SQL program Using case expression
7	**Creation of Sequence** Write a PL/SQL program **in PL/SQL**
8	**a. Create cursor in PL/SQL using** Implicit cursor **b. Create cursor in PL/SQL using Explicit Cursor**
9	a. **Create cursor in PL/SQL using** Parameterized cursor b. **Create cursor in PL/SQL using** Cursor for loop
10	**Creation of Procedures in PL/SQL**
11	**Functions in PL/SQL** **a.** Compute and returns the maximum value **b.** Compute factorial of given number
12	a. Write a PL/SQL program to Create Row level trigger b. Write a PL/SQL program to Create Statement level trigger
13	a. Write a PL/SQL program to Create instead of trigger b. Write a PL/SQL program using Conditional trigger
14	**Handling exceptions** **a.** Creation of user defined exception **b.** Creation of system defined exception
15	**Creation of Package in PL/SQL**

Open Elective

Visualization Tools For Marketing Research

Course Code **Course Credit:02**

1 Credit: 15 Lectures **1 Lecture: 60minutes**

Course Objectives:

1. **To provide details of data visualization**
2. **To recognize various data visualization tools**
3. **To recognize Excel for visualization**
4. **To recognize Power BI and Tableau for visualization.**
5. **To compare the data visualization tools.**

Course Outcomes:

After successful completion of this course, students would be able to:

1. **The learners will be able to understand concepts in data visualization.**
2. **The learners will be able to understand the numerous visualization tools.**
3. **The learners will be able to make use of Excel , Power BI and Tableau for visualization.**
4. **The learners will be able to decide the choice of visualization tool.**

Unit I	Introduction To Data Visualization, Advantages of Visualization , Importance of visualization in marketing, techniques for use of data visualization in marketing, Best tools for data visualization in marketing, The Potential of Data Visualization in Marketing,Golden rules of Data Visualization. **Excel As Data Visualization Tool**: Steps to Present Data Visually in Excel, Excel Data Visualization Tool for Analysis,Overlaid Gridlines,Overlaid gridlines with a formula and scatterplot, vertical line, block shading(annual, monthly), broken stacked bars, vertical and horizontal bullet , dot plot, slope, vertical and horizontal scatter, Gantt,heatmap, diverging bars, tile grid map	**15L**

Unit II	**Power BI as Data Visualization Tool:**What is Power BI?, Compare Power BI with Excel and Tableau, downloading and installing Power BI, Importing and Transforming Data in Power BI, building and designing power BI reports,publishing reports to power BI service **Tableau as Data Visualization Tool:** Introduction, Key components of Tableau,Importing Data in Tableau, Joining Datasets in Tableau, What is Tableau Public? Connect to your data,Step Drag and drop to take a first look,Focus your results, Examples-Use for reporting,Use for story telling,Use for Analysis	**15L**

References:

1. **Jon Schwabish, A Step-by-Step Guide to Advanced Data Visualization, 2007 June**
2. **Alberto Ferrari and Marco Russo, Introducing Microsoft Power BI, Microsoft Press Publication,2016**
3. **An Introduction to Analysis and Data Visualization using Tableau Software.,**
4. **Tableau An Introduction,Princeton University**

Revised Scheme of Examination
Faculty of Science
(Undergraduate Programme)

SCHEME OF EXAMINATION (for 100 marks 3 credits)

The scheme of examination shall be divided into two parts:

- **Internal assessment 40% i.e.40 marks**
- **Semester end examination 60% i.e.60 marks**

(A)Internal Assessment 40 marks

Description	Marks
An internal test of 20 marks Q.1 a. Multiple choice Questions - 05 Marks b. True/False - 05 Marks Q.2. Attempt 2 questions out of 3 questions (5 marks each) - 10 Marks OR **Online MCQ test**	20
Presentation/Case Studies/Assignments	15
Attendance and Class Participation	5
Total	40

B) Semester End examination 60 marks

PAPER PATTERN

Duration: 2 hours	
Total Marks:60	
Q.1 15 marks OR 15 marks (7 and 8 marks)-Unit 1	15
Q.2 15 marks OR 15 marks (7 and 8 marks)-Unit 2	15
Q.3 15 marks OR 15 marks (7 and 8 marks)-Unit 3	15
Q.4 15 marks-attempt any 3 out of 6 (from Unit 1, Unit 2, Unit 3)	15
Total	60

Passing criteria: Minimum 40% in Internal (16 out of 40) and 40% (24 out of 60) in semester-end examination.

