

**SYLLABUS FOR  
THE FOUR-YEAR UNDERGRADUATE  
PROGRAMME (FYUGP)**

**As per provision of NEP-2020 to be implemented from  
Academic Year 2022 onwards**



**Session 2025-26**

**Semester – III & IV**

**DEPARTMENT OF COMPUTER SCIENCE**

**GOVT. DIGVIJAY AUTONOMOUS P.G. COLLEGE,  
RAJNANDGAON (C.G.)**

## B. SC. (Multiple Major) – DEGREE COURSE (Session 2025-26)

### Major – Computer Science

SECOND YEAR	SEMESTER	COURSE TYPE	Theory/ Practical I	COURSE CODE	PAPER TITLE	CREDIT			Max Marks	ESE	IA
						L	T	P			
	III	DSC	Theory	CSSC- 03T	Data Structure	3	0	0	100	70	30
		DSC-LAB	Practical	CSSC- 03P	Lab 3 – Data Structure Using C++	0	0	1	50	35	15
		DSE	Theory	CSSE-01	Data Communication and Networking	4	0	0	100	70	30
	IV	DSC	Theory	CSSC- 04T	Relational Database Management System	3	0	0	100	70	30
		DSC- LAB	Practical	CSSC- 04P	Lab 4 : Relational Database Management System (Oracle/MySQL)	0	0	1	50	35	15
		DSE	Theory	CSSE-02	Computer System Architecture	4	0	0	100	70	30

**DSC- Discipline Specific Course**

**DSE - Discipline Specific Elective**

**CIA- Continuous Internal Assessment**

**ESE – End Semester Exam**

**FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)**  
**DEPARTMENT OF COMPUTER SCIENCE**  
**COURSE CURRICULUM**

**PART- A: Introduction**

<b>Program:</b> Bachelor in Science (CS) (Certificate / Diploma / Degree/Honors)		<b>Semester – III</b>	<b>Session: 2024-2025</b>
1	Course Code	CSSC -03T	<b>Session 2025-26</b>
2	Course Title	<b>Data Structure</b>	
3	Course Type	<b>DSC (Discipline Specific Course)</b>	
4	Prerequisite (if, any)	<i>As per program</i>	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: <ul style="list-style-type: none"> <li>• Understand the fundamentals and applications of data structure.</li> <li>• Utilize various algorithms for real world problem solving.</li> <li>• Understanding about data management in computer memory.</li> <li>• Apply stack, Queue, Lists, Trees and Graphs for real world application.</li> <li>• Understand how various data structures can be used to implement through any programming language.</li> </ul>	
6	Credit Value	<b>3 Credits</b>	<b>Credit = 15 Hours - Learning &amp; Observation</b>
7	Total Marks	<b>Max. Marks: 100</b>	<b>Min Passing Marks: 40</b>

**PART -B: Content of the Course**

**Total No. of Teaching–Learning Periods (01 Hr. per period) - 45 Periods (45 Hours)**

Unit	Topics (Course contents)	No. of Period
<b>I</b>	<b>Introduction and Basic Concepts:</b> Introduction, Fundamentals of Algorithms, Data types: Primitive, Non-Primitive Absent Data Type (ADT), Classification of Data Structure: Linear and Nonlinear Data Structure. <b>Array:</b> Arrays and its types, Memory allocation and address calculations of Array, Sparse Array. <b>Linked List:</b> Types of Linked List and various Operations Like INSERT, DELETE, TRAVERSE. Introduction and Application of Stack and Queue.	<b>12</b>
<b>II</b>	<b>Stack:</b> Definition, Operations PUSH, POP, Implementations using Array and Linked list, Applications of Stack: Infix, Prefix, Postfix representation and conversion using Stack, Postfix expression evaluation using Stack, Recursion using Stack. <b>Queue:</b> Definition, Types of Queues: Priority Queue, Circular queue, Double Ended Queue, operations of Queue INSERT, DELETE, TRAVERSE, Implementation Queue using Array and Linked list, Applications of Queue.	<b>11</b>
<b>III</b>	<b>Tree:</b> Definition of Trees and their types, Binary trees, Properties of Binary trees and operations Insertion, deletion, searching and traversal algorithm: preorder, post order, in-order traversal, Binary Search Trees, Implementations, AVL Trees. <b>Graph:</b> Definition of Graph and their types, Adjacency and Incident (matrix & linked list) Representation of graphs, Graph Traversal – Breadth first Traversal, Depth first Traversal, Connectivity of Graphs; Weighted Graphs, Shortest Path Algorithm, Spanning Tree, Minimum Spanning Tree, Kruskal's and Prim's Algorithms.	<b>11</b>
<b>IV</b>	<b>Sorting Methods:</b> Types of Sorting Selection Sort, Insertion Sort, Bubble Sort, Quick Sort, Merge Sort, Radix Sort. <b>Searching:</b> Linear search, Binary search.	<b>11</b>

