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 (COMPUTER SCIENCE)
(WITH EFFECT FROM THE ACADEMIC YEAR 2024-2025)

Sr. No.	Heading	Particulars
1	Title of the Programme	B.Sc. (Computer Science)
2	Passing Marks	40%
3	Semesters	III & IV
4	Level	UG
5	Pattern	3-4 years & 6-8 semesters Choice Based Grading System
6	To be implemented from	From Academic year 2024-25 in a progressive manner

Date: 29th June, 2024.

Signature:

Dr. Koel Roychoudhury
AC Chairperson

Dr. Sheeja Ravi
Head of the Department

Semester	Major	Minor	O E	VSC, SEC (VSEC)	AEC, VE C, IKS	OJT, FP, CEP, CC, RP	Cum Cr/ Sem.
IV	DataBase Management System (4 credits) Data Communications and Networking (4 Credits)	Linear Algebra (4 Credits)	Introduction to International Economics / Photography / Financial Literacy / Advertising and Brand Management II (2 credits)	SEC- Basics of Software Development & Testing (2 credits)	AEC- Understanding Basic Forms of English Literature- II (02 Credits)	CC (4 Credits)	22
Total	8	4	2	2	2	4	22

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

Department of Computer Science

NEP Credit Structure for 2024 - 25

Semester	Major	Minor	OE(Any one)	VSC, SEC (VSEC)	AEC, VEC, IKS	OJT, FP, CEP, CC, RP	Cum Cr/ Sem.
III	Operating Systems Principles (4 credits) Adv.Data Structure (4 Credits) Theory Of Computation (2 Credits)	Calculus (02 Credits)	1. Basics of Insurance 2.Introduction to Indian Economy 3.Social Media Marketing (2 credits)	VSC-Fundamentals of Java Programing (2 credits)	AEC-Understanding Basic Forms of English Literature-1 (02 Credits)	Field Project (2 credits) Co-Curricular (2 Credits)	22
Total	10	2	2	2	2	4	22

SCHEME OF MODULES

Semester III			
Serial No.	**Course Code**	**Credits**	**Course Name**
I	**Major Department Specific Course (DSC)**		
1	U24CS3MJ01	03	Operating Systems Principles
2	U24CS3MJP01	01	Practical of Operating Systems Principles
3	U24CS3MJ02	03	Advanced Data Structure
4	U24CS3MJP02	01	Advanced Data Structures Practical
5	U24CS3MJ03	01	Theory Of Computation
6	U24CS3MJP03	01	Theory of Computation Practical
II	**Minor Department Specific Course**		
1	U24CS3MI01	01	Calculus
2	U24CS3MIP01	01	Calculus Practical
III	**Open Electives (OE)/ Generic Electives (Any One)**		
1	U24BI3OE01	02	Basics of Insurance (Dept. of Banking and Insurance)
2	U24MMC3E01	02	Social Media Marketing (Dept. of MMC)
3	U24BE3E01	02	Introduction to Indian Economy (Dept. of Economics)
IV	**VOCATIONAL COURSE (VC) & SKILL ENHANCEMENT COURSE (SEC)**		
1	U24CS3VSC01	01	Fundamentals of Java Programming
2	U24CS3VSCP01	01	Fundamentals of Java Programming Practical
V	**ABILITY ENHANCEMENT COURSE(AEC)/VALUE EDUCATION COURSE(VEC) / INDIAN KNOWLEDGE SYSTEM (IKS)**		
1	U24CS3AEC01	02	Understanding Basic Forms of English Literature-1
VI	**ON JOB TRAINING/ FIELD PROJECT/RESEARCH PROJECT/COMMUNITY EXTENSION PROGRAMME**		
1	U24CS3FP01	02	Field Project
2	U24CS3CC01 U24CC3NSS01 U24CC3DLLE02 U24CC3SP03 SIUEXCC211	02	Tech Community Development I NSS DLLE SPORTS NCC
TOTAL CREDITS		**22**	

MAJOR- Operating Systems Principles

COURSE CODE: U24CS3MJ01   **COURSE CREDIT: 03**

1 credit - 15 lectures

lecture is 60 minutes

Course Objectives:

- To learn basic concepts and structure of operating systems
- To learn about process and synchronization in operating system level
- To learn CPU scheduling algorithms and Memory and File system

management Course Outcomes:

- Work with any type of operating system
- Handle threads, processes, process synchronization
- Implement CPU scheduling algorithms
- Understand the background role of memory management and Design file system

UNIT No	Syllabus	No. of lectures
01	Introduction to Operating-Systems: Definition of Operating System, Operating System's role, Operating-System Operations, Functions of Operating System, Computing Environments Operating-System Structures: Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, Operating-System Structure Processes: Process Concept, Process Scheduling, Operations on Processes, Inter process Communication Threads: Overview, Multicore Programming, Multithreading Models	15
02	Process Synchronization: General structure of a typical process, race condition, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling	15

	Algorithms (FCFS, SJF, SRTF, Priority, RR, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling), Thread Scheduling	
	Deadlocks: System Model, Deadlock Characterization, Methods for	
	Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock	
03	Main Memory: Background, Logical address space, Physical address space, MMU, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table	15
	Virtual Memory: Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing	
	Mass-Storage Structure: Overview, Disk Structure, Disk Scheduling, Disk Management	
	File-System Interface and Implementation: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing, File-System Structure, File-System Implementation, Directory Implementation, Allocation Methods, Free-Space Management	

REFERENCES:

Textbook(s):

1. Abraham Silberschatz, Peter Galvin, Greg Gagne, Operating System Concepts, Wiley, 2021

Additional Reference(s):

1. Achyut S. Godbole, Atul Kahate, Operating Systems, Tata McGraw Hill, 2017
2. Naresh Chauhan, Principles of Operating Systems, Oxford Press, 2014
3. Andrew S Tanenbaum, Herbert Bos, Modern Operating Systems, 4e Fourth Edition, Pearson Education, 2016

Practical of Operating Systems Principles

COURSE CODE   : U24CS3MJP01   COURSE CREDIT: 01

1 credit - 2 lectures

1 lecture is 60 minutes

Note: Practicals 1 to 8 by using Python/ JAVA or any programming language.