SCHEME OF EXAMINATION (for 50 marks ,2 credits)

The scheme of examination shall be divided into two parts:

- **Internal assessment 40% i.e.20 marks**
- **Semester end examination 60% i.e.30 marks**

(A)Internal Assessment 20 marks(Theory)

Description	Marks
An internal test of 10 marks Q.1 Multiple choice Questions/True or False - 05 Marks Q.2. Attempt 1 questions out of 2 questions (5 marks each) - 05 Marks OR **Online MCQ test**	10
Presentation/Case Studies/Assignments	05
Attendance and Class Participation	05
Total	20

OR

(A)Internal Assessment 20 marks(Practical)

Description	Marks
Practical Question	10
Journal	05
Viva	05
Total	20

B) Semester End examination 30 marks

PAPER PATTERN

Duration: 1 hour	
Total Marks:30	
Q.1 15 marks OR 15 marks (7 and 8 marks)-Unit 1	15
Q.2 15 marks OR 15 marks (7 and 8 marks)-Unit 2	15
Total	30

OR

PAPER PATTERN(1 credit Theory)

Duration: 1 hour	
Total Marks:30	
Q.1 15 marks OR 15 marks (7 and 8 marks)-Unit 1	15
Q.2 15 marks OR 15 marks (7 and 8 marks)-Unit 1	15
Total	30

Passing criteria: Minimum 40% in Internal (08 out of 20) and 40% (12 out of 30) in semester-end examination.

SCHEME OF PRACTICAL EXAMINATION

(for 50 marks , 1 credit)

Semester end examination 50 marks

PAPER PATTERN

Duration: 2.5 hours	
Total Marks:50	
Q.1 Practical Q1	20

Q.2 Practical Q2	20
Viva	05
Journal	05
Total	50

Passing Standards

The learners to pass a course shall have to obtain a minimum of 40% marks in each head of passing, consisting of Internal Assessment and Semester End Examination. The learners shall obtain a minimum of 40% marks (i.e. 16 out of 40 or 8 Out of 20) in the Internal Assessment and 40% marks in the Semester End Examination (i.e. 24 Out of 60 or 12 Out of 30) separately, to pass the course and a minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.

AC: 22/02/2025
Item No. : 1.1.7

SIES (Nerul) College of Arts, Science and Commerce (Autonomous)
Syllabus for Approval
B.Sc (Information Technology)

Sr. No.	Heading	Particulars
1	Title of the Programme	B.Sc Information Technology
2	Year	Second Year
3	Semesters	IV
4	Level	UG
5	Pattern	3-4 years & 6-8 semesters Choice Based Grading System
6	Status	New
7	To be implemented from	From Academic year 2025-26 in a progressive manner

* Students who have passed first year in CBCS Non-NEP, need to complete and clear 2 credit course examination per semester as per the equivalence committee guidelines.

Date: 22nd **February, 2025.**

Signature:

Dr. Koel Roychoudhury
AC Chairperson

SIES (NERUL) COLLEGE OF ARTS, SCIENCE AND COMMERCE (AUTONOMOUS) NERUL NAVI MUMBAI 400 706.

Dr. Meghna Bhatia
Head of the Department

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SIES (Nerul) College of Arts, Science & Commerce
RISE WITH EDUCATION

CELEBRATING 25 YEARS 1998-2023

SIES (Nerul) College of Arts, Science and Commerce (Autonomous)

(Affiliated to University of Mumbai)

RE-ACCREDITED GRADE "A" BY NAAC (3rd CYCLE)

BOARD OF STUDIES
SYLLABUS FOR
B.Sc (Information Technology)

(WITH EFFECT FROM THE ACADEMIC YEAR 2025-2026)

OBJECTIVES OF THE PROGRAMME:

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- To enhance employability skills and provide scope for higher education and research in the field of information technology.