**Keywords:** Data, ADT, Array, Linked List, Stack, Queue, Tree, Graph, Searching, Sorting.

**Name and Signature of Convener & Members of CBoS:**

*Dr. H. S. Bhatnagar*  
Chairman

*Kiran Chakraborty*  
Member

*Yashwanth*  
Member

*Amey*  
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*Shruti*  
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Member

*Pranav Kulkarni*  
Member

*Anjeeta Kulkarni*  
Member

*Dr. H. S. Bhatnagar*  
*Dr. H. S. Bhatnagar*  
*Dr. H. S. Bhatnagar*



## PART-C: Learning Resources

## Text Books, Reference Books and Others

*Text Books Recommended:*

- Michael T. Goodrich, Data Structures and Algorithms in C++, Wiley
- Horowitz and Sahani, Fundamentals of Data Structures, Computer Science Press

### Reference Books *Recommended:*

- Alfred V. Aho, Data structures and Algorithms, Jhon E. Hopcroft and J.E. Ullman.
- Jean Paul Trembley and Paul Sorenson, An Introduction to Data Structures with Applications, TMH, International Student Edition
- R. Kruse, Leung & Tondo, Data Structures and Program Design in C, PHI publication, 2<sup>nd</sup> Edition

**Online Resources:**

- NPTEL YouTube Channel: Data Structure Complete course
- <https://youtube.com/playlist?list=PLc2MoXNv7E4mtsPlnn9BnTOENXsGyoDgR&si=aAYaVZ-vWfeuhFEO>
- NPTEL YouTube Channel: Introduction to Data Structure
- <https://www.youtube.com/watch?v=zWg7U0OEAoE&list=PLBF3763AF2E1C572F&index=1>
- NPTEL YouTube Channel: Stacks
- <https://www.youtube.com/watch?v=gIUSSZVWDsY&list=PLBF3763AF2E1C572F&index=2>
- NPTEL YouTube Channel: Queues and linked list
- <https://www.youtube.com/watch?v=PGWZUgzDMYI&list=PLBF3763AF2E1C572F&index=3>
- NPTEL YouTube Channel: Trees
- <https://www.youtube.com/watch?v=tORLeHHtazM&list=PLBF3763AF2E1C572F&index=6>
- NPTEL YouTube Channel: Graphs
- <https://www.youtube.com/watch?v=9zpSs845wf8&list=PLBF3763AF2E1C572F&index=24>
- W3schools Data Structure Reference: DSA Tutorial (w3schools.com)

## PART -D: Assessment and Evaluation

### Suggested Continuous Evaluation Methods:

**Maximum Marks: 100 Marks**

**Continuous Internal Assessment (CIA): 30 Marks**

**End Semester Exam (ESE):** 70 Marks

<b>Continuous Internal Assessment (CIA):</b> (By Course Teacher)	Internal Test / Quiz-(2): 20 & 20 Assignment / Seminar - 10 Total Marks - 30	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
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End Semester Exam (ESE):	<p>Two section – A &amp; B</p> <p>Section A: Q1. Objective – 10 x1= 10 Mark; Q2. Short answer type- 5x4 =20 Marks</p> <p>Section B: Descriptive answer type qts., 1out of 2 from each unit-4x10=40 Marks</p>
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Name and Signature of Convener & Members of CBoS:

Dr. H. S. Hota  
chairman  
Sushil  
E  
(Arun Thakkar)  
S  
Snehalata  
Argy  
du  
preksha  
Kumar  
Jyoti  
An  
Dr. V. K. Gupta  
Anjeeta  
ANJEETA KUMAR

