Khandesh Shikshan Mandal Sanchalit,

Pratap College, Amalner

(Autonomous)

Dist.Jalgaon Maharashtra

DST-FIST assisted College | UGC honored "A College with Potential For Excellence"

NAAC re-arcredated 'A+' Grade with CGPA 3.52 | RUSA Funded

'A+' Grade NAAC Reaccredited (CGPA 3.52)
DST-FIST Assisted College

UGC Honored "A College with Potential for Excellence"

Syllabus for

S. Y. B. SC. COMPUTER SCIENCE

Under New Education Policy-2020

(With effect from June 2025)

Semester-III

	Semester-wise Code structure for B. Sc. (Honors/Research) Computer Science Programme as perNEP2020, w. e. f. – June 2024.											
	B. Sc. (Honors/Research) – Second Year, SEMESTER – III, Level – 5.0											
Subject	Course	Course Type	Course Code	Course Title	Credits	Teaching Hours / Week			Marks			
						T	P	Total	Internal (CA)		External (UA)	
									T	P	T	P
(M-1)	DSC-5	DSC	CS-MJ-221	Data Structure-I	2	2		2	20	---	30	---
	DSC-6	IKS	CS-IKS-232	Vedic Mathematics	2	2		2	20	---	30	---
	DSC-7	DSC	CS-MJP-233	Lab on Data Structure-I	2	-	4	4	--	20	--	30
(M-2)	MIN-1	MIN	CS-MN-236 A	Web Design	2	2		2	20	---	30	---
	MIN-2	MIN	CS-MN-236 B	Introduction to Cyber Security	2	2		2	20	---	30	---
	MIN-3	MIN	CS-MNP-236 C	Lab on Web Design	2	-	4	4	--	20	--	30
OE	OE-3	OE	CS-OE-237	Microsoft Excel: Beginners to Advanced	2	2	--	2	20	--	30	--
SEC	SEC-1	SEC	CS-SEC-234	Object Oriented Programming Using C++	2	2	--	2	20	--	30	--
	SEC-2	SEC	CS-SECP-235	Lab on OOPs Using C++	2	-	4	4	--	20	--	30
AEC	AEC-3	AEC	ENG-213	MIL	2	2	--	2	20	--	30	--
CC	CC-3	CC	CC-III	Select Any ONE from the Basket (A/B/C/D/E/F)	2	2	--	2	20	--	30	--

Semester-IV

	Semester-wise Code structure for B. Sc. (Honors/Research) Computer Science Programme as perNEP2020, for Affiliated Colleges w.e.f. – June 2024.											
	B. Sc (Honors/Research) – Second Year, SEMESTER – IV, Level – 5.0											
Subject	Course	Course Type	Course Code	Course Title	Credits	Teaching Hours / Week			Marks			
						T	P	Total	Internal (CA)		External (UA)	
									T	P	T	P
(M-1)	DSC-8	DSC	CS-MJ-241	Data Structure-II	2	2	--	2	20	--	30	--
	DSC-9	DSC	CS-MJP-243	Lab on Data Structure-II	2	--	4	4	--	20	--	30
(M-2)	MIN-4	MIN	CS-MN-246 A	Introduction to DBMS	2	2	--	2	20	--	30	--
	MIN-5	MIN	CS-MNP-246 B	Lab on DBMS	2	--	4	4	--	20	--	30
OE	OE-4	OE	CS-OE-247	SQL for All	2	2	--	2	20	--	30	--
VC	VC-1	VC	CS-VC-244	Data Base Management Systems (DBMS)	2	2	--	2	20	--	30	--
	VC-2	VC	CS-VCP-245	Lab on DBMS	2	-	4	4	--	20	--	30
AEC	AEC-4	AEC	ENG-223	MIL	2	2	--	2	20	--	30	--
CC	CC-4	CC	CC-IV	Select Any ONE from the Basket (A/B/C/D/E/F)	2	2	--	2	20	--	30	--
FP	Int	CEP	CS-CEP-242	Community Engagement Program	4	--	8	8	--	40	--	60

Semester - III

Course Code: CS-MJ-221

Course Title: Data Structure-I

Course Code: CS-MJ-221	**Course Category:** Core Course (DSC)
Course Title: Data Structure-I	**Type:** Theory
Total Contact Hours: 30 (2/week)	**Course Credits:** 02
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA):** 30 Marks

Course Objectives:

- To understand what data structure is, their needs or uses.
- To understand how to analysis algorithms with respect to time and space
- To understand concept and implementation of operations on data structures Stack, Queue, Link list
- To understand how data structure is applied in various areas.

Course Outcomes:

- To provide knowledge how to analyze algorithm with respect to time and space.
- To provide the knowledge of basic data structures and their implementations.
- To provide the knowledge of applications of data structure in various areas.