SIES (NERUL) COLLEGE OF ARTS, SCIENCE AND COMMERCE (AUTONOMOUS)
NERUL NAVI MUMBAI 400 706.

B.Sc. Information Technology Programme

(To be implemented from Academic Year- 2025-26)

Semester IV			
Course Code	**Course Type**	**Course Title**	**Credit**
U24IT4MJ01	Major	Computer Network	3
U24IT4MJP01		Computer Network Practical	1
U24IT4MJ02	Major	Java Web Application Development	3
U24IT4MJP02		Java Web Application Development Practical	1
U24IT4MI01	Minor	Statistical Techniques	3
U24IT4MIP01		Statistical Techniques Practical	1
U24IT4E01	OE	To Be Opted from the list	2
U24IT4SEC01	SEC	Introduction to Software Engineering and Project Management	1
U24IT4SECP01		Introduction to Software Engineering and Project Management Practical	1
U24IT4AEC01	AEC	Understanding Basic Forms of English Literature-2	2
Co-Curricular (To be opted one)			
U24CC4NSS03	CC	NSS-Paper III	4
U24CC4DLLE03		DLLE-SOCIAL WORK PERFORMANCE	
U24CC4SP03		SPORTS- PSYCHOLOGY IN SPORTS AND ADAPTED PHYSICAL EDUCATION	
U24CC4DC02		SIESITDevClub-BackToSociety	
Total			**22**

Open Elective (To be Opted)

Sr. No.	Course Code	Course Name	Credits
1	U24BE4E01	Introduction to International Economics (Economics)	2
2	U24MMC4E01	Photography (BAMMC)	2
3	U24ES4E01	Toxicology and Risk Assessment (EVS)	2
4	U24MS4E01	Digital Marketing Tools (BMS)	2
5	U24COM4E01	Advertising and Brand Management II (Commerce)	2
6	U24BI4E01	Financial Literacy	2
7	U24IT4E01	Marketing Analytics Using Phyton	2
8	U24PT4E01	Packaging Design and Development	2
9	U24CS4E01	Advance Multimedia and Designing	2
10	U24AF4E01	Investment Management	2

Major(Credit 4)
Computer Network

Course Code : U24IT4MJ01 **Course credit: 03**

1 credit - 15 lectures **1 lecture is 60 minutes**

Course Objectives:

1. An understanding of computer networking theory, including principles embodied in the protocols designed for the application layer, transport layer, network layer, and link layer of a networking stack.
2. An understanding of specific implemented protocols covering the application layer, transport layer, network layer, and link layer of the Internet (TCP/IP) stack
3. An understanding of security issues.

Course outcome:

1. To analyze the classification of network services, protocols and architectures.
2. To understand key Internet applications and their protocols.
3. To learn basic concepts of protocols and demonstrates wireless lan.
4. To design and analysis of the routing Protocols.

Sr.No.	Syllabus	No. of Lectures
I	**Introduction:** Computer Network, Evolution of Computer Networks Different types of Computer Network, Difference between LAN, MAN and WAN, Hardware Devices used for Networking: Network Interface Card (NIC), Modem, Hub, Switch L1 and L2 switches, Comparison between switch and hub, Bridge, Router, Gateway. Standards and administration. Network Models: Protocol layering, TCP/IP protocol suite, The OSI model.	15
II	**Introduction to Physical layer:** Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance. **Introduction to the Data Link Layer**: Link layer addressing, Data Link Layer Design Issues, Error detection and correction, block coding **Wireless LANs:** Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks **Network Layer:** IPv4 Addresses, IPv4 Protocol, ARP, ICMP, IPv6	15

III	**Routing:** RIP, OSPF, BGP **Transport Layer:** UDP, TCP **Application Layer:** WWW, HTTP, DNS, SMTP, POP3, MIME, IMAP, DHCP, TELNET, SSH, FTP	15

REFERENCE BOOKS:

1. Computer Communications and Networking Technologies, Michael A. Gallo, William M. Hancock, Cengage Learning.
2. Computer Networks, Bhushan Trivedi, Oxford.
3. Computer Networks: Principles, Technologies and Protocols for Network Design, Natalia Olifer, Victor Olifer, Wiley India.
4. Data Communications and Networking, Behrouz A. Forouzan, Fourth Edition, Tata McGraw Hill.
5. Understanding Communications and Networks, Third Edition, W.A.Shay, Cengage Learning.
6. Computer and Communication Networks, Nader F. Mir, Pearson Education

COMPUTER NETWORK PRACTICAL

COURSE CODE: U24IT4MJP01 **COURSE CREDIT: 01**

1 credit - 15 lectures **1 lecture is 120 minutes**

Sr.No.	List of Practical's
1.	Study of different types of Network cables and practically implement color code for crimping LAN cable.
2.	Study of following Network Devices in Detail
3.	Study of network IP Experiment • Classification of IP address • Subnetting • Super netting
4.	Study the basic networking commands arp, ipconfig, netstat, ARP, ping, trace route etc
5.	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 host
6.	Performing an Initial Switch Configuration.
7.	Performing an Initial Router Configuration.
8.	Configure IP static routing.
9.	Configure IP routing using RIP.
10	Configuring Simple OSPF.
11	Configuring WEP on a Wireless Router
12	Configuring OSPF with multiple areas.
13	Configuring DHCP server and client.
14	Configuring DNS Server and client.
15	Configuring RIP.

Major(4 Credits)
Java Web Application Development

Course Code : U24IT4MJ02 **Course Credit: 03**

1 Credit: 15 Lectures **1 Lecture: 60minutes**

Course Objectives:

- To provide knowledge of web based applications through servlet and jsp.
- To provide understanding and implementation of basic database handling with java
- To use framework in java for handling data and creating web based applications.
- To provide understanding and learning of the basic Spring core.

Course Outcomes:

After successful completion of this course, students would be able to

- Design basic web based applications in java using Servlets and jsp.
- The learner will be able to connect databases with java through Servlets and API .
- The learner will be able to build Hibernate based Web applications.
- The learners will be able to build basic spring Core applications.

Unit	Syllabus	No of Lectures
I	**Java Server Technologies** :Servlet Web Application Basics, Architecture and challenges of Web Application, Introduction to servlet, Servlet life cycle, Developing and Deploying Servlets, Exploring Deployment , Descriptor (web.xml),Using annotations , Handling Request and Response. **Working with Databases**: What is JDBC? JDBC Architecture, Accessing Database, The Servlet GUI and Database Example. **Java Server Pages (JSP):** Life Cycle of a JSP Page, JSP Scripting Elements,JSP Implicit Objects,JSP Directive Elements,JSP Exception Handling,Action Elements	15L
II	**Hibernate** Introduction **Framework** -Introduction,ORM Principle and implementation **Hibernate Architecture** **Hibernate CRUD** -Setting up Project, Configuring JARs, XML files, Setting Connection to DB, Performing CRUD Operations, Object Identity generator type classes, Using SQL with Hibernate, Using HQL, Using Criteria Queries, Create a simple calculator application using servlet. Mapping Collections and Associations, Using Hibernate Annotations	15L

III	**Spring core**: Introduction,Spring Framework,Why use Spring? Advantages of Spring Framework,Core principles of Spring Framework,Features of Spring,Inversion of Control, BeanFactory,ApplicationContext,Dependency Injection,Injecting objects by constructor injection,Setter injection, Dependency injection with Factory/Setter Method, Setter /Constructor injection with Non-string Map, Setter /Constructor injection with Dependent object, Setter /Constructor injection with Collection and Non-string collection, Injecting Literal Values with Setter/Constructor, Spring IoC container, Different ways to create a Spring Bean. Dispatcher Servlet with Spring application.Introduction to Microservices	15L

Java Web Application Development Practical

Course Code : U24IT4MJP02 **Course Credit: 01**

1 Credit: 15 Lectures **1 Lecture: 120 minutes**

Course Objectives:

- To provide knowledge of web-based applications through servlet and jsp.
- To provide understanding and implementation of basic database handling with java
- To use framework in java for handling data and creating web-based applications.
- To provide understanding and learning of the basic Spring core.