3/2/2020



**FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)**  
**DEPARTMENT OF COMPUTER SCIENCE**  
**COURSE CURRICULUM**

<b>PART- A: Introduction</b>			
Program: Bachelor in Science (CS) (Certificate / Diploma / Degree)		Semester – III	Session: 2025-2026 <b>Session 2025-26</b>
1	Course Code	CSSC-03P	
2	Course Title	Lab 3: Data Structure Using C++	
3	Course Type	DSC	
4	Prerequisite	As per program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: <ul style="list-style-type: none"> <li>• Understand how the concept of data structure can be implemented programmatically.</li> <li>• Implement the fundamentals data structure through C and C++</li> <li>• Understand the functioning of Array and linked list programmatically.</li> <li>• Understand the applications of array, linked list stack, queue, tree and graph programmatic.</li> <li>• Write programs for various data structures for real world application.</li> </ul>	
6	Credit Value	1 Credits	Credit =30 Hours Laboratory or Field Learning/Training
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20
<b>PART -B: Content of the Course</b>			
Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)			
Module	Topics (Course contents)		No. of Period
Lab./Field Training/ Experiment	1. Write a program to create a square matrix, fill the data inside and print the diagonal elements. 2. Write a program to perform addition and subtraction on two matrices. 3. Write a program to perform multiplication on two matrices. 4. Write a program to perform insertion, deletion of nodes from the end in singly linked list. 5. Write a program to perform insertion and deletion of nodes from the end in singly linked list. 6. Write a program to perform insertion and deletion of nodes from the end in circular doubly linked list. 7. Write a program to perform push and pop operations in stack, where stack should be created using array. 8. Write a program to perform push and pop operation in stack, where stack should be created linked list. 9. Write a program to calculate factorial of given number using stack. 10. Write a program to perform insertion and deletion of data items in queue, queue should be implemented by using a linked list. 11. Write a program to perform insertion and deletion of data items in queue, queue should be implemented by using arrays. 12. Write a program to demonstrate functioning of a double ended queue. 13. Write a program to read the postfix arithmetic expression and evaluate its value using the stack. 14. Write a program to show how to handle the overflow and underflow situation in stack. 15. Write a program to convert infix notation-based expression into the postfix notation-based expression using the stack. 16. Write a program to implement the concept of priority-based element		30



	<p>traversing using priority queue.</p> <p>17. Write a program to implement the concept of priority-based element traversing using priority queue.</p> <p>18. Write a program to create binary search tree using the concept of linked list and array, suppose data set will be given at the run time.</p> <p>19. Write a program to create a binary tree with any data set and traverse the data items in pre-order, in-order and post-order manner using recursion.</p> <p>20. Write a program to perform deletion of any data item from the binary search tree.</p> <p>21. Write a program to find the height of any tree.</p> <p>22. Write a program to create any given undirected graph using the adjacency matrix, and print each node/element with list of its adjacent elements.</p> <p>23. Write a program to find the height of any given tree.</p> <p>24. Write a program to traverse the element of given graph according BFS and DFS.</p> <p>25. Write a program to find the minimum spanning tree of any given graph.</p> <p>26. Write a program to search any run time given element from the array of 10 elements in the array are unsorted.</p> <p>27. Write a program to demonstrate the binary search.</p> <p>28. Write a program to find the smallest and largest element in any array.</p> <p>29. Write a program to arrange the data items of any array in ascending order.</p> <p>30. Write a program to arrange the data items of any array in descending order using quick sort.</p> <p><b>Note:</b> Concerned teacher can add additional practical exercises as per requirement.</p>	
<b>Keywords</b>	Array, Linked List, Stack, Queue, Traversing, Tree, Graph, Searching, Sorting, Hashing.	
<b>Name and Signature of Convener &amp; Members of CBoS:</b>		
<p>Dr. H. S. Hota Chairman</p> <p>Sunil</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth Kulkarni</p> <p>Shreshth 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## PART-C: Learning Resources

### Text Books, Reference Books and Others

#### Text Books Recommended:

- Michael T. Goodrich, Data Structures and Algorithms in C++, Wiley
- Horowitz and Sahani, Fundamentals of Data Structures, Computer Science Press

#### Reference Books Recommended:

- Alfred V. Aho, Data structures and Algorithms, Jhon E. Hopcroft and J.E. Ullman.
- Jean Paul Trembley and Paul Sorenson, An Introduction to Data Structures with Applications, TMH, International Student Edition
- R. Kruse, Leung & Tondo, Data Structures and Program Design in C, PHI publication, 2<sup>nd</sup> Edition

#### Online Resources:

- NPTTEL YouTube Channel: Data Structure Complete course  
<https://youtube.com/playlist?list=PLc2MoXNv7E4mtsPlnn9BnTOENXsGyoDgR&si=aAYaVZ-vWfeuhFEO>
- NPTTEL YouTube Channel: Introduction to Data Structure  
<https://www.youtube.com/watch?v=zWg7U0OEAOe&list=PLBF3763AF2E1C572F&index=1>
- NPTTEL YouTube Channel: Stacks