Practicals 9 onwards by using Linux Operating System.

Sr. No.	List of Practicals
1	Process Communication: a. Write a program to give a solution to the producer–consumer problem using shared memory. b. Write a program to give a solution to the producer–consumer problem using message passing.
2	Synchronization: a. Write a program to give a solution to the Bounded buffer problem. b. Write a program to give a solution to the readers–writers problem.
3	Write a program that implements FCFS scheduling algorithm.
4	Write a program that implements (with no premption) scheduling algorithm.
5	Write a program that implements RR scheduling algorithm.
6	Write a program that implements the banker's algorithm
7	Write a program that implements the FIFO page-replacement algorithm.
8	Write a program that implements the LRU page-replacement algorithm
9	Installation of Ubuntu Linux operating system. a) Booting and Installing from (USB/DVD)

	b) Using Ubuntu Software center / Using Synaptic c) Explore useful software packages.
10	File System Commands: touch, help, man, more, less, pwd, cd, mkdir, rmdir, ls, find, ls, etc File handling Commands: cat, cp, rm, mv, more, file, wc, od, cmp, diff, comm, chmod, chown, chgrp, gzip and gunzip, zip and unzip, tar, ln, umask,, chmod, chgrp, chown, etc
11	General purpose utility Commands:cal, date, echo, man, printf, passwd, script, who, uname, tty, stty, etc Simple Filters and I/O redirection: head, tail, cut paste, sort, grep family, tee, uniq, tr, etc. Networking Commands: who, whoami, ping, telnet, ftp, ssh, etc Editors: vi, sed, awk
12	Working and Managing with processes- sh, ps, kill, nice, at and batch etc.
13	Shell scripting : Defining variables, reading user input, exit and exit status commands, , expr, test, [], if conditional, logical operators Conditions (for loop, until loop and while loop) arithmetic operations, examples, Redirecting Input / Output in scripts, creating your own Redirection

MAJOR- ADVANCED DATA STRUCTURE

COURSE CODE   : U24CS3MJ02   **COURSE CREDIT: 03**

1 credit - 15 lectures

1 lecture is 60 minutes

COURSE OBJECTIVE:

- To introduce data abstraction and data representation in memory
- To describe, design and use of elementary data structures such as stack, queue, linked list, tree and graph
- How and why different data structures are used for different types of

problems. COURSE OUTCOMES:

Upon successful completion of the course,

- Students will be able to Understand the basic principles and operations of data structures.
- Apply Hashing, Disjoint sets and String Matching techniques for solving problems effectively.
- Apply the concepts of advanced Trees and Graphs for solving problems effectively.
- Analyze the given scenario and choose appropriate Data Structure for solving problems.

Unit No.	SYLLABUS	No of Lectures
I	Threaded Binary Tree - Types of threaded binary tree, advantages and disadvantages. applications. B- Tree - Traversal, operations, applications. B+ tree - Structure, Operations - Insertion Deletion, Searching records, Features of B+ tree, Difference between B+ tree and B tree. Applications of B+ tree. Trees – AVL: Introduction to AVL. Balancing Factor, Insertion, deletion in AVL Trees, Single Rotation, Double Rotation, LL RR Rotation. Applications of Tree like Huffman Coding, Kruskals minimum spanning tree algorithm.	15
II	Priority Queues and Heap: Introduction, Advantages and Disadvantages, Applications, Heaps, Types of heaps, Heapifying the element, Examples	15

		Graph - Breadth First Search or BFS for a graph, Working of BFS Algorithm, Implementation, Complexity analysis, applications. Cycle exists in graph – Undirected Graph Connectivity, Advantages and Disadvantages. Problems on BFS. Depth First Search or DFS for graph - How DFS work, Complexity analysis of DFS. Shortest Path Algorithm - Properties, Algorithms - Bellman - ford, Floyed Warshall algorithm. Single Source Shortest Path Algorithms: Dijkstra's, Advantages & applications.	
III		Hashing: Hash Table ADT, Advantages & Disadvantages, Concept of hashing, hash table, hash functions, collision, collision avoidance techniques, Applications of hashing Disjoint Sets – Equivalence relation, Basic Data Structure, Simple Union and Find algorithms, Smart Union and Path compression algorithm. Managing a partition: a set into disjoint subsets with Quick Union, Find operations, Applications of Disjoint sets with examples.	15

REFERENCES:

Textbooks:

1. Introduction to Algorithm, Thomas H Cormen, PHI
2. Data Structures And Algorithms Made Easy, Narasimha Karumanchi,

2021 Additional References:

1. Fundamentals of Computer Algorithms, SartajSahni and SanguthevarRajasekaran Ellis Horowitz, Universities Press, 2018
2. Data Structures and Algorithms in Python, Michael T. Goodrich, Roberto Tamassia, Michael H. Goldwasser, Wiley, 2016.

ADVANCED DATA STRUCTURES PRACTICAL

COURSE CODE : U24CS3MJP02   **COURSE CREDIT: 01**

1 credit - 15 lectures

1 lecture is 60 minutes

Sr No	List Of Practicals
01	Write a program for Implementation of the Threaded Node.
02	Write a code for Traversal and Searching an element in a B- tree.
03	Write a program for Implementation of the B+ tree. Perform operations like insertion, deletion.
04	Write a program to insert and delete a node in AVL tree.
05	Write a code for implementation of the BFS for graph using Adjacency List.
06	Write a code for implementation of the DFS for graph using Adjacency List.
07	Write a program for Bellman - ford Shortest path algorithm.
08	Write a program for Floyed Warshall Shortest path algorithm.
09	Write a program to implement a Single Source Shortest Path.
10	Write code to Printing Paths in Dijkstra's Shortest Path Algorithm
11	Write a program to create basic Hash Table for insertion, deletion, traversal operations(assume that there are no collisions)
12	Write a program to illustrate the unordered multiset hash function () function And the unordered multiset end() function
13	Write a program to create hash table to handle collisions using overflow chaining

Note: Practical can be implemented using c ++ / Java / Python .