Course Outcomes:

After successful completion of this course, students would be able to

- Design basic web-based application in java using Servlets and jsp.
- The learner will be able to connect databases with java through Servlets and API .
- The learner will be able to build Hibernate based Web applications.
- The learners will be able to build basic spring Core applications.

1	Create a simple servlet to print "Hello World" on the web browser window.
2	Create a simple calculator application using servlet.
3	Create a servlet for a login page. If the username and password are correct then it says message "Hello <username>" else a message "login failed"
3	Create a registration servlet in Java using JDBC. Develop a simple JSP application to display values obtained from the use of intrinsic objects of various types.
5	Validate the above created registration .On correct registration details display a welcome page or an error page otherwise.
6	Develop a simple JSP application to display values returned by use of intrinsic objects.
7	Create a registration and login JSP application to register and authenticate the user based on username and password using JDBC.
8	Create a java web application using hibernate technology.
9	Create a java web application using hibernate annotations.

10	Create java web application using HQL
11	Create a simple Spring application which displays "Hello Spring Java method"
12	Create a simple Spring application to display username.
13	Create a simple Spring application to enter user details in the database.
14	Create a simple Spring application to read user login and password details from the database.
15	Create a Spring application for modifying data in the database.

Reference Books:

1. Herbert Schildt, Java The Complete Reference, Eleventh Edition, McGraw-Hill Education, 2020
2. Bryan Basham, Kathy Sierra, Bert Bates, Head First Servlets and JSP, O'reilly (SPD), 2018
3. Cay S. Horstmann, Gary Cornell, Core Java™ 2: Volume II–Advanced Features Prentice Hall PTR, 2004
4. James Elliott, Timothy M. O'Brien, Ryan Fowler , Harnessing Hibernate, O'Reilly Media, Inc, April 2008
5. Madhusudhan Konda, Just Hibernate ,June 2014, O'Reilly Media, Inc.
6. Sachin Malhotra &SaurabhChoudhary,Programming in JAVA, 2nd Ed, Oxford Press, 20
7. Joe Wigglesworth and Paula McMillan, Java Programming: Advanced Topics, Thomson Course Technology
8. Eric Jendrock, Jennifer Ball, D Carson and others, The Java EE 5 Tutorial, Pearson Education The Java Tutorials: http://docs.oracle.com/javase/tutorial/

Minor(Credit 4)
Statistical Techniques (Credit 3)

COURSE CODE: U24IT4MI01 **COURSE CREDIT: 03**

1 credit - 15 lectures **1 lecture is 60 minutes**

Course Objectives:

1. To make learners aware about the different types of data and the use of different measures of central tendency and dispersion wherever relevant.
2. To make learners aware about the techniques to check the Skewness and Kurtosis of data.
3. To make learners enable to find the correlation between different variables and further apply the regression analysis to find the exact relation between them and develop the ability to analyze statistical data through R software.

Course Outcome:

The learner will be able to;

1. Organize, Analyze and present data.
2. Analyze Statistical data using measures of central tendency and dispersion.
3. Develop the relationship between variables using techniques of correlation and regression.

UNIT	Topic	HRS
I	**Data Types:** Attribute, Variable, Discrete and Continuous variable, Univariate and Bivariate distribution, Different types of scales: Nominal, Ordinal, Interval and Ratio. **Data presentation:** Frequency Distribution, Bar Chart, Pie Chart, Histogram, Frequency Polygon, Ogive, Stem-and-leaf Chart. **Measures of Central Tendency:** Concept of Central tendency, characteristics of good measure of central tendency. Arithmetic Mean , Median, Mode, merits, and demerits. Combined mean, Weighted mean, Quartiles, Deciles and Percentiles - examples for ungrouped and grouped data	15
II	**Measures of Dispersion**: Concept of dispersion, Absolute and Relative measure of dispersion,. Range, Semi-interquartile range, Quartile deviation, Standard deviation - Definition, examples for ungrouped and grouped data, merits and demerits. Combined standard deviation, Variance. Coefficient of range, Coefficient of quartile deviation and Coefficient of variation (C.V.) Moments: Concept of Moments, Raw moments, Central moments, Relation between raw and central moments. Measures of Skewness and Kurtosis: Concept of Skewness and Kurtosis, measures based on moments, quartiles.	15