<https://www.youtube.com/watch?v=g1USSZVWDsY&list=PLBF3763AF2E1C572F&index=2>

- NPTEL YouTube Channel: Queues and linked list

<https://www.youtube.com/watch?v=PGWZUgzDMYI&list=PLBF3763AF2E1C572F&index=3>

- NPTEL YouTube Channel: Trees

<https://www.youtube.com/watch?v=tORLeHHtazM&list=PLBF3763AF2E1C572F&index=6>

- NPTEL YouTube Channel: Graphs

<https://www.youtube.com/watch?v=9zpSs845wf8&list=PLBF3763AF2E1C572F&index=24>

- W3schools Data Structure Reference: [DSA Tutorial \(w3schools.com\)](https://www.w3schools.com/dsa/)

## PART -D: Assessment and Evaluation

Suggested Continuous Evaluation Methods:

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2):	10 & 10	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
	Assignment/Seminar +Attendance -	05	
	Total Marks -	15	
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment		Managed by Course teacher as per lab. status
	A. Performed the Task based on lab. work	- 20 Marks	
	B. Spotting based on tools & technology (written) -	10 Marks	
	C. Viva-voce (based on principle/technology)	- 05 Marks	

Name and Signature of Convener & Members of CBoS:

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**FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)**  
**DEPARTMENT OF COMPUTER SCIENCE**  
**COURSE CURRICULUM**

<b>PART- A: Introduction</b>			
<b>Program:</b> Bachelor in Science (CS) (Certificate / Diploma / Degree/Honors)		<b>Semester - IV</b>	<b>Session: 2024-2025</b> <b>Session 2025-26</b>
1	Course Code	CSSC-04T	
2	Course Title	Relational Database Management System	
3	Course Type	DSC (Discipline Specific Course)	
4	Prerequisite (if, any)	As per program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: <ul style="list-style-type: none"> <li>• Learn about Database Concepts, Architecture, various Users, Data Models and Data Management.</li> <li>• Familiar with RDBMS Software like Oracle and MySql.</li> <li>• Create various Tables and Databases.</li> <li>• Explore various SQL commands.</li> <li>• Create Database on the basis of E-R diagrams for Minor and Major Project.</li> </ul>	
6	Credit Value	3 Credits	Credit = 15 Hours - Learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40

**PART -B: Content of the Course**

Total No. of Teaching–Learning Periods (01 Hr. per period) - 45 Periods (45 Hours)

Unit	Topics (Course contents)	No. of Period
I	<b>Overview of Database Management:</b> Introduction, Data Processing versus Data Management, Data Models: Network Model, Relational Model, Hierarchical Model, Instance and schema, View of Database system, File Oriented Approach vs Database Oriented Approach, Data Independence, DBMS Architecture, Database Administration Roles, Database languages: DDL, DML, DCL, TCL, Different kinds of DBMS users, Introduction to Data Dictionary.	12
II	<b>Database Design and E-R Model:</b> Introduction, Entity, Strong and weak entities, Relationship, Cardinality, Attributes, Concept of keys: Super key, Candidate key, Primary key, Alternate key, Foreign key, ER Diagram, Constraints in Database, Codd's Rules, Extended ER features: Generalization, Specialization and Aggregation, Participation, Converting an E-R model into relational Schema.	11
III	<b>Relational Database Design and Operations:</b> Introduction, Dependencies: Functional dependencies, Multivalued Dependencies, Join dependencies, Database anomalies, Decomposition, Normalization: Normal forms 1NF, 2NF, 3NF, BCNF, 4NF, 5NF, Denormalization. Relational Algebra: Select operation, Project operation, Union operation, Cartesian Product operation, Intersection operation, Join operation, Different types of joins (Inner join, Outer join, Self join).	11
IV	<b>Transaction:</b> Introduction, Desirable properties of transaction (ACID), Concurrency control techniques, Serializability.	11
Keywords	Data Models, Data Dictionary, E-R Model, E-R Diagram, Keys, Functional Dependency, Anomalies, Normalization, Relational Algebra, Concurrency, Serializability.	

Name and Signature of Convener & Members of CBoS:

Dr. H. S. Hota  
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## Text Books, Reference Books and Others

- Database system concept, H. Korth and A. Silberschatz, TMH Publications.
- Data Base Management System, Alexies & Mathews, Vikash publication.
- Data Base Management System, C. J. Date ,Narosha Publication.
- Data Base Management System By James Matin.