MAJOR- Theory of Computation

COURSE CODE: U24CS3MJ03   **COURSE CREDIT: 01**

1 credit - 15 lectures

1 lecture is 60 minutes

Course Objective:

- To give an overview of the theoretical foundations of computer science from the perspective of formal languages
- To illustrate finite state machines to solve problems in computing
- To explain the hierarchy of problems arising in the computer sciences.
- To familiarize Regular

grammars Course Outcome:

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

- Understand Grammar and Languages
- Learn about Automata theory and its application in Language Design

UNIT No	SYLLABUS	NO OF LECTURES
1	Automata Theory: Defining Automaton, Finite Automaton, Transitions and Its properties, Acceptability by Finite Automaton, Nondeterministic Finite State Machines, DFA and NDFA equivalence, Mealy and Moore Machines. Regular Sets and Regular Grammar: Regular Grammar, Regular Expressions, Finite automata and Regular Expressions, Pumping Lemma and its Applications. Context Free Languages: Context-free Languages, Derivation Tree, Ambiguity of Grammar, CFG simplification, Normal Forms, Pushdown Automata: Definitions, Acceptance by PDA Turing Machines: Turing Machine Definition, Representations, Acceptability by Turing Machines.	15

REFERENCES:

Textbooks:

1. Theory of Computer Science, K. L. P Mishra, Chandrasekharan, PHI,3rd Edition 2019
2. Introduction to Computer Theory, Daniel Cohen, Wiley, 2nd Edition, 2007

3. Introductory Theory of Computer Science, E.V. Krishnamurthy, Affiliated East-West Press, 2009.

Additional References:

1. Theory of Computation, Kavi Mahesh, Wiley India, 2018
2. Elements of The Theory of Computation, Lewis, Papadimitriou, PHI, 2015
3. Introduction to Languages and the Theory of Computation, John E Martin, McGraw- Hill Education, 2010
4. Introduction to Theory of Computation, Michel Sipser, Thomson
5. Introduction to Automata Theory, Languages and Computation, John E. Hopcroft, Pearson Education, 2014.

# Theory of Computation Practical

COURSE CODE: U24CS3MJP03   **COURSE CREDIT: 01**

1 credit - 15 lectures

1 lecture is 60 minutes

Sr. NO	List of Practical
1	Write a program for tokenization of given input
2	Write a program for generating regular expressions for regular grammar
3	Write a program for generating derivation sequence / language for the given sequence of productions.
4	Design a Program for creating machine that accepts three consecutive one.
5	Design a Program for creating machine that accepts the string always ending with 101.
6	Design a program for accepting decimal number divisible by 2.
7	Design a program for accepting decimal number divisible by 3.
8	Design a program for creating a machine which accepts string having equal no. of 1's and 0's.
9	Design a program for creating a machine which count number of 1's and 0's in a given string.
10	Write a program to convert NDFA to DFA
11	Design a program which will increment the given binary number by 1
12	Design a program for the language starting and ending with a and having any combination of b's in between
13	Design a program for the language starting with a but not having consecutive b's
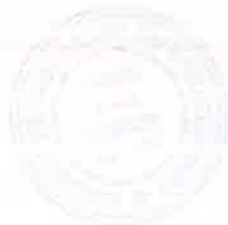
MINOR- Calculus

COURSE CODE: U24CS3MI01   **COURSE CREDIT: 01**

1 credit - 15 lectures

1 lecture is 60 minutes

Course Objective:

- The primary objective of this course is to introduce the basic tools of Calculus which are helpful in understanding their applications to the real world problems. The course is designed to have a grasp of important concepts of Calculus in a scientific way. It covers topics from as basic as definition of functions to partial derivatives of functions in a gradual and logical way. The learner is expected to solve as many examples as possible to a get compete clarity and understanding of the topics covered.

Course Outcome:

- Develop mathematical skills and enhance thinking power of learners.
- Understand mathematical concepts like limit, continuity, derivative, integration of functions, partial derivatives.
- Appreciate real world applications which use the learned concepts. Skill to formulate a problem through Mathematical modelling and simulation.

UNIT NO	SYLLABUS	NO OF Lectures
1	DERIVATIVES AND ITS APPLICATIONS: Review of Basic Concepts: Functions, limit of a function, continuity of a function, derivative function. Derivative In Graphing And Applications: Increase, Decrease, Concavity, Relative Extreme; Graphing Polynomials, Absolute Maxima and Minima, Newton's Method. PARTIAL DERIVATIVES AND ITS APPLICATIONS: Functions of Several Variables: Functions of two or more variables, Limits and Continuity of functions of two or three variables. Partial Derivatives: Partial Derivatives, Differentiability, Differentials, and Local Linearity, Chain Rule, Implicit Differentiation.	15

REFERENCES:

Textbooks:

1. Calculus: Early transcendental (10th Edition): Howard Anton, IrlBivens, Stephen Davis, John Wiley & sons, 2012.

Additional References:

1. Calculus and analytic geometry (9th edition): George B Thomas, Ross L Finney, Addison Wesley, 1995
2. Calculus: Early Transcendentals (8th Edition): James Stewart, Brooks Cole, 2015.
3. Calculus (10th Edition): Ron Larson, Bruce H. Edwards, Cengage Learning, 2013.
4. Thomas' Calculus (13th Edition): George B. Thomas, Maurice D. Weir, Joel R. Hass, Pearson, 2014.