Course Content:

Unit 1: Introduction to Data Structure, Algorithm Notations and Analysis of algorithm (08 L, 08 M)

1.1 Introduction to Data Structure,
1.2 Types of data structure
1. Primitive 2.Non Primitive 3.Linear 4. Non linear
1.3 Need of data structure
1.4 Algorithm Notations. a. Format Convention b. Name of Algorithm c. Introductory Comment
d. Steps e. Comments
1.5 Time analysis of an algorithm
1.6 Space analysis of an algorithm

Unit 2: Stacks (07 L, 12 M)

2.1 Definition and concept
2.2 Representations – static
2.3 Operations – push, pop, peep, change
2.4 Applications – infix to postfix, postfix evaluation, Recursion using stack

Unit 3: Queues **(07 L, 12 M)**

3.1 Definition and Concept of Queue
3.2 Representation – static
3.3 Operations- Insert, Delete
3.4 Circular queue : Concept, Operations – insert, delete
3.5 DeQue : Concept
3.6 Priority queues : Concept

Unit 4: Linked List **(08 L, 13 M)**

4.1 Introduction to Linked list
4.2 Implementation of List – Dynamic representation.
4.3 Types of Linked List
    a. Singly Linked list : Operations- Insert, delete
    b. Circular linked list : Operations- Insert, delete
    c. Doubly linked linear list : Operations- Insert, delete
4.4 Applications of linked list – polynomial manipulation

Reference Books:

1. Jean-Paul Trembley, Paul. G. Soresan, An introduction to data structures with applications, Mc-Graw Hill International Editions, ISBN-13: 978-0070651579,ISBN-10: 0070651574
2. Horowitz, Sahani, Data Structures :Galgotia publication
3. Aho, Hopcroft, Ulman, Data Structures and Algorithms, ISBN-13: 978-0201000238 ,ISBN-10: 0201000237
4. Nikaulus wirth, Algorithms- Data Structures Programs, ISBN-13: 978-0130224187,ISBN-10: 0130224189
5. Tannenbaum, Data Structures using C and C++; PHI., ISBN-13: 978-0130369970,ISBN-10: 0130369977
6. Thoms Horbron, -File systems – Structures and Algorithms; PHI. I 7. Bonald Knuth, -Art of Computer Programming Vol. I;, ISBN-13: 978-0201896831,ISBN-10: 9780201896831

Course Code: CS-IKS-232

Course Title: Vedic Mathematics

Course Code: CS-IKS-232	**Course Category:** Core Course (DSC)
Course Title: Vedic Mathematics	**Type: Theory**
Total Contact Hours: 30 (2/week)	**Course Credits:** 02
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA):** 30 Marks

Course Objectives:

- Gain an understanding of the historical and cultural context in which Vedic mathematics developed.
- Learn and apply fundamental Vedic mathematical sutras for addition, subtraction, multiplication, and division.
- Develop the ability to perform mental calculations quickly and accurately using Vedic methods.
- Use Vedic mathematics to solve geometry problems.

Course Outcomes:

- Apply Vedic sutras effectively to perform mental calculations, leading to improved speed and accuracy in arithmetic operations.
- Utilize Vedic methods to simplify geometry and trigonometry problems, enhancing problem-solving skills in these areas.
- Demonstrate ethical mathematical practices, including proper attribution of sources and responsible problem-solving.

Course Content:

Unit 1: Introduction to Vedic Mathematics **(04 L, 08 M)**

1.1 Historical background and significance of Vedic mathematics.

1.2 Overview of Vedic mathematical techniques and sutras.

1.3 Benefits of learning Vedic mathematics.

1.4 Introduction to mental calculation strategies.

Unit 2: Basic Operations **(08 L, 12 M)**

2.1 Addition and subtraction using Vedic sutras.

2.2 Sutra: "Nikhilam Navatashcaramam Dashatah" (All from 9 and the last from 10).

2.3 Multiplication techniques.

2.4 Sutra: "Urdhva-Tiryagbhyam" (Vertically and crosswise).

2.5 Division techniques.

2.6 Sutra: "Paravartya Yojayet" (Transpose and apply).

2.7 Practical exercises and problems involving these operations.

Unit 3: Advanced Multiplication and Division **(12 L, 16 M)**

3.1 Advanced multiplication of numbers with specific patterns.

3.2 Sutra: "Ekadhikena Purvena" (By one more than the previous one).

3.3 Squaring numbers.

3.4 Sutra: "Anurupyena" (Proportionately).

3.5 Finding square roots.

3.6 Sutra: "Shunyam Saamyasamuccaye" (The sum of the same in balance).

3.7 Cube roots and cube calculations.

3.8 Sutra: "Varga Yojayet" (By the completion or non-completion in the square).

Unit 4: Algebraic Techniques **(06 L, 09 M)**

4.1 Solving algebraic equations using Vedic methods.

4.2 Simplifying and factorizing algebraic expressions.

4.3 Applying Vedic mathematics to polynomial and quadratic equations.

4.4 Practical exercises and problem-solving in algebra.

4.5 Using Vedic techniques to solve geometry problems.

4.6 Trigonometric calculations made easier with Vedic methods.

Reference Books:

1. Bharati Krisna Tirthaji, “Vedic Mathematics: Sixteen Simple Mathematical Formulae From The Vedas”,
2. Dhaval Bathia "Vedic Mathematics Made Easy"
3. Kenneth Williams "Vedic Mathematics for All Ages: A Beginner's Guide"