III	**Correlation:** Concept of correlation, Types and interpretation, Measure of Correlation: Scatter diagram and interpretation; Karl Pearson's coefficient of correlation (r): Definition, examples for ungrouped and grouped data, effect of shift of origin and change of scale, properties; Spearman's rank correlation coefficient: Definition, examples of with and without repetition. **Regression:** Concept of dependent (response) and independent (predictor) variables, concept of regression, Types and interpretation, Difference between correlation and regression, Relation between correlation and regression. Linear Regression - Definition, examples using least square method and regression coefficient.	**15**

References:

1. Goon, A. M., Gupta, M. K. and Dasgupta, B. (1983). Fundamentals of Statistics, Vol. 1, Sixth Revised Edition, The World Press Pvt. Ltd., Calcutta.

2. Gupta, S.C. and Kapoor, V.K. (1987): Fundamentals of Mathematical Statistics, S. Chand and Sons, New Delhi

3. Schaum's Outline Of Theory And Problems Of Beginning Statistics, Larry J. Stephens, Schaum's Outline Series McGraw-Hill. 2009

4. Agarwal, B. L. (2003). Programmed Statistics, Second Edition, New Age International Publishers, New Delhi.

Statistical Techniques Practical (Credit 1)

COURSE CODE: U24IT4MIP01
1 credit - 30 lectures

COURSE CREDIT: 01
1 lecture is 60 minutes

Note: The following practicals are to be implemented using R.

Sr.No.	List of Practicals
1	Using R execute the basic commands, array, list and frames.
2	Create a Matrix using R and Perform the operations addition, inverse, transpose and multiplication operations.
3	Using R draw the following: Frequency Distribution, Grouped Frequency Distribution Diagrams and Graphs.
4	Using R Execute the statistical functions:mean, median, mode.
5	Using R import the data from Excel / .CSV file and Perform the above functions.
6	Using R Execute the statistical functions: quartiles, range, inter quartile range.
7	Using R import the data from Excel / .CSV file and Perform the above functions.
8	Using R import the data from Excel / .CSV file and Calculate the standard deviation, variance, co-variance.
9	Using R import the data from Excel / .CSV file and draw the skewness.
10	Using R import the data from Excel / .CSV file and draw the Kurtosis.
11	Using R perform the binomial and normal distribution on the data
12	Perform the Linear Correlation using R.
13	Perform the Linear Regression using R.
14	Compute the Least squares means using R.
15	Compute the Linear Least Square Regression.

Open Elective
Marketing Analytics using Python

COURSE CODE : U24ITOEP01 **COURSE CREDIT: 02**

1 credit - 15 lectures **1 lecture is 60 minutes**

Course Objectives:

- To introduce the fundamentals of marketing analytics using Python and EDA
- To Evaluate and Optimize Marketing Campaigns

Course outcome:

- Students will effectively use Python and key libraries for marketing data analysis and they will acquire data analysis skills
- Students will apply A/B testing, and optimize marketing campaigns using real-world case studies.

Unit	Topic	Hours
1	**Introduction to Marketing Analytics and Python** Introduction to Marketing Analytics: marketing analytics and its significance in modern marketing. Python for Marketing Analytics: Benefits of using Python for marketing data analysis. Brief about Python and essential libraries. **Data Acquisition and Cleaning** Data Sources: Identify common data sources for marketing campaigns (website analytics, social media data, CRM systems).Importing Data: Import data using pandas. Data Cleaning and Wrangling: Handle missing values, outliers, and data inconsistencies. **Exploratory Data Analysis (EDA)** Introduction to EDA: Understand the role of EDA in marketing analytics. Data Visualization: using seaborn and matplotlib. Descriptive Statistics: Calculate key metrics (click-through rates, conversion rates, customer acquisition cost).	15
2	**Customer Segmentation and Targeting** Customer Segmentation: Define segmentation and its benefits. Segmentation Techniques in Python: k-means clustering and RFM analysis. Analyze Customer Behavior: Study customer journeys, touchpoints, and purchase patterns. **Marketing Campaign Analysis** A/B Testing and Attribution: Learn A/B testing concepts and attribution models for campaign effectiveness. Advanced Python Libraries: Use scikit-learn for machine learning models to predict customer behavior and optimize campaigns.	15