Calculus Practical

COURSE CODE: U24CS3MIP01   **COURSE CREDIT: 01**

1 credit - 15 lectures

1 lecture is 60 minutes

Sr. NO	List of Practical
1	Practical based on Functions of one variable, its domain and range
2	Practical based on Operations on functions.
3	Practical based on Limits of functions of one variable
4	Practical based on Continuity of functions of one variable
5	Practical based on Derivatives of functions of one variable
6	Practical based on Increasing and Decreasing functions
7	Practical based on Concavity and inflection points
8	Practical based on Relative Extrema, Absolute Extrema
9	Practical based on Newton's method to find approximate solution of an equation
10	Practical based on Partial derivatives of functions, First and Second order partial
11	Practical based on Differential for functions of two or three variables
12	Practical based on Chain rule for functions of two or three variables
13	Practical based on Implicit differentiation

VOCATIONAL SKILL COURSE (VSC) - Fundamentals of Java Programming

COURSE CODE: U24CS3VSC01   **COURSE CREDIT: 01**

1 credit - 15 lectures

1 lecture is 60 minutes

Course Objectives:

- To provide insight into java based applications using OOP concepts

UNIT No	Syllabus	No. of lectures
01	Module I Introduction: History, Features of Java, Java Development Kit, Java Application Programming Interface, Java Virtual Machine Java Program Structure, Java Tokens. OOPS: Introduction, Class, Object, Static Keywords, Constructors, this keyword, Inheritance, Inner class, Anonymous Inner class, super keyword, Polymorphism (overloading and overriding), Abstraction, Encapsulation, Abstract Classes, Interfaces Packages: Introduction to predefined packages, User Defined Packages, Access specifiers Exception Handling: 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 Collection Framework: Introduction, java.util Package interfaces, List, Set, Map, List interface & its classes, Set interface & its classes, Map interface & its classes.	15

Textbook:

1. Herbert Schildt, Java The Complete Reference, Eleventh Edition, McGraw-Hill Education, 2020.

References:

1. E. Balagurusamy, Programming with Java- A Primer, Tata McGraw-Hill Education India, 2014
2. Programming in JAVA, 2nd Ed, Sachin Malhotra & Saurabh Choudhary, Oxford Press, 2018

Fundamentals of Java Programming Practical

COURSE CODE: U24CS3VSCP01   **COURSE CREDIT: 01**

1 credit – 15 Lecture

1 lecture 60 minutes

Sr.No	List of Practicals
1	Accept integer values for a, b and c which are coefficients of quadratic equations. Find the solution of the quadratic equation.
2	Accept two n x m matrices. Write a Java program to find addition of these matrices.
3	Accept n strings. Sort names in ascending order.
4	Create a package: Animals. In the package animals create an interface Animal with suitable behaviors. Implement the interface Animal in the same package animals.
5	Demonstrate Java inheritance using extended keywords.
6	Demonstrate method overloading and method overriding in Java
7	Demonstrate creating your own exception in Java
8	a. Write a program to create a class and implement the concepts of Constructor Overloading, Method Overloading, Static methods b. Write a program to implement the concept of Inheritance and Method Overriding
9	a. Write a program to implement the concepts of Abstract classes and methods b. Write a program to implement the concept of interfaces
10	Write a program to define user defined exceptions and raise them as per the requirements
11	Write a program to demonstrate the methods of: a. List interface b. Set interface c. Map interface
12	Write a program for creating threads using Runnable interface Thread class
13	Write a program for creating multiple threads

Field Project

COURSE CODE : U24CS3FP01   **COURSE CREDIT: 02**

1 credit 15 Lecture

1 lecture 60 minutes

The significance of the field project can be appreciated from the fact that it is an opportunity for the students to put into practice the knowledge gained during the entire first and second year. It will help to observe how the principles and concepts are practiced in the workplace. Field project (training) will provide possible opportunities to learn, understand and sharpen the real time technical / managerial skills required at the job / project and will give exposure to the current technological developments relevant to the subject area of training.

The experience gained from the field project will be used in classroom discussions. It will also help the students to identify their areas of interest and various career prospects which will help them to get prepared accordingly.

Guidelines applicable to students who are currently not working

- The students who are currently not working will identify and approach companies / organizations on their own wherein they want to pursue their training according to their area of interest.
- It should be noted that the company / organization must not be a family business.
- The college reserves the right to approve or disapprove the company / organization for training. Hence, students must take prior approval of the same from the College before proceeding on training.

Guidelines applicable to working students

- The students who are working in a company / organization can pursue their training in the same company / organization, subject to approval of the same by the company / organization where they are working.
- In case the students' organization is not allowing them to pursue training with them, the students can pursue their training in any other company / organization if their current company / organization allows and sanctions leave for the same.
- The students can also opt for remote training, wherein they do the training from home, without visiting the company / organization physically, subject to the approval of the concerned company / organization.

Instructions applicable to all students

- The students are required to provide details of the organization (Name of the organization, address, contact person, contact details) in which they are willing to do summer training (field project, Project).
- College will give a request letter to the students for submitting the same to company / organization where they want to pursue training.
- The request / offer letter may be submitted to industries for their willingness for providing the training. On acceptance of the letter, the company / organization will issue a confirmation letter / email to the students for pursuing training which should be submitted to the College.
- The company / organization will provide industry mentors to the students. The mentors will facilitate both the personal and professional growth of the students through knowledge sharing and the provision of insights learned from years of experience.
- Students will submit the training report to the industry/organization at the end of training. The training report should be as per the guidelines mentioned below
- Industry / Organization will issue Training Certificate to the students which should also mention the attendance of the student. The students should submit the training completion certificate along with training report to the College.
- The report will be evaluated as per the rubric parameters mentioned below:

Evaluation Parameters

Parameters	Maximum Marks
On the basis of Project Report	30
Submission of the project report as per prescribed format (10 marks)	
Innovation and applicability of project work (10 Marks)	
Quality of the project work (10 marks)	
On the basis of Viva-voce of the project report	20
The student is well aware with the latest trends of development in the area of project work (10 marks)	
The student is confident and able to answer the queries / questions raised with proper justifications (10 Marks)	
Total Marks	50

Duration of the Project

- The duration of the summer training will be as per the guidelines of regulatory body. It is a course of 2 Credits. Hence, the duration of the summer training must be of 30 hrs.