Course Code: CS-MJP-233

Course Title: Lab on Data Structure-I

Course Code: CS-MJP-233	**Course Category:** Core Course (DSC)
Course Title: Lab on Data Structure-I	**Type:** Practical
Total Contact Hours: 60 (4/week)	**Course Credits:** 02
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA):** 30 Marks
Course Objectives: • **To provide the knowledge of basic data structures and their implementations.** • **To understand importance of data structures in context of writing efficient programs.**	
Course Outcomes: • **The course is designed to develop skills to design and implement simple linear and nonlinear data structures and their operations.** • **It strengthens the ability to the students to identify and apply the suitable data structure for the given real-world problem.**	

List of Experiment:

(Note : Implement all practical using 'C++' Language)

1. Write a program to implement Stack operations: push, pop, peep, change,

2. Write a program to convert given infix expression into postfix.

3. Write a program to implement Linear Queue operations : Insert, Delete

4. Write a program to implement Circular queue with its operations: Insert, Delete

5. Write a program to implement singly linked list with operations. i)create ii)insert iii)delete

6. Write a program to implement doubly linked list with operations. i)create ii) insert iii)delete.

Course Code: CS-OE-237

Course Title: Microsoft Excel:Beginners to Advance

Course Code: CS-OE-237	**Course Category:** Open Elective (OE)
Course Title: Microsoft Excel-Excel from Beginner to Advanced	**Type:** Theory
Total Contact Hours: 30 (2/week)	**Course Credits:** 02
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA):** 30 Marks

Course Objectives:

- To learn how to create table, workbook and worksheets.
- To understand how Excel can be used for data management.
- To learn how to create custom data formats and layouts.
- To learn the mathematical formulae and advanced formulae for calculation.
- To understand the concept of filters and sort.

Course Outcomes:

After competing this course, you will be able to:

- Create table, workbook and worksheets.
- To do data management.
- Create custom data formats and layouts
- Use mathematical formulae and advanced formulae for calculation.
- Apply filters and sort to the data.

Course Content:

Unit 1: Workbook and Worksheet Handling (6 L, 8 M)

1.1 Create Worksheets and Workbooks: Create a workbook, Add a worksheet to an existing workbook

1.2. Navigate in Worksheets and Workbooks: Search for data within a workbook, Navigate to a named cell, range, or workbook element, Insert and remove hyperlinks

1.3. Format Worksheets and Workbooks: Insert and delete columns or rows, Adjust row height and column width, Insert headers and footers

Unit 2: Apply Custom Data Formats and Layouts (4 L, 7 M)

2.1. Apply Custom Data Formats and Validation-Create custom number formats, Populate cells by using advanced Fill Series options, Configure data validation

2.2. Apply Advanced Conditional Formatting and Filtering, Create custom conditional formatting rules, Create conditional formatting rules that use formulas, Manage conditional formatting rules

Unit 3: Create Tables and Apply Filter and Sort (4 L, 8 M)

3.1. Create and Manage Tables-Create an Excel table from a cell range, Convert a table to a cell range, Add or remove table rows and columns
3.2. Filter and Sort a Table-Filter records, Sort data by multiple columns, Change sort order, Remove duplicate records

Unit 4: Perform Operations with Formulas and Functions (6 L, 7 M)

4.1. Summarize Data by using Functions-Insert references, Perform calculations by using the SUM MIN and MAX, COUNT, AVERAGE
4.2. Perform Conditional Operations by using the IF , SUMIF, AVERAGEIF, COUNTIF
4.3. Format and Modify Text by using Functions: RIGHT, LEFT, and MID, UPPER, LOWER, PROPER, CONCATENATE.

Unit 5: Create Charts, Objects and Tables (10 L, 15 M)

5.1. Create Charts-Create a new chart, Add additional data series, Switch between rows and columns in source data, Analyze data by using Quick Analysis
5.2. Format Charts-Resize charts, Add and modify chart elements, Apply chart layouts and styles, Move charts to a chart sheet
5.3. Insert and Format Objects-Insert text boxes and shapes, Insert images, Modify object properties, Add alternative text to objects for accessibility
5.4 Create Advanced Charts and Tables-Create and Manage PivotTables- Create PivotTables, slicers, Group PivotTable data
5.5 Create and Manage Pivot Charts-Create PivotCharts- Manipulate options in existing PivotCharts, Apply styles to PivotCharts

Reference Books:

1. Excel 2016 Bible: By John Walkenbach
2. Excel 2016 for Dummies: By Greg Harvey
3. Excel: Quick Start Guide from Beginner to Expert: By William Fischer
4. Power Pivot and Power BI: By Rob Collie and Avichal Singh
5. Excel 2016 from Scratch: By Peter Kalmström
6. Excel Charts: By John Walkenbach

Course Code: CS-SEC-234

Course Title: Object Oriented Programming using C++

Course Code: CS-SEC-234	**Course Category:** SEC-1
Course Title: Object Oriented Programming using C++	**Type:** Theory
Total Contact Hours: 30 (2/week)	**Course Credits:** 02
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA):** 30 Marks

Course Objectives:

- To understand how C++ improves C with object-oriented features.
- To learn how to write inline functions for efficiency and performance.
- To learn the syntax and semantics of the C++ programming language.
- To understand the concept of data abstraction and encapsulation.
- To learn how to overload functions and operators in C++.

Course Outcomes:

After competing this course, you will be able to:

- Understanding OOPs concepts.
- Understanding datatypes, operators and manipulators.
- Use of Functions in C++.
- Understanding the concept of Operator Overloading.