- Principles of Database System By Ullman.
- Program Design, Peter Juliff, PHI Publications.
- The Complete Reference, Kevin Loney, Oracle Press.
- SQL, PL/SQL The Programming Language of Oracle, Ivan Bayross , PustakKosh Publication.
- Microsoft SQL Server Management and Administration, Ross, STM Publications.

- SWAYAM URL link for DBMS and RDBMS: <https://youtu.be/f6LGtJutWyA>
- SWAYAM URL link for DBMS and RDBMS: <https://youtu.be/IoL9Ve2SRwQ>
- SWAYAM URL link for DBMS and RDBMS: <https://swayam.gov.in/courses/4434-data-base-management-system>.
- Introduction of DBMS from SWAYAM: [https://onlinecourses.swayam2.ac.in/cec19\\_cs05/preview](https://onlinecourses.swayam2.ac.in/cec19_cs05/preview)
- Introduction of RDBMS from SWAYAM : [https://onlinecourses.nptel.ac.in/noc19\\_cs46/preview](https://onlinecourses.nptel.ac.in/noc19_cs46/preview)
- Introduction to DMBS: <https://www.w3schools.in/dbms/intro>
- Data independence: <https://www.w3schools.in/dbms/data-independence>
- Generalization and Aggregation: <https://www.w3schools.in/dbms/generalization-aggregation>
- Introduction to DMBS: <https://www.javatpoint.com/dbms-tutorial>

### Suggested Continuous Evaluation Methods:

**Continuous Internal Assessment (CIA): 30 Marks**

Continuous Internal	Internal Test / Quiz-(2): 20 +20
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<b>Continuous Internal Assessment (CIA):</b> (By Course Teacher)	Internal Test / Quiz-(2):	<b>20 +20</b>	Better marks out of the two Test / Quiz obtained marks in Assignment shall be considered against <b>30 Marks</b>
	Assignment / Seminar -	<b>10</b>	
	Total Marks -	<b>30</b>	

<b>End Semester Exam (ESE):</b>	<b>Two section – A &amp; B</b> Section A: Q1. Objective – 10 x1= 10 Mark: Q2. Short answer type- 5x4 =20 Marks Section B: Descriptive answer type qts., 1 out of 2 from each unit-4x10=40 Marks
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~~Name and Signature~~ of Convener & Members of CBoS:

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**FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)**  
**DEPARTMENT OF COMPUTER SCIENCE**  
**COURSE CURRICULUM**

**PART- A: Introduction**

Program: Bachelor in Science (CS) (Certificate / Diploma / Degree)		Semester - IV	Session: 2024-2025 <b>Session 2025-26</b>
1	Course Code	CSSC-04P	
2	Course Title	Lab 4: Relational Database Management System (Oracle/MySQL)	
3	Course Type	Practical	
4	Prerequisite	As per program	
5	Course Learning Outcomes (CLO)	<p>At the end of this course, the students will be able to:</p> <ul style="list-style-type: none"> <li>• Learn about Database Concepts, Architecture, various Users, Data Models and Data Management which helps them to interact with various Databases.</li> <li>• Develop various Tables and Databases which helps them to develop new Software.</li> <li>• Practice various SQL commands which helps them to generate new relationships among various Tables and Databases which are useful for Software Development.</li> <li>• Familiar with RDBMS Software like Oracle and SQL Server which are used as Backend for Software Development.</li> <li>• Develop new Databases for their Minor and Major Project Development which enhances their Data Storage, Data Accessibility and Data Management.</li> </ul>	
6	Credit Value	1 Credits	Credit =30 Hours Laboratory or Field Learning/Training
7	Total Marks	Max. Marks: 50	Min Passing Marks: 20

**PART -B: Content of the Course**

Total No. of learning-Training/performance Periods: 30 Periods (30 Hours)

Module	Topics (Course contents)	No. of Period
List of Practical Experiments	<ol style="list-style-type: none"> <li>1. Design an employee table in Oracle/SQL Server having eid(primary key) ename, edesignation, edoj, edob, eaddress, salary, econtact as fields and answer the following questions : <ol style="list-style-type: none"> <li>a) Insert five records in above created table.</li> <li>b) Display all five records.</li> <li>c) Delete the fourth record.</li> <li>d) Update the third record of the field ename as 'hari'.</li> <li>e) Add one new field in the table.</li> </ol> </li> <li>2. Design a salary table Oracle/SQL Server with one primary key and foreign key(employee table) having following fields : Month, working days, deptid, gross, incentive, deduction and net salary. <ol style="list-style-type: none"> <li>a) Insert five records in the above created table.</li> <li>b) Display all five records.</li> <li>c) Use foreign key relations and display records.</li> <li>d) Update the second record of field deptid as 'Sales'.</li> <li>e) Add one new field in the table.</li> </ol> </li> <li>3. Create a new user in Oracle/SQL Server.</li> <li>4. Create a view in Oracle/SQL Server.</li> <li>5. Create a new table in Oracle/SQL Server and practice for join operation.</li> <li>6. Create a new user in Oracle/SQL Server and practice for the commit and rollback command.</li> </ol>	30