Instructions for formatting of the report
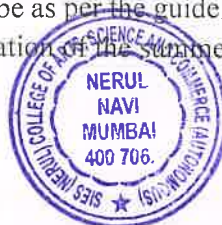
- The report should be prepared on A4 letter size paper.
- The font type should be Times New Roman. The font size should be 14 for headings and 12 for normal text.
- All the headings and subheadings should be in bold and all the other matters should be normal.
- The text should be justified throughout the report except for headings for figures, tables, schemes etc.
- The line spacing should be fixed at 1.5 for the entire report.
- The page numbers should be mentioned at bottom middle position.
- The top, bottom and right margins should be 1" each whereas the left margins should be set at 2.5".
- The chapters should be numbered as Chapter-1, Chapter-2, etc. whereas figures, charts, tables etc. should be numbered as 1.1, 2.1 etc. For example, figure 1.1 corresponds to first figure in chapter- 1.
- The report should be minimum of 40 pages and maximum of 60

pages. Categorization of chapters

The report should be divided into minimum of 3 chapters. The number of chapters can be increased to maximum of 5 depending upon the requirement and nature of the work undertaken by the students. The suggestive guidelines for each chapter are as follows:

- Chapter-1: Chapter-1 should be titled "INTRODUCTION TO THE PROJECT". It should include the objectives, importance and applicability, scope, relevance etc. of the proposed work. This may also include the work plan and the implementation part.
- Chapter-2 or more: Chapter-2 or more chapters can be on the work done by the student during their Summer Training period and achievement of objectives. Each Chapter must be given appropriate title. The tables, figures, schemes etc. should appear in the report as and where they are required with proper labeling.
- Final Chapter: The final chapter should be titled as "CONCLUSION". This chapter may include the summary of the findings and key observations during the project to attain the objectives mentioned in Chapter-1. This chapter should also discuss the future scope and applicability of the outcome of the Summer Training.

Guidelines for writing references

- The references should be written in the last section of the report.
- American Psychological Association (APA)'s 7th edition should be followed to write the citations.
- While writing the reference of a research paper / book / articles / book chapter, following order should be followed
- Surname of the authors and then initials of first and middle names
- year of publication after name

Work-flow of Summer Training

- The students will provide details of the organization in which they are willing to do Field Project.
- College will issue request letter to the students.
- The students will submit organization's confirmation letter / e-mail to college
- The students will report to the organization.
- As per the directions of the HR cell of the organization, they will get acclimatized to the organization's environment.
- The students will get a project allocated with an associated mentor.
- The students will conduct the project under the supervision of a mentor.
- After completion, the students will prepare and submit the report to the college.

Contents of Report

1. Cover Page (as per Annexure – II)
2. Declaration by student (as per Annexure – II)
3. Training completion certificate from organization / Company (as per Annexure – III)
4. Acknowledgement (if any)
5. List of Tables (if any)
6. List of Figures / Charts (if any)
7. List of abbreviations (if any)
8. Chapter - 1 INTRODUCTION TO THE PROJECT
9. Chapter - 2, 3, 4 etc. (if any)
10. Final Chapter - CONCLUSION
11. Reference

Annexure

1 Title

Page

Title of the Project

Font size 18, Line Spacing 1.5

Name of the Organization / Company /

Project A Field Project Report

Submitted in partial fulfilment of the requirements for the

Award of the degree of

(in Times New Roman, <font size14>)

"Name of the Programme"

Fontsize16

By

Student Name

(<in Times New Roman font size 14> bold)

(Enter Seat Number Here)

(in Times New Roman, <font size 14> bold)

Department of Computer Science

SIES (NERUL) COLLEGE OF ARTS, SCIENCE AND COMMERCE

Year

(In Times New Roman <fontsize16> bold)

Annexure - II: Student Declaration

<u>To whom so ever it may concern</u>

I, Name of the student, Registration Number of the student, hereby declare that the work done by me on "Topic of the work" from DD/MM/YYYY to DD/MM/YYYY, is a record of original work for the partial fulfillment of the requirements for the award of the degree, degree name.

Name of the Student (Seat Number)

Signature of the student

Dated:

Certification by the Organization regarding the Field Project

(On the letter head of the Organization)

This is to certify that Mr. / Ms._____has completed
Field Project titled_____under the supervision of
_____ from DD/MM/YYYY to DD/MM/YYYY in our
organization. His / her contribution during this summer training
been_____.

_____

(Authorized Signatory

SCHEME OF MODULES

Sr. No.	Course Code	Credits	Course Name
			Semester IV
I			**Major Department Specific Course (DSC)**
1	U24CS4MJ01	03	DataBase Management System
2	U24CS4MJP01	01	Practical of DataBase Management System
3	U24CS4MJ02	03	Data Communications and Networking
4	U24CS4MJP02	01	Practical of Data Communications and Networking
II			**Minor Department Specific Course**
1	U24CS4MI01	03	Linear Algebra
2	U24CS4MIP01	01	Practical of Linear Algebra
III			**Open Electives (OE)/ Generic Electives (Any One)**
1	U24BE4OE01	02	Introduction to International Economics (Dept. of Economics)
2	U24MMC4OE01	02	Photography (Dept. of MMC)
3	U24BI4OE01	02	Financial Literacy (Dept. of Banking and Insurance)
4	U24COM4E01	02	Advertising and Brand Management II (Dept. of Commerce)
IV			**VOCATIONAL COURSE (VC) & SKILL ENHANCEMENT COURSE (SEC)**
1	U24CS4SEC01	01	Basics of Software Development & Testing
2	U24CS4SECP01	01	Practical of Basics of Software Development & Testing
V			**ABILITY ENHANCEMENT COURSE(AEC)/VALUE EDUCATION COURSE(VEC) / INDIAN KNOWLEDGE SYSTEM (IKS)**
1	U24CS4AEC01	02	Understanding Basic Forms of English Literature- II
VI			**ON JOB TRAINING/ FIELD PROJECT/RESEARCH PROJECT/COMMUNITY EXTENSION PROGRAMME**
1	U24CC4CD01	04	Tech Community Development-II
2	U24CC4NSS01	04	NSS
3	U24CC4DLLE03	04	DLLE
4	U24CC4SP04	04	SPORTS
5	SIUEXCC211	04	NCC
	TOTAL CREDITS	**22**	

SEMESTER IV

MAJOR- Database Management System

COURSE CODE :U24CS4MJ01   **COURSE CREDIT: 03**

1 credit - 15 lectures

1 lecture is 60 minutes

Course Objectives:

- To make students aware fundamentals of database system
- To give idea how ERD components helpful in database design and implementation
- To make students aware about Transaction and concurrency

control Course Outcomes:

- To appreciate the importance of database design
- Analyze database requirements and determine the entities involved in the system and their relationship to one another
- To appreciate the importance of advanced concepts such as deadlock handling.