Evaluation Pattern

Sr No	Course Assessment	Marks
1	Attendance and class participation	10
2	Presentation of Project	10
3	Develop a comprehensive marketing analytics project using Python to analyze a real-world marketing dataset and present actionable insights.	30

Resources:

Books:

- **Python for Data Analysis** by Wes McKinney (covers core Python libraries like pandas and NumPy)
- **Marketing Analytics** by Wayne L. Winston (marketing analytics fundamentals)
- **Data Science for Business** by Foster Provost and Tom Fawcett (covers data analysis techniques)
- **Hands-On Machine Learning with Scikit-Learn, Keras & TensorFlow** by Aurélien Géron (introduction to machine learning for marketing)
- **Marketing Analytics: A Practical Approach** by Stephan Maximilian Schmid (case studies and applications)

Online Resources:

- **DataCamp:** https://www.datacamp.com/tracks/marketing-analytics-with-python (Interactive tutorials and tracks for marketing analytics with Python)
- **Kaggle:** https://www.kaggle.com/ (Marketing datasets and competitions for practice)
- **Seaborn Documentation:** https://seaborn.pydata.org/ (Seaborn library documentation for data visualization)
- **Scikit-learn Documentation:** https://scikit-learn.org/ (Scikit-learn library documentation for machine learning)
- **Google Analytics Academy:** https://analytics.google.com/analytics/academy/ (Free courses on marketing analytics concepts)
- **Marketing Dive:** https://www.marketingdive.com/ (Articles and resources on marketing trends and best practices)

Skill Enhancement Course

INTRODUCTION TO SOFTWARE ENGINEERING AND PROJECT MANAGEMENT

COURSE CODE: U24I T4SEC01 01

COURSE CREDIT:

1 credit - 15 lectures

1 lecture is 60 minutes

Course Objectives:

1) To introduce and understand the fundamental principles of software engineering and project management.
2) To have a good knowledge of the responsibilities of a project manager.
3) To be familiar with the different methods and techniques used for project management.

Learning Outcome:

Learners will be able to:

1) Apply project management concepts and techniques to a project.
2) Explain project management in terms of the software development process.

Unit	Details	Lectures
I	**Introduction to Software Engineering and Project Management:** Introduction to Software Engineering: Software, Evolving role of software, Project phases and the project life cycle. **Software Process Models:** Waterfall Model, Evolutionary Process Model: Prototype and Spiral Model, Incremental Process model: Iterative approach, RAD, JAD model, Agile Development: Extreme programming, Scrum. **Software Requirement Analysis:** Types of Requirement, Feasibility Study, Requirement Analysis and Design: DFD etc. **Project Scheduling** – Introduction to Project Scheduling – Principles guide for Software Project Scheduling – Work Breakdown Structure (WBS) – Concept of Task network and Scheduling Tool: Timeline Chart (Gantt Chart) Schedule Monitoring Tools - Gantt Chart, PERT and Critical Path.	15

Reference Books:

1. Software Engineering, A Precise Approach: Pankaj Jalote, Wiley India-2010
2. Project Management, Harvey Maylor, Pearson Education, 3rd edition.
3. Projects, Prasanna Chandra, Tata McGraw Hill
4. Project Management- A Managerial Approach", Jack Meredith, Samuel J. Mantel Jr., John Wiley and Sons
5. Project Management – The Managerial Process, Clifford F. Gray& Erik W. Larson, Tata McGraw Hill