	<ol style="list-style-type: none"> <li>7. Create a new database in Oracle/SQL Server having at least five tables for the Hotel Management System.</li> <li>8. Create a new database in Oracle/SQL Server having at least four tables for Covid Vaccination Management System.</li> <li>9. Create a new database in Oracle/SQL Server having at least five tables for the Library Management System.</li> <li>10. Create a new table in Oracle/SQL Server and practice for Group by and Order by Clause.</li> <li>11. Create a new table in Oracle/SQL Server and practice for max(), min(), avg() and count() functions.</li> <li>12. Create a new table in Oracle/SQL Server and practice for lower(), substr(), trim() and upper() functions.</li> <li>13. Create a new table in Oracle/SQL Server and practice for unique and check constraints.</li> <li>14. Create a new table in Oracle/SQL Server and practice for any two date formats.</li> <li>15. Create a new table in Oracle/SQL Server and practice using clauses.</li> <li>16. Create a new table in Oracle/SQL Server and practice for having clauses with sub queries.</li> <li>17. Create a new table in Oracle/SQL Server and practice for aliases in any table.</li> <li>18. Create a new table in Oracle/SQL Server and practice for inner and outer join.</li> <li>19. Create a new table in Oracle/SQL Server and practice for Drop command.</li> <li>20. Write a PL/SQL program for addition of two numbers.</li> <li>21. Write a PL/SQL program to find the factorial value of any entered number.</li> <li>22. Write a PL/SQL program for swapping of two numbers.</li> <li>23. Write a PL/SQL program to print the first ten Natural Numbers.</li> <li>24. Write a PL/SQL program to generate even series upto five digits starting from 2 and sum all the terms.</li> <li>25. Write a PL/SQL program to practice for implicit and explicit cursors.</li> </ol> <p><b>Note:</b> Concerned teacher can add additional practical exercises as per requirement.</p>	
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**Keywords** TABLE, SQL, PL/SQL.

**Name and Signature of Convener & Members of CBoS:**

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*Shubh*

*Surabhi Thakur*

*Shreeraj*  
Ann

*Shreeraj*  
Kumar

*Dr. A. K. Singh*  
Vice-Chairman

*Anjeeta*  
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## PART-C: Learning Resources

**Text Books, Reference Books and Others**

**Text Books Recommended:**

- Database system concept, H. Korth and A. Silberschatz, TMH Publications.
- Data Base Management System, Alexies & Mathews, Vikash publication.
- Data Base Management System, C. J. Date ,Narosha Publication.
- Data Base Management System By James Matin.

**Reference Books Recommended:**

- Principles of Database System by Ullman.
- Program Design, Peter Juliff, PHI Publications.
- The Complete Reference, Kevin Loney, Oracle Press.

*Dr. H.S. Hota*

- SQL, PL/SQL The Programming Language of Oracle, Ivan Bayross, PustakKosh Publication.
- Microsoft SQL Server Management and Administration, Ross, STM Publications.

**Online Resources:**

- SWAYAM URL link for DBMS and RDBMS:  
<https://youtu.be/f6LGtJutWyA>
- SWAYAM URL link for DBMS and RDBMS:  
<https://youtu.be/loL9Ve2SRwQ>
- SWAYAM URL link for DBMS and RDBMS :  
<https://swayam.gov.in/courses/4434-data-base-management-system>

**PART -D: Assessment and Evaluation**

**Suggested Continuous Evaluation Methods:**

Maximum Marks: 50 Marks

Continuous Internal Assessment (CIA): 15 Marks

End Semester Exam (ESE): 35 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 10 & 10 Assignment/Seminar +Attendance - 05 Total Marks - 15	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 15 Marks
End Semester Exam (ESE):	Laboratory / Field Skill Performance: On spot Assessment A. Performed the Task based on lab. work - 20 Marks B. Spotting based on tools & technology (written) - 10 Marks C. Viva-voce (based on principle/technology) - 05 Marks	Managed by Course teacher as per lab. status