Unit No.	Syllabus	No. of lecture
1.	**Introduction**: Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Database Design, Database Engine, Database and Application Architecture, Database Users and Administrators, History of Database Systems **Introduction to the Relational Model**: Structure of Relational Databases, Database Schema, Keys, Schema Diagrams. Relational Query Languages. The Relational Algebra	15
2.	**Database Design Using the E-R Model**: Overview of the Design Process, The Entity-Relationship Model, Complex Attributes, Mapping Cardinalities, Primary Key, Removing Redundant Attributes in Entity Sets, Reducing E-R Diagrams to Relational Schemas **Relational Database Design**: Features of Good Relational Designs, Decomposition Using Functional Dependencies, Normal Forms, Functional-Dependency Theory, Algorithms for Decomposition Using Functional Dependencies, Decomposition Using Multivalued Dependencies, More Normal Forms, Atomic Domains and First Normal Form, Database-Design Process, Modeling Temporal Data	15
3.	**Transactions:** Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity,	15

| | Transaction Isolation Levels, Implementation of Isolation Levels, Transactions as SQL Statements

Concurrency Control: Lock-Based Protocols, Deadlock Handling | |

References:

Text Books:

1. "Database System Concepts", Abraham Silberschatz, Henry F. Korth, S. Sudarshan, McGraw Hill, 2017
2. "Database Management Systems", Raghu Ramakrishnan and Johannes Gehrke, 3rd Edition, 2014

Additional References:

1. "Fundamentals of Database System", Elmasri Ramez, Navathe Shamkant, Pearson Education, Seventh edition, 2017
2. "Murach's MySQL", Joel Murach, 3rd Edition, 3rd Edition, 2019
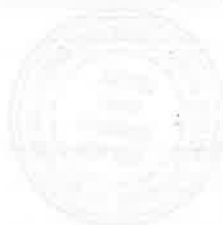
Practical of Database Management Systems

COURSE CODE :U24CS4MJP01 **COURSE CREDIT: 01**

1 credit - 30 lectures

1 lecture is 60 minutes

Sr. No.	List of Practical
1	Perform the Following: Installing MySQL on your machine Creating a Database Creating tables in the database
2	Perform the following: Inserting the records in table Updating the records in table Deleting the records in table
3	Perform the following: Basic SELECT queries Conditional SELECT Queries String matching using SELECT
4	Perform the following Queries using Aggregate function Queries using SET Operations
5	Perform the Following: Nested Subqueries
6	Perform the following: Date Functions String Functions Math Functions
7	Perform the Following:

	Inner Join
	Outer Join
8	Perform the following: Creating Views Dropping views
	Selecting from a view
9	Perform the following Creating index on table
10	Perform the following: Creating roles Grant Statement
	Revoke Statement
11	Perform the following Implementing transactions
12	Perform the following: Create functions and procedures on tables
13	Perform the following: Creating and implementing Triggers

MAJOR- Data Communications and Networking

COURSE CODE :U24CS4MJ02   **COURSE CREDIT: 03**

1 credit - 15 lectures

1 lecture is 60 minutes

Course Objectives:

- To Understand Basic Concepts of Networking.
- To Understand Working of Network Layer Architecture.
- To Learn Practical Implementation of Basic Routing Algorithms and to Learn Different Networking Protocols.

Course Outcomes:

- Learn communication system, network models and components.
- Learn basic networking concepts and layered architecture.
- Understand the concepts of networking, which are important for them to be known as a 'networking professionals'.

UNIT No	Syllabus	No. of lectures
01	Introduction: Networking standards and Administrations, networks, network types – LAN, MAN, WAN. Network Models: The OSI model, TCP/IP protocol suite, Introduction to Physical layer: Data and signals, periodic analog signals, digital signals, transmission impairment, data rate limits, performance. Modulation Techniques Digital transmissions: Digital-to-digital conversion, analog-to-digital conversion, transmission modes Analog transmissions: digital-to-analog conversion, analog-to-analog conversion. Bandwidth Utilization – Multiplexing and Spectrum spreading: Multiplexing, Spread Spectrum Transmission media: Guided Media, Unguided Media Switching: Introduction, Circuit Switched Network, Packet Switching.	15
02	Introduction to Data Link Layer: Link layer addressing, Data Link Layer , Design Issues. Error detection and correction: -Block coding, cyclic codes, checksum, forward error correction, error correcting codes, error detecting codes. Data Link Control: DLC services, data link layer protocols, HDLC, Point-to-point protocol. Media Access Control: Random access, controlled access, channelization, Wired LANs – Ethernet: Ethernet Protocol, standard Ethernet, fast Ethernet, gigabit Ethernet, 10 gigabit Ethernet Wired Network: Telephone Network, Cable Network, SONET, ATM	15

	Wireless LANs: Introduction, IEEE 802.11 project, Bluetooth, WiMAX, Cellular telephony, Satellite networks. Introduction to Network Layer: Network layer services, packet switching, network layer performance, IPv4 addressing, forwarding of IP packets, Network Layer Protocols : Internet Protocol, ICMPv4, Mobile IP		
03	Unicast Routing: Introduction, routing algorithms, unicast routing protocols. Next generation IP: IPv6 addressing, IPv6 protocol, ICMPv6 protocol, transition from IPv4 to IPv6. Introduction to the Transport Layer: Transport Layer Protocol, User Datagram Protocol, Transmission Control Protocol, SCTP. Introduction to Application Layer: Client Server Programming, Iterative Programming. Standard Client-Server Protocols: WWW, HTTP, FTP, Electronic Mail, TELNET, Secure Cell, DNS, SNMP	15	

References:

Textbooks:

1. Data Communications and Networking, Behrouz A. Forouzan, Fifth Edition, TMH, 2018.
1. Computer Network, Andrew S. Tanenbaum, David J. Wetherall, Fifth Edition, Pearson Education, 2018.