Course Content:

Unit 1: Object Oriented Programming **(10 L, 16 M)**

1.1 What is Object Oriented?
1.2 What is Object Oriented Development?
1.3 Object Oriented Themes
1.4 Principles of OOPS (3H)
1.5 OOPS Paradigm
1.6 Basic Concepts of OOPS
1.7 Benefits and Application of OOPS

Unit 2: Basics of C++ **(6 L, 08 M)**

2.1 Introduction to structure of C++ program
2.2 Header Files
2.3 Access Modifiers

2.4 Tokens, Expressions and Control Structures
2.5 Predefine and User Define Data Types

Unit 3: Classes and Objects **(8 L, 15 M)**

3.1 Simple classes (Class specification, class members accessing),
3.2 Defining member functions
3.3 Passing object as an argument
3.4 Returning object from functions
3.5 Friend functions, friend classes
3.6 Pointer to object
3.7 Array of pointer to object
3.8 Inheritance and Types of Inheritance

Unit 4: Constructors and Destructors **(6 L, 06 M)**

4.1 Introduction
4.2 Default Constructor
4.3 Parameterized Constructor and examples
4.4 Destructors

Reference Books:

1. Object oriented programming with C++, E Balgurusamy, ISBN-10: 9383286504; ISBN-13: 978- 9383286508
2. Programming with C++ D Ravichandran, ISBN, 0070681899, 97800706
3. Programming in C++ by John H Hubbard, ISBN-10: 0071353461
4. Mastering C++ by K Venugopal, Rajkumar, T Ravishankar, ISBN-10/ASIN: 0074634542

Course Code: CS-SECP-235

Course Title: Lab on OOP using C++

Course Code: CS-SECP-235	**Course Category:** SEC-2
Course Title: Lab on OOP using C++	**Type:** Practical
Total Contact Hours: 60 (4/week)	**Course Credits:** 02
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA):** 30 Marks

Course Objectives:

- Implementation of Class and object concept in C++.
- To learn how to write inline functions.
- To learn concept of array of objects
- To learn how to overload functions and operators in C++.

Course Outcomes:

Student will be able to develop C++ program:

Class and object

Inheritances

Array of objects

Overload functions and operators

List of Experiment:

1. Write a C++ program to find factorial of a given number.
2. Write a C++ program to find whether the given number is Armstrong number or not.
3. Write a C++ program to generate prime numbers between the given range.
4. Write a C++ program that demonstrate simple class for following objects

   i) Student Information ii) Employee Information
5. Write a C++ to demonstrate the concept of Friend functions, friend classes
6. Write a C++ to demonstrate the concept of various types of inheritances.
7. Write an object-oriented program to demonstrate constructor overloading.
8. Write an object-oriented program to demonstrate the use of destructor.

Course Code: CS-MN-236 A

Course Title: Web Design

Course Code: CS-MN-236 A	**Course Category: Minor Course (MIN)**
Course Title: Web Design	**Type: Theory**
Total Contact Hours: 30 (2/week)	**Course Credits: 02**
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA): 30 Marks**
Course Objectives: • To introduce the fundamentals of Internet, and the principles of web design. • To construct basic websites using HTML and Cascading Style Sheets.	
Course Outcomes: At the end of the course, student will be able to: • Acquainted with elements, Tags and basic structure of HTML files. • Up skills the knowledge of basic and advanced web designing. • Students were implement effective use of List and Tables. • Students were implement effective web page navigation. • Students were capable to design web page layout • Students were understood and implement use of style sheet.	

Course Content:

Unit 1: –Introduction to Web **(10 L, 12 M)**

Introduction to Internet, Advantages of Internet, Working of Internet, World Wide Web (WWW), Hypertext Transfer Protocol (HTTP), Universal Resource Locator (URL), Introduction to Web Browser and Web server, Introduction to Web page, Static and Dynamic Web page,

Unit 2: Fundamentals of HTML **(10 L, 15 M)**

Introduction to HTML, Basic structure of HTML document, Formatting Text, Font Tags and Attributes, Headings Tags, Image Tag and Attributes, Inserting Audio and Video Files, Marquee Tag and Attributes, List Tag - Ordered List, Unordered List, Definition List, Introduction to Hyperlink, Internal and External Hyperlink, Table Tags & Attributes, Cell Spacing, Cell Padding, Row Span, Col Span

Unit 3: Frame, Frameset and Form **(05 L, 08 M)**

Frame, Frameset, Creating Framesets, Target Frameset, Form Tag and Attributes, Form Elements - Textbox, Text Area, List Box, Radio Button, Checkbox, Submit and Reset Button

Unit 4: Introduction to CSS (05 L, 10 M)

Basic of CSS, Advantages of CSS, Role of CSS in Web Designing, CSS Structure and Syntax, Types of CSS – Inline CSS, Internal CSS, External CSS, CSS Selector - Selectors and declarations, Types of Selectors - Element Selector, Class Selector, ID Selector, Child Selector, Universal Selector, Group Selector.