INTRODUCTION TO SOFTWARE ENGINEERING AND PROJECT MANAGEMENT PRACTICAL

COURSE CODE: U24IT4SECP01 **COURSE CREDIT: 01**

1 credit - 15 lectures **1 lecture is 120 minutes**

Sr.No.	List of Practical's
1.	Develop and write the complete problem statement for any project.
2.	Develop requirements specification for a given problem.
3.	Draw the entity relationship diagram.
4.	Develop DFD Model (level 0 and level 1 DFD) of the problem.
5.	Develop use case diagrams
6.	Develop activity diagrams to show flow from one activity to another activity.
7.	Design and implement any system through Class Diagram.
8.	Design and implement any system through Object Diagram.
9.	Design and implement any system through Sequence Diagram.
10	Design and implement any system through Collaboration Diagram
11	Write test cases to validate requirements of assigned projects.
12	Use a project management tool such as Use Timeline charts or Microsoft project or Gantt project to track progress of the assigned project.
13	Schedule all the activities and sub-activities using the PERT charts
14	Schedule all the activities and sub-activities using the CPM charts
15	Design the Work Breakdown Structure for the system to be automated.

Revised Scheme of Examination
Faculty of Science
(Undergraduate Programme)

SCHEME OF EXAMINATION (for 100 marks 3 credits)

The scheme of examination shall be divided into two parts:

- **Internal assessment 40% i.e.40 marks**
- **Semester end examination 60% i.e.60 marks**

(A)Internal Assessment 40 marks

Description	Marks
An internal test of 20 marks Q.1 a. Multiple choice Questions - 05 Marks b. True/False - 05 Marks Q.2. Attempt 2 questions out of 3 questions (5 marks each) - 10 Marks OR **Online MCQ test**	20
Presentation/Case Studies/Assignments	15
Attendance and Class Participation	5
Total	40

B) Semester End examination 60 marks

PAPER PATTERN

Duration: 2 hours	
Total Marks:60	
Q.1 15 marks OR 15 marks (7 and 8 marks)-Unit 1	15
Q.2 15 marks OR 15 marks (7 and 8 marks)-Unit 2	15
Q.3 15 marks OR 15 marks (7 and 8 marks)-Unit 3	15
Q.4 15 marks-attempt any 3 out of 6 (from Unit 1, Unit 2, Unit 3)	15
Total	60

Passing criteria: Minimum 40% in Internal (16 out of 40) and 40% (24 out of 60) in semester-end examination.

SCHEME OF EXAMINATION (for 50 marks ,2 credits)

The scheme of examination shall be divided into two parts:

- **Internal assessment 40% i.e.20 marks**
- **Semester end examination 60% i.e.30 marks**

(A)Internal Assessment 20 marks(Theory)

Description	Marks
An internal test of 10 marks Q.1 Multiple choice Questions/True or False - 05 Marks Q.2. Attempt 1 questions out of 2 questions (5 marks each) - 05 Marks OR **Online MCQ test**	10
Presentation/Case Studies/Assignments	05
Attendance and Class Participation	05
Total	20

OR

(A)Internal Assessment 20 marks(Practical)

Description	Marks
Practical Question	10
Journal	05
Viva	05
Total	20

B) Semester End examination 30 marks

PAPER PATTERN

Duration: 1 hour	
Total Marks:30	
Q.1 15 marks OR 15 marks (7 and 8 marks)-Unit 1	15
Q.2 15 marks OR 15 marks (7 and 8 marks)-Unit 2	15
Total	30

OR

PAPER PATTERN(1 credit Theory)

Duration: 1 hour	
Total Marks:30	
Q.1 15 marks OR 15 marks (7 and 8 marks)-Unit 1	15
Q.2 15 marks OR 15 marks (7 and 8 marks)-Unit 1	15
Total	30

Passing criteria: Minimum 40% in Internal (08 out of 20) and 40% (12 out of 30) in semester-end examination.

SCHEME OF PRACTICAL EXAMINATION
(for 50 marks , 1 credit)

Semester end examination 50 marks

PAPER PATTERN

Duration: 2.5 hours	
Total Marks:50	
Q.1 Practical Q1	20
Q.2 Practical Q2	20
Viva	05

Journal	05
Total	50

Passing Standards

The learners to pass a course shall have to obtain a minimum of 40% marks in each head of passing, consisting of Internal Assessment and Semester End Examination. The learners shall obtain a minimum of 40% marks (i.e. 16 out of 40 or 8 Out of 20) in the Internal Assessment and 40% marks in the Semester End Examination (i.e. 24 Out of 60 or 12 Out of 30) separately, to pass the course and a minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.