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Dr. H.S. Hota



## COURSE CURRICULUM

**Program: Bachelor in Science (CS)**  
(Certificate / Diploma / Degree/Honors)

Session: 2024-2025

1	Course Code	CSSE-01		Session 2025-26
2	Course Title	Data Communication and Networking		
3	Course Type	DSE (Discipline Specific Elective)		
4	Prerequisite	As per program		
5	Course Learning Outcomes (CLO)	<p>At the end of this course, the students will be able to:</p> <ul style="list-style-type: none"> <li>Understand the fundamentals and functionalities of computer network technology.</li> <li>Understand and explain the Data Communications System and its components.</li> <li>Analyze the different types of network topologies and protocols.</li> <li>Analyze various layers of OSI and TCP/IP models.</li> <li>Explore wireless and wired LANs.</li> </ul>		
6	Credit Value	4 Credits	Credit = 15 Hours - learning & Observation	
7	Total Marks	Max. Marks:	100	Min Passing Marks: 40

**Total No. of Teaching–Learning Periods (01 Hr. per period) – 60 Periods (60 Hours)**

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## PART-C: Learning Resources

### Text Books, Reference Books and Others

#### Text Books Recommended:

- Andrew S. Tanenbaum, Computer Networks, PHI / Pearson Education Inc.
- Behrouz A. Forouzan, Data Communication and Networking, Tata McGraw-Hill.

#### Reference Books Recommended:

- William Stallings, Data and Computer Communication, Pearson Education.
- Nader F. Mir, Computer and Communication Networks, Pearson Education, 2007.
- Black, Data & Computer Communication, PHI

#### Online Resources:

- NPTEL link for Data Communication:  
<https://nptel.ac.in/courses/106105082>
- Introduction to Data Communication from SWAYAM Portal  
[https://www.youtube.com/watch?v=swtH\\_okidQc&list=PLUtlVcb-iqn8dG1-Cn7NTedILR3hRVgcN&index=1](https://www.youtube.com/watch?v=swtH_okidQc&list=PLUtlVcb-iqn8dG1-Cn7NTedILR3hRVgcN&index=1)
- Layered Architecture  
<https://www.youtube.com/watch?v=xHO6LjSHco0&list=PLUtlVcb-iqn8dG1-Cn7NTedILR3hRVgcN&index=2>
- Data and Signal  
<https://www.youtube.com/watch?v=6ZGVZ7gUccE&list=PLUtlVcb-iqn8dG1-Cn7NTedILR3hRVgcN&index=3>
- Guided Transmission Media  
<https://www.youtube.com/watch?v=y7v3EAJsWXA&list=PLUtlVcb-iqn8dG1-Cn7NTedILR3hRVgcN&index=5>
- Unguided Transmission Media  
<https://www.youtube.com/watch?v=hKq1tYIVxdQ&list=PLUtlVcb-iqn8dG1-Cn7NTedILR3hRVgcN&index=6>

## PART -D: Assessment and Evaluation

### Suggested Continuous Evaluation Methods:

Maximum Marks: 100 Marks

Continuous Internal Assessment (CIA): 30 Marks

End Semester Exam (ESE): 70 Marks

Continuous Internal Assessment (CIA): (By Course Teacher)	Internal Test / Quiz-(2): 20 + 20	Better marks out of the two Test / Quiz + obtained marks in Assignment shall be considered against 30 Marks
	Assignment / Seminar - 10	
	Total Marks - 30	

End Semester Exam (ESE):	Two section – A & B
	Section A: Q1. Objective – 10 x 1 = 10 Mark; Q2. Short answer type- 5x4 =20 Marks
	Section B: Descriptive answer type qts., 1 out of 2 from each unit-4x10=40 Marks

### Name and Signature of Convener & Members of CBoS:

Dr. H.S. Bhat  
Chairman

Kiran Bhat

Yash

Anny

Chal

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**FOUR YEAR UNDERGRADUATE PROGRAM (2024 – 28)**  
**DEPARTMENT OF COMPUTER SCIENCE**  
**COURSE CURRICULUM**