Reference Books:

- Textbook of Web Designing By Joel Sklar, Cengage Learning Publication 2009
- Web designing in Nut Shell (Desktop Quick Reference) by Jennifer Niederst Publication O'Reilly publication
- Designing web navigation by James Kalbach Publication – O'Reilly publication
- Textbook of Web Designing By Joel Sklar, Cengage Learning Publication 2009 ISBN, 1423901940

Course Code: CS-MN-236 B

Course Title: Introduction to Cyber Security

Course Code: CS-MN-236 B	**Course Category: Minor Course (MIN)**
Course Title: Introduction to Cyber Security	**Type: Theory**
Total Contact Hours: 30 (2/week)	**Course Credits: 02**
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA): 30 Marks**

Course Objectives:

- Introduce fundamental concepts of the cyber world including key terms, digital ecosystems, and the roles of various electronic communication and transaction models (EDI, E-Governance, E-Commerce).
- Provide comprehensive knowledge of cyber crimes, their categories, and common threats such as viruses, hacking, phishing, and cyber terrorism to raise awareness of potential digital risks.
- Familiarize students with cyber laws and security mechanisms, focusing on legal frameworks, data protection strategies, digital signatures, and compliance with information security standards.
- Explain the concept and importance of Intellectual Property Rights (IPR) in the digital domain, including copyright issues and the provisions of the Information Technology Act related to content protection.
- Develop an understanding of key cybersecurity practices and tools, including encryption, cryptography, biometric authentication, and firewalls, essential for safeguarding digital information.

Course Outcomes: At the end of the course, student will be able to:

- Define and explain key concepts and terminology of the cyber world, including cyber space, EDI, E-governance, and various E-commerce models such as B2B, B2C, and G2C.
- Identify and categorize various types of cybercrimes, such as hacking, phishing, cyber stalking, and e-fraud, and describe the associated threats and their impacts on digital systems and society.
- Interpret the basic principles and significance of cyber laws, including copyright issues, digital signatures, and legal frameworks governing information security and online behavior.
- Apply fundamental cyber security techniques such as data encryption, cryptography, biometric authentication, and use of firewalls to protect digital assets and information systems.

- Recognize the importance of Intellectual Property Rights (IPR) in the digital environment and describe the legal protections under the Information Technology Act related to copyright infringement and content rights.

Course Content:

Unit 1:- Basic Terms and Introduction (05 L, 06 M)

Cyber world, Cyber Space, Cybernetics, Electronic Data Interchange (EDI), E–governance, E–commerce, B2B, B2C, & C2B, C2C, G2B (Government to Business), G2C (Government to Citizens)

Unit 2:- Cyber Crime (10 L, 09 M)

Concept of Cyber Crimes – Categories of Cybercrime, Types of Cybercrimes, Viruses, worms, software piracy, Web jacking, Web Defacement, Cyber Stalking, Cyber Pornography, Hacking, Phishing, e-fraud, threatening email, Cyber Terrorism.

Unit 3:- Cyber Laws and Security (10 L, 12 M)

Introduction to Cyber Law, Definition, Objective of Cyber Law – Need and Scope, Copyright issues in Cyberspace, Data encryption, Cryptography, Digital Signatures, Password, Encrypted smart card, Bio-metric, firewall, Information Security Management System and other Security Compliances.

Unit 4:- Intellectual Property Rights (05 L, 08 M)

Introduction, Objective of copyright, Requirement and meaning of copyright, Copyright as bundle of rights, Framing, Linking and infringement, Information technology act related to copyright

Reference Books:

1) Cyber Laws Dr Gupta &Agrawal , Premier publishing Company

2) VivekSood , “Cyber Law simplified”, ISBN: 9780070435063,Tata MaGraw-Hill

3) S.R. Sharma , “Nature of Cyber Laws”, ISBN: 9788126115402, Anmol Publications

4) S.R. Sharma , “Dimensions of Cyber Crime”,ISBN: 9788126115419 , Anmol Publications

Course Code: CS-MNP-236 C

Course Title: Lab on Web Design

Course Code: CS-MNP-236 C	**Course Category: Minor Course (MIN)**
Course Title: **Lab on Web Design**	**Type: Practical**
Total Contact Hours: 60 (4/week)	**Course Credits: 02**
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA): 30 Marks**
Course Objectives: • To introduce the fundamentals of Internet, and the principles of web design. • To construct basic websites using HTML and Cascading Style Sheets.	
Course Outcomes: At the end of the course, student will be able to: • Students were able to design consistent look and feel web pages. • Students were capable to use multimedia in web page. • Students were implement effective web page navigation. • Students were capable to design web page layout • Students were implement use of style sheet.	

List of Experiment:

1. Create web page using basic HTML tags.
2. Create Web page with different Images and Marquee Tag.
3. Create a web page using different List tag.
4. Create web page using Anchor Tag (Internal Link and External Link)
5. Create web page to design time table of your college using Table tag.
6. Create web page inserting audio and video files.
7. Design a web page using Frames and Frameset Tag.
8. Design webpage of College Admission Form.
9. Design a web page using Inline, Internal and External CSS

Semester IV

Course Code: CS-MJ-241

Course Title: Data Structure-II

Course Code: CS-MJ-241	**Course Category:** Core Course (DSC)
Course Title: Data Structure-II	**Type:** Theory
Total Contact Hours: 30 (2/week)	**Course Credits:** 02
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA):** 30 Marks

Course Objectives:

- To understand concept and implementation of operations on data structure Tree, Graph
- To understand concept and implementation of various sorting techniques.
- To understand concept and implementation of various searching techniques.