Additional References:

1. Computer Network, Bhushan Trivedi, Oxford University Press, 2016
2. Data and Computer Communication, William Stallings, PHI, 2017

Practical of Data Communications and Networking

COURSE CODE :U24CS4MJP02   **COURSE CREDIT: 01**

1 credit - 2 lectures

1 lecture is 60 minutes

Sr. No	List of Practicals
1	Using, linux-terminal or Windows-cmd, execute following networking commands and note the output: ping, traceroute, netstat, arp, ipconfig, Getmac, hostname, NSLookUp, pathping, SystemInfo.
2	Using Packet Tracer, create a basic network of two computers using appropriate network wire. Use Static IP address allocation and show connectivity
3	Using Packet Tracer, create a basic network of One server and two computers using appropriate network wire. Use Dynamic IP address allocation and show connectivity
4	Using Packet Tracer, create a basic network of One server and two computers and two mobile / movable devices using appropriate network wire. Show connectivity
5	Using Packet Tracer, create a network with three routers with RIPv1 and each router associated network will have minimum three PC. Show Connectivity
6	Using Packet Tracer, create a network with three routers with RIPv2 and each router associated network will have minimum three PC. Show Connectivity
7	Using Packet Tracer, create a network with three routers with OSPF and each router associated network will have minimum three PC. Show Connectivity
8	Using Packet Tracer, create a network with three routers with BGP and each router associated network will have minimum three PC. Show Connectivity
9	Using Packet Tracer, create a wireless network of multiple PCs using appropriate access point.
10	Understanding, Reading and Analyzing Routing Table of a network.
11	Implement a sensor network simulation.
12	Create MAC protocol simulation implementation.
13	Simulate Mobile Adhoc Network with Directional Antenna.

MINOR- Linear Algebra

COURSE CODE:U24CS4MI01   **COURSE CREDIT: 03**

1 credit - 15 lectures

1 lecture is 60 minutes

Course Objective:

- To offer the learner the relevant Linear Algebra concepts through Computer Science applications.
- To interpret existence and analyze the solution set of a system of linear equations.
- To formulate, solve, apply, and interpret properties of linear systems.
- To learn about the concept of linear independence of vectors over a field, and the dimension of a vector space.
- To interpret basic concepts of linear transformations, dimension, matrix representation of a linear transformation, and the change of coordinate matrix.

Course Outcome:

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

- Appreciate the relevance and applications of Linear Algebra in the field of Computer Science.
- Understand the concepts through program implementation. Instil a computational thinking while learning linear algebra.
- Express clear understanding of the concept of a solution to a system of equations. Find eigenvalues and corresponding eigenvectors for a square matrix.

Unit	Syllabus	No. of Lectures
1	Field: Introduction to complex numbers, complex numbers in Python, abstracting over fields, Playing with GF (2). Vectors: Vectors are functions, Vector addition, Scalar-vector multiplication, combining vector addition and scalar multiplication, Dictionary-based representations of vectors, Dot-product, Solving a triangular system of linear equations. The Vector Space: Linear combination, Span, The geometry of sets of vectors, Vector spaces, Linear systems, homogeneous and otherwise	15
2	Matrix: Matrices as vectors, Column space and row space, Matrix-vector and vector-matrix multiplication in terms of linear combinations, Matrix-vector multiplication in terms of dot-products, Null space, Computing sparse matrix-vector product, Linear functions, Matrix-matrix	15

	multiplication, Inner product and outer product, From function inverse to matrix inverse.	
	Basis: Coordinate systems, two greedy algorithms for finding a set of generators, Linear dependence, Basis, Unique representation, Change of basis, first look, Computational problems involving finding a basis	
	Gaussian elimination: Echelon form, Gaussian elimination over GF(2), Solving a matrix-vector equation using Gaussian elimination.	
3	Inner Product: The inner product for vectors over the reals, Orthogonality.	15
	Orthogonalization: Projection orthogonal to multiple vectors, projecting orthogonal to mutually orthogonal vectors, Building an orthogonal set of generators, orthogonal complement.	
	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.	

REFERENCES:

Textbooks:

1. Coding the Matrix Linear Algebra through Applications to Computer Science, First Edition, Philip N. Klein, Newtonian Press 2013
2. Schaum's Outline of Linear Algebra, Sixth Edition by Seymour Lipschutz, Marc Lipson, McGraw Hill 2017

Additional References:

1. Linear Algebra and Probability for Computer Science Applications, First Edition, Ernest Davis, A K Peters/CRC Press, 2012.
2. Linear Algebra and Its Applications, Gilbert Strang, Cengage Learning, 4th Edition, 2007
3. Linear Algebra and Its Applications, David C Lay, Pearson Education India; 3rd Edition, 2002
4. Introduction to Information Retrieval, Christopher D. Manning, Prabhakar Raghavan and Hinrich Schütze, Cambridge University Press, 2008.
5. Computer Networking with Internet Protocols and Technology, William Stallings, Pearson Education India, 2013.

Practical of Linear Algebra

COURSE CODE:U24CS4MIP01   **COURSE CREDIT: 01**

1 credit - 15 lectures

1 lecture is 60 minutes

Sr. No.	List of Practical
1	Write a program which demonstrates the following: Addition of two complex numbers Displaying the conjugate of a complex number Plotting a set of complex numbers
2	Write a program which demonstrates the following Creating a new plot by rotating the given number by a degree 90, 180, 270 degrees and also by scaling by a number a = 1/2, a = 1/3, a = 2 etc.
3	Write a program to do the following: Enter a vector u as a n-list Enter another vector v as a n-list Find the vector au + bv for different values of a and b
4	Write a program to find the dot product of u and v
5	Vector Applications: Classify given data using support vector machines (SVM)
6	Basic Matrix Operations: Matrix Addition, Subtraction, Multiplication Check if matrix is invertible. If yes then find Inverse
7	Write a program to convert a matrix into its row echelon form. (Order 2). Write a program to find rank of a matrix.
8	Write a program to do the following: • Find the vector –matrix multiplication of a r by c matrix M with an c-vector u. • Find the matrix-matrix product of M with a c by p matrix N.