<b>PART- A: Introduction</b>			
Program: Bachelor in Science (CS) (Certificate / Diploma / Degree/Honors)		Semester - IV	Session: 2024-2025 <b>Session 2025-26</b>
1	Course Code	CSSE-02	
2	Course Title	Computer System Architecture	
3	Course Type	DSE (Discipline Specific Elective)	
4	Prerequisite	As per Program	
5	Course Learning Outcomes (CLO)	At the end of this course, the students will be able to: <ul style="list-style-type: none"> <li>• Understand the architecture and functioning of computer systems at the hardware level.</li> <li>• Analyze the Instruction Set Architecture (ISA)</li> <li>• Understand design, Implementation and Analysis of data path for instruction execution.</li> <li>• Understand the functioning of the CPU.</li> <li>• Understand the concept of parallel processing with their applications.</li> <li>• Understand the communication between the peripheral devices and CPU.</li> <li>• Explore the concepts of Memory Organization.</li> <li>• Understand the concept of multiprocessing.</li> <li>• Design the basic computer system Architecture.</li> </ul>	
6	Credit Value	4 Credits	Credit = 15 Hours - learning & Observation
7	Total Marks	Max. Marks: 100	Min Passing Marks: 40
<b>PART -B: Content of the Course</b>			
Total No. of Teaching–Learning Periods (01 Hr. per period) – 60 Periods (60 Hours)			
Unit	Topics (Course contents)		No. of Period
I	<b>Fundamentals Of Basic Computer Organization And Design:</b> Introduction of digital components, register and its types(DR,AR,AC,IR,PC,TR,INPR,OUTR), register transfer and register transfer language, microoperations and its types, common bus system for register and memory organization, computer instruction, basic format of instruction, types of instruction according addressing field (zero, one, two, three addressing), types of instruction (MRI,NMRI), addressing modes, instruction cycle and its flowchart, types of control unit(hardwired and microprogrammed control unit), design of control unit in basic computer.		15
II	<b>Central Processing Unit and Parallel Processing Techniques:</b> Introduction to CPU, general register organization, stack organization (register stack, memory stack), application of stack organizations, CPU instructions (data transfer instruction, data manipulation instruction, program control instructions), RISC and CISC instructions, interrupts and its types, interrupt cycle. Flynn's classification of computers, Parallel processing techniques (pipeline processing, vector processing, array processing), pipeline processing concept, types of pipelines and its application, speedup ratio of a pipeline, vector processing concept and its applications, concept of array processing and its applications.		15
III	<b>Input – Output Organization:</b> Introduction to peripheral devices, input-output interface and its designing, Modes of data transfer (synchronous and asynchronous data transfer), controls in asynchronous data transfer (strobe control and handshaking control), modes of data transfer (programmed i/o, interrupt-initiated i/o and direct memory access), input-output processor.		15
IV	<b>Memory Organization and Multiprocessor Architecture:</b> Memory hierarchy, main memory and its organization (RAM and ROM Chips, memory address map, memory connections to CPU), auxiliary memory, associative memory, concept of cache memory, cache memory mapping techniques (associative mapping, direct mapping, set-associative mapping), cache coherence problem and its solution, introduction to multiprocessors, interconnection structures of multiprocessor-based systems, inter-processor communication and synchronization.		15





**Keywords** Registers, micro-operation, instruction, control unit, instruction cycle, interrupt cycle, CPU, stack, parallel processing, pipeline processing, vector processing, array processing, asynchronous data transfer, DMA, RAM, ROM, cache memory, IOP, multiprocessor.

**Name and Signature of Convener & Members of CBoS:**

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Gad  
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ANJETA KUR

## PART-C: Learning Resources

### Text Books, Reference Books and Others

#### Text Books Recommended:

- M. Morris Mano, Computer System Architecture, 3e, Pearson Education.
- B. Ram Sanjay Kumar, Computer Fundamentals Architecture and Organization, 5e, New Age International Publishers.

#### Reference Books Recommended:

- William Stalling, Computer Organization & Architecture, 11e, Pearson.
- Jyotsna Sengupta, Fundamentals of Computer Organization and Architecture, Deep & Deep Publications.
- Amit Kumar Mishra, A Textbook of Computer Architecture, Katson Books.

#### Online Resources:

- NPTEL YouTube Channel: Online Lecture Series on Computer Architecture
  - <https://youtube.com/playlist?list=PL59E5B57A04EAE09C&si=WUP8O10Y6Zrleu-i>
  - <https://youtube.com/playlist?list=PL1A5A6AE8AFC187B7&si=Jm1OO3rT9NGSMkmN>
  - <https://youtube.com/playlist?list=PLgHucKw979AvenTpPNZMZyORdL5HvTr9m&si=PqQM Y-sh6tCuzPXA>
- NPTEL Portal : Online Lecture Computer Architecture and Organization  
NPTEL :: Computer Science and Engineering – NOC :Computer architecture and organization

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