Course Outcomes:

- To provide knowledge how to analyze algorithm with respect to time and space.
- To provide the knowledge of data structures tree and graph with their implementations.
- To provide the knowledge about applications of data structure like graph and tree in various areas.
- To provide the knowledge of various sorting and searching techniques and their applications in various areas.

Course Content:

Unit 1: Tree **(08 L, 12 M)**

1.1 Definition and Concept of tree
1.2 Binary tree
1.3 Storage representation and Manipulation of Binary trees
  a. Sequential Storage representation of Binary Tree
  b. Linked Storage representation of Binary Tree
  c. Threaded storage representation of Binary Tree
1.4 Operations on Binary tree - Traversing

Unit 2: Graph **(07 L, 10 M)**

2.1 Definition and Concept
2.2 Matrix representation of graph
2.3 List Structures
2.4 Multi list representation of Graph

2.5 Traversal of graph: Breadth First Search and Depth First search
2.6 Applications of graph

Unit 3: Sorting **(08 L, 13 M)**

3.1 Introduction
3.2 Sorting Techniques:
3.2.1 Selection Sort
3.2.2 Insertion sort
3.2.3 Bubble Sort
3.2.4 Merge Sort
3.2.5 Quick Sort

Unit 4: Searching Techniques **(07 L, 10 M)**

4.1 Sequential Searching
4.2 Binary searching
4.3 Hash Table Method
4.3.1 Introduction
4.3.2 Hashing Function
4.3.3 Collision Resolution Technique

Reference Books:

1. Jean-Paul Trembley, Paul. G. Soresan, An introduction to data structures with applications, Mc-Graw Hill International Editions, ISBN-13: 978-0070651579,ISBN-10: 0070651574
2. Horowitz, Sahani, Data Structures :Galgotia publication
3. Aho, Hopcroft, Ulman, Data Structures and Algorithms, ISBN-13: 978-0201000238 ,ISBN-10: 0201000237
4. Nikaulus wirth, Algorithms- Data Structures Programs, ISBN-13: 978-0130224187,ISBN-10: 0130224189
5. Tannenbaum, Data Structures using C and C++; PHI., ISBN-13: 978-0130369970,ISBN-10: 0130369977
6. Thoms Horbron, -File systems – Structures and Algorithms; PHI. I 7. Bonald Knuth, -Art of Computer Programming Vol. I;, ISBN-13: 978-0201896831,ISBN-10: 9780201896831

Course Code: CS-MJP-241

Course Title: Lab on Data Structure-II

Course Code: CS-MJ-241	**Course Category:** Core Course (DSC)
Course Title: Lab on Data Structure-II	**Type:** Practical
Total Contact Hours: 60 (4/week)	**Course Credits:** 02
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA):** 30 Marks

Course Objectives:

- To provide the knowledge of data structures and their implementations.
- To understand importance of data structures in context of writing efficient programs.

Course Outcomes:

- The course is designed to develop skills to design and implement simple non-linear data structures and their operations.
- It strengthens the ability of the students to identify and apply the suitable data structure for the given real-world problem.

List of Experiment:

(Note : Implement all practical using 'C++' Language)

1. To Create a binary tree and Implement following Tree Traversal Techniques:

   i) Inorder ii) Preorder iii) Postorder.

2. Implement following Graph Search Techniques: i) BFS ii) DFS.

3. Implement Selection sort technique.

4. Implement Bubble sort technique

5. Implement Insertion sort technique.

6.Implement Merge sort technique.

7. Implement Quick sort technique.

8. Implement: i) Linear Search ii) Binary Search

Course Code: CS-OE-247

Course Title: SQL (Structured Query Language) for All

Course Code: CS-OE-247	**Course Category:** Open Elective (OE)
Course Title: SQL (Structured Query Language) for all	**Type:** Theory
Total Contact Hours: 60 (4/week)	**Course Credits: 02**
College Assessment (CA) Marks: 40 Marks	**University Assessment (UA):** 60 Marks

Course Objectives:

- To learn about SQL and their types
- To learn DBMS concepts.
- To learn concept of SQL data handling.
- To learn SQL functions.

Course Outcomes:

Student will be able to design SQL database:

- With constraints
- SQL data handling
- SQL functions.

Course Content:

Unit 1: Introduction to Databases and SQL **(4 L, 6 M)**

1.1 Overview of Databases: What is a database?
1.2 Types of databases (Relational, Non-relational).
1.3 Database Management System (DBMS): Definition, Types, Functions.
1.4 Relational Databases: Tables, Rows, and Columns.
1.5 SQL (Structured Query Language): Definition, history, importance, and role in managing relational databases.
1.6 SQL syntax basics: DDL/DML/DTL/DCL, Keywords, clauses, and case sensitivity.

Unit 2: SQL Data Types **(6 L, 10 M)**

2.1 Numeric Data Types: INT, DECIMAL, FLOAT, etc.
2.2 Character Data Types: CHAR, VARCHAR, TEXT.
2.3 Date and Time Data Types: DATE, TIME, DATETIME, TIMESTAMP.
2.4 Other Data Types: BOOLEAN, BLOB, ENUM.