9	Basic Matrix Application – I Representation of Image in Matrix Format and Image Transformations
10	Basic Matrix Application – II Perform Image addition and subtraction
11	Write a program to enter a vector b and find the projection of b orthogonal to a given vector u.
12	Write a program to convert a matrix into its row echelon form.
13	Write a program to calculate eigenvalue and eigenvector (Order 2 and 3)

Skill Enhancement (SEC)- Basics of Software Development & Testing

COURSE CODE:U24CS4SEC01   **COURSE CREDIT: 01**

1 credit - 15 lectures

1 lecture is 60 minutes

Course Objectives

- Different Process Models used in software Engineering
- Learning of SRS & UML in software Engineering
- Study fundamental concepts in software testing.
- Understand different levels and types of software

testing. Course Outcomes

- Students will be able to decompose the given project in various phases of a lifecycle.
- Students will be able to choose appropriate process model depending on the user requirements.
- Students will be able perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.

UNIT	Syllabus	No. of lecture
01	Requirement Analysis and System Modeling: Requirements Engineering, Eliciting Requirements, SRS Validation, Components of SRS, Characteristics of SRS, Software Development Life Cycle. Software Project Management: Estimation in Project Planning Process –Software Scope And Feasibility, Resource Estimation, Empirical Estimation Models – COCOMO II, Estimation for Agile Development Software Testing: Verification and Validation, Introduction to Testing, Testing Principles, Testing Objectives, Test Oracles, Levels of Testing, White-Box Testing/Structural Testing, Functional/Black-Box Testing, Test Plan, Test-Case Design	15

References:

Textbooks:

1. Software Engineering, A Practitioner's Approach, Roger S, Pressman

Additional References:

1. Software Engineering, Ian Somerville, Pearson Education
2. Software Engineering: Principles and Practices", Deepak Jain, OXFORD University Press,
3. Fundamentals of Software Engineering, Fourth Edition, Rajib Mall, PHI

Practical of Basics of Software Development & Testing

COURSE CODE :U24CS4SECP01   **COURSE CREDIT: 01**

1 credit - 30 lectures

1 lecture is 60 minutes

Sr. No	List of Practical
1	Development of DFD for the project.
2	To illustrate and use any web testing tools.
3	To illustrate the use of class diagrams.
4	To draw an activity diagram and use case diagram for ATM and Library Management System.
5	Draw Object Diagram for ATM System.
6	Development of State Transition Diagram.
7	Draw ER Diagram for Hospital Management System
8	Prepare a SRS for small project.
9	Functional testing Implementation
10	Study any open source testing tool.
11	Automatic testing Implementation
12	Prepare a Test Plan for grail.
13	Write a Test case for face book, twitter etc

SCHEME OF THEORY & PRACTICALS EXAMINATION

MAJOR- (4 credit)

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
Internal test of 20 marks Multiple choice Questions / True or False - 10 Marks Attempt 2 questions out of 3 questions (5 marks each)- 10 Marks	20
One Project and Viva voce / Presentation / Case studies / Assignments Poster Making / Quiz / Role Play / Subject Specific Activities	15
Attendance and Class behavior	05
Total	40

(B) Semester end examination 60 marks PAPER PATTERN

Duration: 2 hours			
Total Marks: 60			
All Questions are Compulsory			
Question	Based on	Options	Marks
Q. 1	Unit 1	A and B OR P and Q	15
Q. 2	Unit 2	A and B OR P and Q	15
Q. 3	Unit 3	A and B OR P and Q	15
Q. 4	Unit 1,2,3	A and B OR P and Q	15
Total			60

Note:

Q.1, 2, 3 and 4 may be divided into sub questions with internal choice if required.

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

SCHEME OF PRACTICAL EXAMINATION (4 credit)

The scheme of Practical examination shall be

Practical assessment carries 50Marks : 40 marks + 05marks (journal)+ 05 marks(viva)

Minimum 75 % practical are required to be completed and written in the journal. (Certified Journal is compulsory for appearing at the time of Practical Exam)

(A) Practical Assessment 50 marks

Description	Marks
Two questions of practical (20 marks each)	40
Journal	5
Viva	5
Total	50

Passing criteria: Minimum 40% in Practical (20 out of 50)

II. MAJOR & MINOR - (2 credit)

The scheme of examination shall be divided into two parts:

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

Practical Assessment 20 marks

Description	Marks
One question of 10 marks practical	10
Journal	5
Viva	5
Total	20

Semester end examination 30 marks PAPER PATTERN

Duration: 1 hours	
Total Marks: 30	
Description	Marks
Q.1 10 marks OR 10 marks	10
Q.2 10 marks OR 10 marks	10
Q.3 10 marks OR 10 marks	10
Note: 1. Q.1, 2, 3 may be divided into sub questions if required. 2. Q.3 May include theory (short notes) /Case Study in one of the options.	

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

VOCATIONAL COURSE (VSC) & SKILL ENHANCEMENT COURSE(SEC)

The scheme of examination shall be divided into two parts:

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

marks Practical Assessment 20 marks

Description	Marks
One question of 10 marks practical	10
Journal	5
Viva	5
Total	20

B) Semester end examination 30 marks PAPER PATTERN

Duration: 1 hours	
Total Marks: 30	
Description	Marks
Q.1 10 marks OR 10 marks	10
Q.2 10 marks OR 10 marks	10
Q.3 10 marks OR 10 marks	10
Total	30
Note:	
Q.1, 2, 3 may be divided into sub questions if required.	
Q.3 May include theory (short notes) /Case Study in one of the options.	

Passing criteria: Minimum 40% in Internal (8 out of 20) and 40% (12 out of 30) in semester end examination.

SCHEME OF EXAMINATION

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

Description	Marks
Internal tests of 10 marks Q.1 Multiple choice questions/True or False - 05 Marks Q.2. Attempt 1 question out of 2 questions 05 Marks	10
Presentation/Case studies/Assignments/Open book test	05
Attendance and Class behavior	05
Total	20

B) Semester end examination 30 marks

PAPER PATTERN

Duration : 1 hours	
Total Marks: 60	
Q.1 10 marks OR 10 marks	10
Q.2 10 marks OR 10 marks	10
Q.3 10 marks OR 10 marks	10
Total	30
Note:- Q.1,2 and 3 - 10 marks may be divided into sub questions if required.	

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