Unit 3: SQL Queries **(8 L, 12 M)**

3.1 SELECT Statement: Syntax and usage, Retrieving data from a table, Using DISTINCT for unique records, Filtering data using the WHERE clause, Order and Sorting Data: ORDER BY, ASC, DESC.
3.2 LIMIT: Restricting the number of rows returned, Filtering and Sorting Data
3.3 WHERE Clause: Comparison operators, logical operators (AND, OR, NOT).
3.4 IN, BETWEEN, LIKE: Range queries and pattern matching.
3.5 NULL Values: IS NULL, IS NOT NULL.
3.6 Aggregate Functions: COUNT, SUM, AVG, MIN, MAX.
3.7 Subqueries in SELECT, WHERE, and FROM clauses.

Unit 4: SQL Data handling **(8 L, 12 M)**

4.1 CREATE, ALTER, DROP: Creating, modifying, and deleting tables
4.2 SQL Constraints-Primary Key: Ensuring uniqueness for each record, Foreign Key: Establishing relationships between tables, Unique, Not Null, Check: Data validation, Default Constraints: Setting default values.
4.3 INSERT INTO: Adding new rows to a table
4.4 UPDATE: Modifying existing rows.
4.5 DELETE: Removing rows from a table.
4.6 Transactions: COMMIT, ROLLBACK, SAVEPOINT.

Unit 5: SQL Functions **(4 L, 5 M)**

5.1 String Functions: CONCAT, LENGTH, SUBSTRING, UPPER, LOWER, etc.
5.2 Mathematical Functions: ROUND, CEIL, FLOOR, MOD, etc.
5.3 Date Functions: NOW, DATE_ADD, DATEDIFF, YEAR, MONTH, DAY.
5.4 Aggregate Functions: COUNT, AVG, SUM, MIN, MAX.

Reference Books:

1. "SQL for Smarties: Advanced SQL Programming" by Joe Celko
2. "Learning SQL" by Alan Beaulieu
3. "SQL in 10 Minutes, Sams Teach Yourself" by Ben Forta
4. "SQL: The Complete Reference" by James R. Groff and Paul N. Weinberg
5. "SQL for Data Scientists: A Beginner's Guide for Building Datasets for Analysis" by Renee M. P. Teate
6. "Head First SQL: Your Brain on SQL -- A Learner's Guide" by Lynn Beighley
7. "SQL Cookbook" by Anthony Molinaro "Database System Concepts" by Abraham Silberschatz, Henry F. Korth, and S. Sudarshan

Course Code: CS-VC-244

Course Title: Database Management System (DBMS)

Course Code: CS-VC-244	**Course Category:** Vocational Course (VC-1)
Course Title: Database Management System (DBMS)	**Type: Theory**
Total Contact Hours: 30 (2/week)	**Course Credits:** 02
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA):** 30 Marks

Course Objectives:

- To provide a sound introduction to the discipline of database management system as a subject.
- To give an introduction to systematic design approaches covering conceptual, logical and physical view
- To present the concepts and techniques relating to query processing using SQL

Course Outcomes:

- Understand and effectively explain the concepts of database technologies.
- Design and implement a database schema for give problem domain and normalize Database
- To make the students understand the students about SQL Queries.

Course Content:

Unit 1: Database Management System (07 L, 10 M)

1.1 Introduction of Basic Concept and Definitions DBMS - Data and Information, Data Vs. Information, Data Dictionary, Data Item or Field, Record
1.2 Definition of DBMS
1.3 Applications of DBMS
1.4 Advantages and Disadvantages of DBMS
1.5 Users of DBMS - Database Designers, Application programmer, Sophisticated Users, End Users

Unit 2: Relational Model (05 L, 7 M)

2.1 Basic Terms – Relation, Tuple, Attribute, Cardinality, Degree of relationship set, Domain
2.2 Keys - Super Key, Candidate Key, Primary Key, Foreign Key

Unit 3: Relational Algebra Operations (06 L, 10 M)

3.1 Preliminaries

3.2 Relational Algebra – Select, Project, Union, Difference, Intersection, Cartesian Product, Natural Join

Unit 4: Queries In DBMS **(12 L, 18 M)**

4.1 Introduction
4.2 History Of SQL
4.3 Basic Structure
4.4 DDL Commands
4.5 DML Commands
4.6 Simple Queries
4.7 Aggregate Functions

Reference Books:

1. Database System Concepts- Abraham Silberschatz, Henry F. Korth& S. Sudarshan,McGraw- Hill, 4th Edition / 5th Edition.
2. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education/Addison Wesley, 2007.
3. Database System Concepts – Alexis Leon & Mathews leon, Vikas Publication House Ltd, New Delhi.

Course Code: CS-VCP-245

Course Title: Lab on DBMS

Course Code: CS-VCP-245	**Course Category:** Vocational Course (VC-2)
Course Title: Lab on DBMS	**Type:** Practical
Total Contact Hours: 60 (4/week)	**Course Credits:** 02
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA):** 30 Marks

Course Objectives:

- To study basic concepts of database management System
- To understand SQL Commands
- To understand how to Enables student to write SQL command to implements: Constraints and Relationships.

Course Outcomes:

- After completion of this course, students will able to write SQL DDL, DML queries, they can understand Constraints and able to implement Relationships.

List of Experiment:

1) Assignment on DDL Commands (Table Creation).
2) Assignment on DDL Commands (Alter and Drop table)
3) Assignment on DML Commands (Insert, Update and Delete).
4) Assignment on Table Creation with Constraints.
5) Assignment on Implementation of Select Command.
6) Assignment on aggregate function.

Course Code: CS-CEP- 242

Course Title: Community Engagement Program

Course Code: CS-CEP- 242	**Course Category:** Field Project (FP)
Course Title: Community Engagement Program	**Type:** Practical
Total Contact Hours: 120 (8/week)	**Course Credits:** 04
College Assessment (CA) Marks: 40 Marks	**University Assessment (UA):** 60 Marks

Course Objectives:

- **Bridge the Gap Between Theory and Practice:** To provide students with hands-on experience in real-world work environments, enabling them to apply theoretical knowledge in practical scenarios.
- **Enhance Technical and Professional Skills:** To develop technical proficiency, problem-solving abilities, and industry-relevant skills through on-the-job training.
- **Foster Industry Readiness and Employability:** To expose students to workplace culture, teamwork, communication, and professional ethics, preparing them for future careers.

Course Outcomes:

- **Apply Theoretical Concepts to Practical Work** – Demonstrate the ability to integrate classroom knowledge with hands-on experience in an industry setting.
- **Develop Industry-Specific Technical Skills** – Gain expertise in relevant tools, technologies, and methodologies used in the industry.
- **Exhibit Professional and Ethical Competence** – Showcase teamwork, communication, time management, and professional ethics in a workplace environment.
- **Analyze and Solve Real-World Problems** – Identify and address practical challenges using computational approaches, innovation, and critical thinking.

On Job Training

*** CEP should be completed in the summer vacation after 4th semester**

Course Code: CS-MN-246 A

Course Title: Introduction to DBMS

Course Code: CS-MN-246 A	**Course Category: Minor Course (MIN)**
Course Title: Introduction to DBMS	**Type: Theory**
Total Contact Hours: 30 (2/week)	**Course Credits: 02**
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA): 30 Marks**

Course Objectives:

- To provide a sound introduction to the discipline of database management system as a subject.
- To give an introduction to systematic design approaches covering conceptual, logical and physical view
- To present the concepts and techniques relating to query processing using SQL

Course Outcomes:

- Understand and effectively explain the concepts of database technologies.
- Design and implement a database schema for give problem domain and normalize Database
- To make the students understand the students about SQL Queries.

Course Content:

Unit 1: Database Management System (07L, 10 M)

1.1 Introduction of Basic Concept and Definitions DBMS

i. Data and Information

ii. Data Vs. Information

iii. Data Dictionary

iv. Data Item or Field

v. Record

1.2 Definition of DBMS

1.3 Applications of DBMS

1.4 Advantages and Disadvantages of DBMS

1.5 Users of DBMS

i. Database Designers

ii. Application programmer

iii. Sophisticated Users

iv. End Users

Unit 2: Relational Model (05L, 7 M)

2.1 Basic Terms

i. Relation

ii. Tuple

iii. Attribute

iv. Cardinality

v. Degree of relationship set

vi. Domain

2.2 Keys

i. Super Key

ii. Candidate Key

iii. Primary Key

iv. Foreign Key

Unit 3: Relational Algebra Operations (06L, 10 M)

3.1 Preliminaries

3.2 Relational Algebra

i. Select

ii. Project

iii. Union

iv. Difference

v. Intersection

vi. Cartesian Product

vii. Natural Join

Unit 4: Queries In DBMS (12 L, 18 M)

4.1 Introduction

4.2 History Of SQL

4.3 Basic Structure

4.4 DDL Commands

4.5 DML Commands

4.6 Simple Queries

4.7 Aggregate Functions

Reference Books:

1. Database System Concepts- Abraham Silberschatz, Henry F. Korth& S. Sudarshan,McGraw- Hill, 4th Edition / 5th Edition.

2. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson Education/Addison Wesley, 2007.

3. Database System Concepts – Alexis Leon & Mathews leon, Vikas Publication House Ltd, New Delhi.

Course Code: CS-MNP-246 B

Course Title: Lab on DBMS

Course Code: CS-MNP-246 B	**Course Category: Minor Course (MIN)**
Course Title: Lab on DBMS	**Type: Practical**
Total Contact Hours: 60 (4/week)	**Course Credits: 02**
College Assessment (CA) Marks: 20 Marks	**University Assessment (UA): 30 Marks**

Course Objectives:

- To study basic concepts of database management System
- To understand SQL Commands
- To understand how to Enables student to write SQL command to implements: Constraints and Relationships.

Course Outcomes:

- After completion of this course, students will able to write SQL DDL, DML queries ,they can understand Constraints and able to implement Relationships.

List of Experiment:

1) Assignment on DDL Commands (Table Creation).
2) Assignment on DDL Commands (Alter and Drop table)
3) Assignment on DML Commands (Insert, Update and Delete).
4) Assignment on Table Creation with Constraints.
5) Assignment on Implementation of Select Command.
6) Assignment on aggregate function.

Reference Books:

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